

Facility: <u>R.E. Ginna</u> Examination Level: RO ☒ SRO ☐	Date of Examination: <u>07/24/19</u> Operating Test Number: <u>N2019-301R</u>	
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations K/A – 2.1.18 3.6	M, S	Ability to make accurate, clear, and concise logs, records, status boards, and reports. Perform a Daily Surveillance Log
Conduct of Operations K/A – 2.1.37 4.3	M, R	Knowledge of procedures, guidelines, or limitations associated with reactivity management. Calculate SDM for an Operating Reactor with a Misaligned Control Rod
Equipment Control K/A – 2.2.42 3.9	D, R	Ability to recognize system parameters that are entry-level conditions for Technical Specifications. HCO Review of STP-O-36QC
Radiation Control K/A – 2.3.11 3.8	D, R	Ability to control radiation releases. Determine Maximum Reactor Vessel Venting Time
Emergency Plan		
NOTE: All items (five total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).		
* Type Codes and Criteria: (C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs and RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1, randomly selected)		

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Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations K/A – 2.1.25 4.2	D, R	Ability to interpret reference materials, such as graphs, curves, tables, etc. Perform a Critical Rod Position Calculation in accordance with O-1.2.2
Conduct of Operations K/A – 2.1.32 4.0	N, R	Ability to explain and apply system limits and precautions. Determine Operating Limits for Station 13A Transmission in accordance with O-6.9
Equipment Control K/A – 2.2.40 4.7	M, R	Ability to apply Technical Specifications for a system. Determine limitations in accordance with A-52.12, Nonfunctional Equipment Important to Safety
Radiation Control K/A – 2.3.6 3.8	N, R	Ability to approve release permits. Review and Approve Gas Decay Tank Release Permit
Emergency Plan 2.4.41 4.6	M, R	Knowledge of the emergency action level thresholds and classifications. Determine Protective Action Recommendations in accordance with EP-CE-111

NOTE: All items (five total) are required for SROs. RO applicants require only four items unless they are retaking only the administrative topics (which would require all five items).

* Type Codes and Criteria:

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

Facility: <u>R.E. Ginna</u>	Date of Examination: <u>07/24/19</u>
Exam Level: RO ☒ SRO-I ☐ SRO-U ☐	Operating Test Number: <u>N2019-301R</u>

Control Room Systems: **8 for RO**, 7 for SRO-I, and 2 or 3 for SRO-U

System/JPM Title	Type Code*	Safety Function
a. 006 Emergency Core Cooling System (ECCS) [006 A4.01 (4.1/3.9)] Establish RCS Injection in AP-RCS.4 with CI Valve Failures	M, S, A, EN	2
b. 062 AC Electrical Distribution System [062 A4.01 (3.3/3.1)] Transfer 4160V Auxiliary Loads and Take Actions for Loss of Bus	M, S, A	6
c. 012 Reactor Protection System (RPS) [012 A4.04 (3.3*/3.3)] Defeat Failed RCS Temperature Channel	D, S	7
d. 010 Pressurizer Pressure Control System (PZR PCS) [010 A4.03 (4.0/3.8)] Placing LTOP in Service	D, S, L	3
e. EPE W/E06 Degraded Core Cooling (EPE W/E06 EA2.2 (3.5/4.1)) Vent RCS for Accumulator/RHR Injection	M, S, A, EN	4P
f. 045 Main Turbine Generator (MT/G) System [045 A4.01 (3.1/2.9)] Perform Intercept and Reheat Stop Valve Test with Low EH System Pressure	M, S, A	4S
g. 026 Containment Spray System (CSS) [026 A2.08 (3.2/3.7)] Secure Containment Spray in E-1	D, S, EN	5
h. APE 026 Loss of Component Cooling Water (CCW) [APE 026 AA1.02 (3.2/3.3)] Respond to Complete Loss of CCW Flow	N, S, A	8

In-Plant Systems: **3 for RO**, 3 for SRO-I, and 3 or 2 for SRO-U

i. 039 Main and Reheat Steam System (MRSS) [039 A3.02(3.1/3.5*)] Locally Close MSIVs	D, E	4S
j. 033 Spent Fuel Pool Cooling System (SFPCS) [033 G2.1.29 (4.1/4.0)] Alternate SFP Cooling Systems (A to B)	D, R	8
k. EPE 009 Small Break LOCA [EPE 009 EA1.08 (4.0/4.1)] Locally Isolate CI/CVI Valves	D, E, R	5

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

* Type Codes	Criteria for R /SRO-I/SRO-U
(A)lternate path (C)ontrol room (D)irect from bank (E)mergency or abnormal in-plant (EN)gineered safety feature (L)ow-Power/Shutdown (N)ew or (M)odified from bank including 1(A) (P)revious 2 exams (R)CA (S)imulator	4-6/4-6 /2-3 $\leq 9/\leq 8/\leq 4$ $\geq 1/\geq 1/\geq 1$ $\geq 1/\geq 1/\geq 1$ (control room system) $\geq 1/\geq 1/\geq 1$ $\geq 2/\geq 2/\geq 1$ $\leq 3/\leq 3/\leq 2$ (randomly selected) $\geq 1/\geq 1/\geq 1$

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Control Room Systems:* 8 for RO, 7 for SRO-I , and 2 or 3 for SRO-U		
System/JPM Title	Type Code*	Safety Function
a. 006 Emergency Core Cooling System (ECCS) [006 A4.01 (4.1/3.9)] Establish RCS Injection in AP-RCS.4 with CI Valve Failures	M, S, A, EN	2
b. 062 AC Electrical Distribution System [062 A4.01 (3.3/3.1)] Transfer 4160V Auxiliary Loads and Take Actions for Loss of Bus	M, S, A	6
c. N/A		
d. 010 Pressurizer Pressure Control System (PZR PCS) [010 A4.03 (4.0/3.8)] Placing LTOP in Service	D, S, L	3
e. EPE W/E06 Degraded Core Cooling (EPE W/E06 EA2.2 (3.5/4.1)) Vent RCS for Accumulator/RHR Injection	M, S, A, EN	4P
f. 045 Main Turbine Generator (MT/G) System [045 A4.01 (3.1/2.9)] Perform Intercept and Reheat Stop Valve Test with Low EH System Pressure	M, S, A	4S
g. 026 Containment Spray System (CSS) [026 A2.08 (3.2/3.7)] Secure Containment Spray in E-1	D, S, EN	5
h. APE 026 Loss of Component Cooling Water (CCW) [APE 026 AA1.02 (3.2/3.3)] Respond to Complete Loss of CCW Flow	N, S, A	8

In-Plant Systems:* 3 for RO, 3 for SRO-I , and 3 or 2 for SRO-U		
i. 039 Main and Reheat Steam System (MRSS) [039 A3.02(3.1/3.5*)] Locally Close MSIVs	D, E	4S
j. 033 Spent Fuel Pool Cooling System (SFPCS) [033 G2.1.29 (4.1/4.0)] Alternate SFP Cooling Systems (A to B)	D, R	8
k. EPE 009 Small Break LOCA [EPE 009 EA1.08 (4.0/4.1)] Locally Isolate CI/CVI Valves	D, E, R	5

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

* Type Codes	Criteria for R / SRO-I / SRO-U
(A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	$\leq 9 / \leq 8 / \leq 4$
(D)irect from bank	$\geq 1 / \geq 1 / \geq 1$
(E)mergency or abnormal in-plant	$\geq 1 / \geq 1 / \geq 1$ (control room system)
(EN)gineered safety feature	$\geq 1 / \geq 1 / \geq 1$
(L)ow-Power/Shutdown	$\geq 2 / \geq 2 / \geq 1$
(N)ew or (M)odified from bank including 1(A)	$\leq 3 / \leq 3 / \leq 2$ (randomly selected)
(P)revious 2 exams	$\geq 1 / \geq 1 / \geq 1$
(R)CA	
(S)imulator	

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Control Room Systems:* 8 for RO, 7 for SRO-I, and 2 or 3 for SRO-U		
System/JPM Title	Type Code*	Safety Function
a. 006 Emergency Core Cooling System (ECCS) [006 A4.01 (4.1/3.9)] Establish RCS Injection in AP-RCS.4 with CI Valve Failures	M, S, A, EN	2
b. N/A		
c. N/A		
d. 010 Pressurizer Pressure Control System (PZR PCS) [010 A4.03 (4.0/3.8)] Placing LTOP in Service	D, S, L	3
e. N/A		
f. N/A		
g. N/A		
h. APE 026 Loss of Component Cooling Water (CCW) [APE 026 AA1.02 (3.2/3.3)] Respond to Complete Loss of CCW Flow	N, S, A	8
In-Plant Systems:* 3 for RO, 3 for SRO-I, and 3 or 2 for SRO-U		
i. 039 Main and Reheat Steam System (MRSS) [039 A3.02(3.1/3.5*)] Locally Close MSIVs	D, E	4S
j. N/A		
k. EPE 009 Small Break LOCA [EPE 009 EA1.08 (4.0/4.1)] Locally Isolate CI/CVI Valves	D, E, R	5
* All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions, all five SRO-U systems must serve different safety functions, and in-plant systems and functions may overlap those tested in the control room.		

* Type Codes	Criteria for R / SRO-I / SRO-U
(A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	
(D)irect from bank	$\leq 9 / \leq 8 / \leq 4$
(E)mergency or abnormal in-plant	$\geq 1 / \geq 1 / \geq 1$
(EN)gineered safety feature	$\geq 1 / \geq 1 / \geq 1$ (control room system)
(L)ow-Power/Shutdown	$\geq 1 / \geq 1 / \geq 1$
(N)ew or (M)odified from bank including 1(A)	$\geq 2 / \geq 2 / \geq 1$
(P)revious 2 exams	$\leq 3 / \leq 3 / \leq 2$ (randomly selected)
(R)CA	$\geq 1 / \geq 1 / \geq 1$
(S)imulator	

Facility: Ginna Scenario No.: 1 Op-Test No.: N2019-301R

Examiners: _____ Operators: _____

Initial Conditions: The plant is at 70% power due to Grid issues.

Turnover: Plant has been at 70% power for 50 hours. Off-site power circuit 767 is OOS

Critical Tasks: CT #1: Take MANUAL control of Pressurizer pressure to prevent an automatic Reactor trip from occurring.

CT #2: ECA-2.1-A Control the AFW flowrate to 50 gpm per SG in order to minimize the RCS
Cooldown rate before a severe challenge (Orange Path) develops to the integrity CSF (EOP-Based)

Event No.	Malf. No.	Event Type*	Event Description
1		N(BOP) R(ATC) N(US)	Raise Turbine Load to 100% in accordance with O-5.2, Load Ascension
2	PZR02D	I(ALL) TS(US)	PT-449, Pressurizer Pressure, fails HIGH
3	OVR-EDS44D	C(ALL) TS(US)	Loss of 4160V Bus 12B
4	STM05A STM05B STM03	M(ALL)	Both Steam Generators faulted downstream of MSIVs (MSIVs fail to close)
5	SIS02A SIS02B	C(ATC) C(US)	Safety Injection fails to Auto Actuate (manual successful)
6	RPS07E	C(ATC)	RHR Pump 'A' fails to Auto Start after SI initiation (manual successful)
7			Entry into ECA-2.1, Uncontrolled Depressurization of Both Steam Generators

* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor

Ginna July 2019 NRC Simulator Exam #1

The plant is at 70% power following a plant power reduction to address Electrical Grid issues associated with storm damage that also resulted in a loss of Offsite Power Circuit 767. The plant has been at 70% power for 50 hours. Energy Operations has notified the station that grid stability has been restored and requests the station return to full power. Additionally, Offsite Power Circuit 767 will be available in approximately 3 hours.

The following equipment is Out-of-Service: Offsite Power Circuit 767. A-52.12 submitted for TRM TR 3.8.1, 72 hour Action.

Shortly after taking the watch, Operators will commence raising power at 10%/HR in accordance with O-5.2, Load Ascension.

Approximately 2 minutes after commencing load ascension, PT-449, Pressurizer Pressure, fails high causing the Pressurizer Spray valves to OPEN. The Operator will respond in accordance with AR-F-2, PRESSURIZER HI PRESS 2310 PSI, and enter AP-PRZR.1, Abnormal Pressurizer Pressure. AP-PRZR.1 will refer the Operator to ER-INST.1, Reactor Protection Bistable Defeat After Instrumentation Loop Failure, for the defeat of PT-449. The Operator will address Technical Specification LCO 3.3.1, Reactor Trip System (RTS) Instrumentation; LCO 3.3.3, Post Accident Monitoring (PAM) Instrumentation, and Technical Requirements Manual TR 3.4.3, Anticipated Transient Without Scram (ATWS) Mitigation. If RCS pressure lowers < 2175 psig during the transient, then the Operator will also address Technical Specification LCO 3.4.1, RCS Pressure, Temperature, and Flow Departure from Nucleate Boiling (DNB) Limits.

Approximately 12 minutes into the scenario, 4160V Bus 12B is lost. Operators will respond in accordance with AP-ELEC.1, Loss of 12A and/or 12B Busses. 'B' Emergency Diesel Generator will automatically start and energize the 480 VAC safeguards Buses 16 and 17. The Operator will address Technical Specification LCO 3.8.1, AC Sources – MODES 1, 2, 3, and 4, and Technical Requirements Manual TR 3.8.1, Offsite Power Sources.

Approximately 30 minutes into the scenario, a large Steamline break occurs downstream of the MSIVs. MSIVs will **NOT** close. Safety Injection fails to automatically actuate requiring the Operators to manually initiate Safety Injection. RHR Pump 'A' fails to automatically start on SI initiation, Operators will manually start 'A' RHR Pump.

The crew will enter E-0, Reactor Trip or Safety Injection, and transition to E-2, Faulted Steam Generator Isolation. The crew will have to transition to ECA-2.1, Uncontrolled Depressurization of Both Steam Generators.

The scenario will terminate at Step 16 of ECA-2.1, after the crew has determined whether SI Termination criteria have been met and either terminates SI at Step 17 or returns to Step 2; or transitions FR-P.1, Response to Imminent-Pressurized Thermal Shock Condition, due to an ORANGE path on Integrity CSFST.

Critical Tasks:

Take MANUAL control of Pressurizer pressure to prevent an automatic Reactor trip from occurring.

Safety Significance: Failure to manually control Pressurizer pressure will result in degrading Over-Temperature Delta-T conditions ultimately causing an automatic Reactor trip. In this case, Pressurizer pressure can be manually controlled from the control room. Therefore, failure to manually control Pressurizer pressure also represents a "demonstrated inability by the crew to take an action or combination of actions that would prevent a challenge to plant safety."

Additionally, under the postulated plant conditions, failure to manually control Pressurizer pressure (when it is possible to do so) results in a "significant reduction of safety margin beyond that irreparably introduced by the scenario."

Reduce AFW flow to both SGs to 50 gpm each per ECA-2.1, in order to minimize the RCS cooldown rate before a severe (orange-path) challenge develops to the integrity CSF (EOP-Based).

Safety Significance: Failure to control the AFW flow rate to the SGs leads to an unnecessary and avoidable severe challenge to the integrity CSF. Also, failure to perform the critical task increases the challenges to the subcriticality and the containment CSFs beyond those irreparably introduced by the postulated plant conditions.

Thus, failure to perform the critical task constitutes "demonstrated inability by the crew to take an action or combination of actions that would prevent a challenge to plant safety." It also causes a "significant reduction of safety margin beyond that irreparably introduced by the scenario."

Facility: Ginna Scenario No.: 2 Op-Test No.: N2019-301R

Examiners: _____ Operators: _____

Initial Conditions: Plant is at 48% Power, EOL.

Turnover: Circuit 7T is OOS. MDAFW Pump 'B' is OOS for bearing replacement.

Critical Tasks: CT #1 - E-3 – A: Isolate feedwater flow into and steam flow from the ruptured SG before a transition to ECA-3.1 occurs.

CT #2 – E-3 – B: Establish/maintain an RCS temperature so that transition from E-3 does not occur because the temperature is either too high to maintain required subcooling or too low causing a challenge to the subcriticality or integrity CSF.

Event No.	Malf. No.	Event Type*	Event Description
1		N(BOP) N(US) R(ATC)	Load Reduction per O-2.1, Normal Shutdown to Hot Shutdown
2	ROD07	I(ALL)	T _{REF} Fails Low
3	CVC07A	C(ATC) C(US)	PCV-135 Fails Closed
4	EDS04D RPS07R	C(BOP) C(US) TS(US)	Loss of Bus 18 'D' Service Water Pump fails to automatically start (manual successful)
5	SGN04B	C(ALL) TS(US)	Steam Generator Tube Leak
6	SGN04B	M(ALL)	Steam Generator Tube Rupture
7	RPS07A RPS07B	C(ATC) C(US)	Safety Injection Pumps 'A' and 'B' fail to Auto Start (manual successful)
8	RPS07J	C(ATC)	CNMT Recirc Fan 'D' fails to Auto Start (manual successful)
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Ginna July 2019 NRC Simulator Exam #2

The Plant is at 48% Power, EOL conditions. Station Management has decided to shutdown the unit due to the extended Circuit 7T outage.

The following equipment is Out-of-Service: Off-Site Power Circuit 7T. A-52.12 submitted for TRM TR 3.8.1, 72 hour Action; Motor Driven Auxiliary Feedwater Pump 'B' is Out-of-Service for bearing replacement. A-52.4 submitted for ITS LCO 3.7.5, 7 day Action.

Operators will commence Shutdown in accordance with O-2.1, Normal Shutdown to Hot Shutdown, at 10% / HR.

Approximately 2 minutes after commencing the shutdown, T_{REF} input to Rod Control fails **LOW** causing inward rod motion. The Operators should determine Rod Motion is not called for and the HCO places RODS in manual per AP-RCC.1, Continuous Control Rod Withdrawal/Insertion.

Approximately 10 minutes into the scenario, PCV-135 fails closed causing a loss of letdown flow. The HCO should recognize the failure of PCV-135 and take manual control to restore Letdown flow per AR-A-11, LETDOWN LINE HI PRESS 400 PSI.

Approximately 17 minutes into the scenario, a fault on 480V Bus 18 will occur, resulting in Bus 18 de-energizing. The Operator will respond in accordance with AR-L-23, BUS 18 UNDER VOLTAGE SAFEGUARDS, and/or AR-L-5, SAFEGUARD BUS MAIN BREAKER OVERCURRENT TRIP, and enter AP-ELEC.17/18, Loss of Safeguards Bus 17/18. Operators will start Service Water Pump 'D'. The Operator will address Technical Specification LCO 3.8.1, AC Sources – Modes 1, 2, 3, and 4; and LCO 3.8.9, Distribution Systems – Modes 1, 2, 3, and 4.

Approximately 27 minutes into the scenario, a 5 gpm Steam Generator Tube Leak (SGTL) will develop on the 'B' Steam Generator. The Operator will respond in accordance with AR-PPCS-R47AR, SGTL INDICATED, and enter AP-SG.1, Steam Generator Tube Leak, and commence a load reduction. The Operator will address Technical Specification LCO 3.4.13, RCS Operational Leakage, and LCO 3.4.17, Steam Generator (SG) Tube Integrity.

Approximately 32 minutes into the scenario, the Steam Generator Tube Leak will rise to 375 gpm. The Operator will recognize that the Charging System will not maintain Pressurizer Level thereby requiring a Reactor Trip and Safety Injection actuations and transition to E-0, Reactor Trip or Safety Injection.

Safety Injection Pumps 'A' and 'B' and Containment Recirc Fan 'D' fail to automatically start on Safety Injection signal. Manual Start is successful.

The crew will transition to E-3, Steam Generator Tube Rupture.

The scenario will terminate at Step 22 of E-3 after the crew has completed RCS depressurization and secured SI and RHR Pumps.

Critical Tasks:

Isolate feedwater flow into and steam flow from the ruptured SG (B) so that minimum ΔP between the B SG and A SG is not less than 250 psid once target temperature is reached (Entry into ECA-3.1 at Step 16 RNO). (EOP-Based)

Safety Significance: Failure to isolate the ruptured SG causes a loss of ΔP between the ruptured SG and the intact SG. Upon a loss of ΔP , the crew must transition to a contingency procedure that constitutes an incorrect performance that "necessitates the crew taking compensating action which complicates the event mitigation strategy." If the crew fails to isolate steam from the SG, or feed flow into the SG, the ruptured SG pressure will tend to decrease to the same pressures as the intact SG, requiring a transition to a contingency procedure, and delaying the stopping of RCS leakage into the SG.

While in EOP-E-3, establish/maintain an RCS temperature so that transition from E-3 does not occur because the RCS temperature is in either (1) Too high to maintain 20°F of RCS Subcooling OR (2) below 284°F (RCS Integrity Red Path Limit) (EOP-Based)

Safety Significance: Failure to establish and maintain the correct RCS temperature during a SGTR leads to a transition from E-3 to a contingency procedure. This failure constitutes an incorrect performance that necessitates the operator taking compensating action that would unnecessarily complicate the event mitigation strategy.

Facility: Ginna					Date of Exam:													
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 and Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A			3	18	3		3	6
	2	1	2	2				1	2				1	9	2	2	4	
	Tier Totals	4	5	5				4	5				4	27	5	5	10	
2. Plant Systems	1	3	3	3	2	2	3	2	3	3	2	2	28	3		2	5	
	2	1	1	1	1	1	1	0	1	1	1	1	10	0	2	1	3	
	Tier Totals	4	4	4	3	3	4	2	4	4	3	3	38	5		3	8	
3. Generic Knowledge and Abilities Categories					1		2		3		4		10	1	2	3	4	7
					2		2		3		3			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 outline sections (i.e., except for one category in Tier 3 of the SRO-only section, the "Tier Totals" in each K/A category shall not be less than two). (One Tier 3 radiation control K/A is allowed if it 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 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' 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

- * These systems/evolutions must be included as part of the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan. They are not required to be included when using earlier revisions of the K/A catalog.
- ** These systems/evolutions may be eliminated from the sample (as applicable to the facility) when Revision 3 of the K/A catalog is used to develop the sample plan.

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions—Tier 1/Group 1 (RO/SRO)									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#
000008 (APE 8) Pressurizer Vapor Space Accident / 3				8			PRT level pressure and temperature	3.8	1
000009 (EPE 9) Small Break LOCA / 3			12				Letdown isolation	3.4	2
000011 (EPE 11) Large Break LOCA / 3					3		Consequences of managing LOCA with loss of CCW	3.7	3
000022 (APE 22) Loss of Reactor Coolant Makeup / 2	3						Relationship between charging flow and PZR level	3.0	4
000025 (APE 25) Loss of Residual Heat Removal System / 4				3			LPI pumps	3.4	5
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3		3					Controllers and positioners	2.6	6
000029 (EPE 29) Anticipated Transient Without Scram / 1		6					Breakers, relays, and disconnects.	2.9	7
000038 (EPE 38) Steam Generator Tube Rupture / 3	4						Reflux boiling	3.1	8
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4						2.2.40	Ability to apply technical specifications for a system.	3.4	9
000054 (APE 54; CE E06) Loss of Main Feedwater / 4			4				Actions contained in EOPs for loss of MFW	4.4	10
000055 (EPE 55) Station Blackout / 6					3		Actions necessary to restore power	3.9	11
000056 (APE 56) Loss of Offsite Power / 6					77		Auxiliary feed pump (running)	4.1	12
000057 (APE 57) Loss of Vital AC Instrument Bus / 6						2.1.7	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior and instrument interpretation.	4.4	13
000058 (APE 58) Loss of DC Power / 6			1				Use of dc control power by D/Gs	3.4	14
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6	3						Under-excitation	3.3	15
(W E04) LOCA Outside Containment / 3				3			Desired operating results during abnormal and emergency situations.	3.8	16
(W E11) Loss of Emergency Coolant Recirculation / 4						2.2.37	Ability to determine operability and/or availability of safety related equipment	3.6	17
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4		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.	3.9	18
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4					10		When to secure RCPs on loss of cooling or seal injection	3.7	76
000022 (APE 22) Loss of Reactor Coolant Makeup / 2					2		Charging pump problems	3.7	77
000029 (EPE 29) Anticipated Transient Without Scram / 1						2.4.2	Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions.	4.6	78
000058 (APE 58) Loss of DC Power / 6						2.4.34	Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects	4.1	79

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000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6					4		VARs outside the capability curve	3.6	80
(W E11) Loss of Emergency Coolant Recirculation / 4						2.4.3	Ability to identify post-accident instrumentation.	3.9	81
K/A Category Totals:	3	3	3	3	3/3	3/3	Group Point Total:		18/6

ES-401		PWR Examination Outline						Form ES-401-2		
Emergency and Abnormal Plant Evolutions—Tier 1/Group 2 (RO/SRO)										
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G*	K/A Topic(s)	IR	#	
000005 (APE 5) Inoperable/Stuck Control Rod / 1					1		Stuck or inoperable rod from in-core and ex-core NIS, in-core or loop temperature measurements	3.3	19	
000028 (APE 28) Pressurizer (PZR) Level Control Malfunction / 2		3					Controllers and positioners	2.6	20	
000032 (APE 32) Loss of Source Range Nuclear Instrumentation / 7			1				Startup termination on source-range loss	3.2	21	
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7				2			Level trip bypass	3.0	22	
000060 (APE 60) Accidental Gaseous Radwaste Release / 9					1		A radiation-level alarm, as to whether the cause was due to a gradual (in time) signal increase or due to a sudden increase (a "spike"), including the use of strip-chart recorders, meter and alarm observations	3.1	23	
000061 (APE 61) Area Radiation Monitoring System Alarms / 7		1					Detectors at each ARM system location	2.5	24	
000067 (APE 67) Plant Fire On Site / 8						2.1.7	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior and instrument interpretation.	4.4	25	
000076 (APE 76) High Reactor Coolant Activity / 9			6				Actions contained in EOP for high reactor coolant activity	3.2	26	
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4	2						Normal, abnormal and emergency operating procedures associated with (Natural Circulation Operations).	3.3	27	
000005 (APE 5) Inoperable/Stuck Control Rod / 1						2.2.22	Knowledge of limiting conditions for operations and safety limits.	4.7	82	
000024 (APE 24) Emergency Boration / 1					6		When boron dilution is taking place	3.7	83	
000033 (APE 33) Loss of Intermediate Range Nuclear Instrumentation / 7					8		Intermediate range channel operability	3.4	84	
(W E16) High Containment Radiation /9						2.4.4	Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.	4.7	85	
K/A Category Point Totals:	1	2	2	1	2/2	1/2	Group Point Total:		9/4	

ES-401		PWR Examination Outline Plant Systems—Tier 2/Group 1 (RO/SRO)											Form ES-401-2	
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
003 (SF4P RCP) Reactor Coolant Pump						2						RCP seals and seal water supply	2.7	28
003 (SF4P RCP) Reactor Coolant Pump						14						Starting requirements	2.6	29
004 (SF1; SF2 CVCS) Chemical and Volume Control								3				Boundary isolation valve leak	3.6	30
005 (SF4P RHR) Residual Heat Removal							2					RHR flow rate	3.3	31
005 (SF4P RHR) Residual Heat Removal								4				RHR valve malfunction	2.9	32
006 (SF2; SF3 ECCS) Emergency Core Cooling					10							Theory of thermal stress	2.5	33
007 (SF5 PRTS) Pressurizer Relief/Quench Tank											2.2.38	Knowledge of conditions and limitations in the facility license.	3.6	34
008 (SF8 CCW) Component Cooling Water									1			Setpoints on instrument signal levels for normal operations, warnings and trips that are applicable to the CCWS	3.2	35
008 (SF8 CCW) Component Cooling Water									3			All flow rate indications and the ability to evaluate the performance of this closed-cycle cooling system.	3.0	36
010 (SF3 PZR PCS) Pressurizer Pressure Control						2						PZR	3.2	37
012 (SF7 RPS) Reactor Protection	1											120V vital/instrument power system	3.4	38
012 (SF7 RPS) Reactor Protection		1										RPS channels, components and interconnections	3.3	39
013 (SF2 ESFAS) Engineered Safety Features Actuation										1		ESFAS-initiated equipment which fails to actuate	4.5	40
022 (SF5 CCS) Containment Cooling				1								Cooling of containment penetrations	2.5	41
026 (SF5 CSS) Containment Spray							1					Containment pressure	3.9	42
039 (SF4S MSS) Main and Reheat Steam					8							Effect of steam removal on reactivity	3.6	43
059 (SF4S MFW) Main Feedwater									3			Feedwater pump suction flow pressure	2.5	44
061 (SF4S AFW) Auxiliary/Emergency Feedwater		2										AFW electric drive pumps	3.7	45
062 (SF6 ED AC) AC Electrical Distribution								5				Methods for energizing a dead bus	2.9	46
062 (SF6 ED AC) AC Electrical Distribution			1									Major system loads	3.5	47
063 (SF6 ED DC) DC Electrical Distribution			2									Components using DC control power	3.5	48
064 (SF6 EDG) Emergency Diesel Generator			3									ED/G (manual loads)	3.6	49
064 (SF6 EDG) Emergency Diesel Generator				4								Overload ratings	3.1	50
073 (SF7 PRM) Process Radiation Monitoring	1											Those systems served by PRMs	3.6	51

076 (SF4S SW) Service Water										2		SWS valves	2.6	52
078 (SF8 IAS) Instrument Air											2.4.35	Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects.	3.8	53
078 (SF8 IAS) Instrument Air		1										Instrument air compressor	2.7	54
103 (SF5 CNT) Containment	2											Containment isolation/containment integrity	3.9	55
004 (SF1; SF2 CVCS) Chemical and Volume Control											2.2.12	Knowledge of surveillance procedures.	4.1	86
013 (SF2 ESFAS) Engineered Safety Features Actuation								4				Loss of instrument bus	4.2	87
059 (SF4S MFW) Main Feedwater								3				Overfeeding event	3.1	88
061 (SF4S AFW) Auxiliary/Emergency Feedwater											2.4.34	Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects	4.1	89
078 (SF8 IAS) Instrument Air								1				Air dryer and filter malfunctions	2.9	90
K/A Category Point Totals:	3	3	3	2	2	3	2	3/3	3	2	2/2	Group Point Total:		28/5

ES-401		PWR Examination Outline Plant Systems—Tier 2/Group 2 (RO/SRO)										Form ES-401-2		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G*	K/A Topic(s)	IR	#
002 (SF2; SF4P RCS) Reactor Coolant						12						Code Safety valves	3.0	56
011 (SF2 PZR LCS) Pressurizer Level Control		2										PZR heaters	3.1	57
014 (SF1 RPI) Rod Position Indication								1				Loss of offsite power	2.8	58
017 (SF7 ITM) In-Core Temperature Monitor					3							Indication of superheating	3.7	59
029 (SF8 CPS) Containment Purge											2.4.49	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.6	60
033 (SF8 SFPCS) Spent Fuel Pool Cooling									2			Spent fuel leak or rupture	2.9	61
034 (SF8 FHS) Fuel-Handling Equipment	1											RCS	2.5	62
035 (SF 4P SG) Steam Generator			1									RCS	4.4	63
068 (SF9 LRS) Liquid Radwaste										4		Automatic isolation	3.8	64
079 (SF8 SAS**) Station Air				1								Cross-connect with IAS	2.9	65
017 (SF7 ITM) In-Core Temperature Monitor								2				Core damage	4.1	91
029 (SF8 CPS) Containment Purge								1				Maintenance or other activity taking place inside containment	3.6	92
075 (SF8 CW) Circulating Water											2.1.25	Ability to interpret reference materials such as graphs, monographs and tables which contain performance data.	4.2	93
K/A Category Point Totals:	1	1	1	1	1	1	0	1/2	1	1	1/1	Group Point Total:		10/3

Facility:		Date of Exam:				
Category	K/A #	Topic	RO		SRO-only	
			IR	#	IR	#
1. Conduct of Operations	2.1.36	Knowledge of procedures and limitations involved in core alterations	3.0	66		
	2.1.45	Ability to identify and interpret diverse indications to validate the response of another indication	4.3	67		
	2.1.35	Knowledge of the fuel-handling responsibilities of SROs.			3.9	94
	2.1.39	Knowledge of conservative decision making practices			4.3	95
	Subtotal			2		2
2. Equipment Control	2.2.6	Knowledge of the process for making changes to procedures	3.0	68		
	2.2.7	Knowledge of the process for conducting special or infrequent tests	2.9	69		
	2.2.13	Knowledge of tagging and clearance procedures.			4.3	96
	2.2.18	Knowledge of the process for managing maintenance activities during shutdown operations.			3.9	97
	Subtotal			2		2
3. Radiation Control	2.3.13	Knowledge of radiological safety procedures pertaining to licensed operator duties	3.4	70		
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities	3.4	71		
	2.3.4	Knowledge of radiation exposure limits under normal and emergency conditions	3.2	72		
	2.3.12	Knowledge of radiological safety principles pertaining to licensed operator duties			3.7	98
	Subtotal			3		1
4. Emergency Procedures/Plan	2.4.29	Knowledge of the emergency plan.	3.1	73		
	2.4.43	Knowledge of emergency communications systems and techniques.	3.2	74		
	2.4.8	Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	3.8	75		
	2.4.12	Knowledge of general operating crew responsibilities during emergency operations.			4.3	99
	2.4.37	Knowledge of the lines of authority during implementation of an emergency plan.			4.1	100
	Subtotal			3		2
Tier 3 Point Total				10		7