

Facility: Seabrook StationDate of Examination: 2/19/2018Examination Level: RO ☒ SRO ☐

Operating Test Number: \_\_\_\_\_

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R,M	Calculate Boron Change K/A 2.1.25, Ability to interpret reference materials, such as graphs, curves, tables, etc.
Conduct of Operations	R,M	Calculate Blended Makeup to VCT K/A 2.1.20, Ability to interpret and execute procedure steps
Equipment Control	R,M	Shutdown Margin Surveillance-Mode 2 K/A 2.2.12, Knowledge of surveillance procedures
Radiation Control	R,D,P	Initiate LEWSR Request K/A 2.3.11, Ability to control radiation releases
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 ( $\leq 3$  for ROs;  $\leq 4$  for SROs and RO retakes)  
(N)ew or (M)odified from bank ( $\geq 1$ )  
(P)revious 2 exams ( $\leq 1$ , randomly selected)

## SROI

Facility: <u>Seabrook Station</u>	Date of Examination: <u>2/19/2018</u>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>	Operating Test Number: _____

  

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R,M	Approve Boron Change Calculation  K/A 2.1.25, Ability to interpret reference materials, such as graphs, curves, tables, etc.
Conduct of Operations	R,M	Approve Blended Makeup Calculation to VCT  K/A 2.1.20, Ability to interpret and execute procedure steps
Equipment Control	R,M	Shutdown Margin Surveillance-Mode 2  K/A 2.2.12, Knowledge of surveillance procedures
Radiation Control	R,D,P	Approve LEWSR Request  K/A 2.3.11, Ability to control radiation releases
Emergency Plan	S,M	Post Scenario E Plan Classification and State Notification  K/A 2.4.41, Knowledge of SRO responsibilities in emergency plan implementation

  

**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 ( $\leq 3$  for ROs;  $\leq 4$  for SROs and RO retakes)  
(N)ew or (M)odified from bank ( $\geq 1$ )  
(P)revious 2 exams ( $\leq 1$ , randomly selected)

## SROU

Facility: <u>Seabrook Station</u>	Date of Examination: <u>2/19/2018</u>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>	Operating Test Number: _____

  

Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R,M	Approve Boron Change Calculation  K/A 2.1.25, Ability to interpret reference materials, such as graphs, curves, tables, etc.
Conduct of Operations	R,M	Approve Blended Makeup Calculation to VCT  K/A 2.1.20, Ability to interpret and execute procedure steps
Equipment Control	R,M	Shutdown Margin Surveillance-Mode 2  K/A 2.2.12, Knowledge of surveillance procedures
Radiation Control	R,D,P	Approve LEWSR Request  K/A 2.3.11, Ability to control radiation releases
Emergency Plan	S,M	Post Scenario E Plan Classification and State Notification  K/A 2.4.41, Knowledge of SRO responsibilities in emergency plan implementation

  

**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)

## RO

Facility: <u>Seabrook Station</u>	Date of Examination: <u>2/19/2018</u>
Exam Level: RO <input checked="" type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>	Operating Test Number: _____

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. Electronically Remove a Failed NI Detector	D,S	1
b. Pressurizer Level Channel Failure	D,P,S	2
c. Isolate Accumulators	A,D,S	3
d. Post LOCA Cooldown PORV Operation (ES-1.2)	A,D,P,S	4 Primary System
e. Transfer SW from Cooling Tower to Ocean	A,D, P,S	4 Secondary System
f. E-0, Attachment A	A, N,EN,L,S	5
g. Low Voltage on Safeguards Bus	A,D,S	6
h. Steam Generator Level Control System Instrument Failure	N,S	7

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

i. Local Rapid Manual Boration	D,E,R	2
j. Shift SUFP Suction	D,E,L	4
k. Local Rx Trip During ATWS	A,D,E	7

\* 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

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

(A)lternate path	4-6/4-6 1/2-3
(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	

ES-301

## Control Room/In-Plant Systems Outline

Form ES-301-2

## SROI

Facility: <u>Seabrook Station</u>	Date of Examination: <u>2/19/2018</u>
Exam Level: RO <input type="checkbox"/> SRO-I <input checked="" type="checkbox"/> SRO-U <input type="checkbox"/>	Operating Test Number: _____

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. Electronically Remove a Failed NI Detector	D,S	1
c. Isolate Accumulators	A,D,S	3
d. Post LOCA Cooldown PORV Operation (ES-1.2)	A,D,P,S	4 Primary System
e. Transfer SW from Cooling Tower to Ocean	A,D, P,S	4 Secondary System
f. E-0, Attachment A	A, N,EN,L,S	5
g. Low Voltage on Safeguards Bus	A,D,S	6
h. Steam Generator Level Control System Instrument Failure	N,S	7

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

i. Local Rapid Manual Boration	D,E,R	2
j. Shift SUFP Suction	D,E,L	4
k. Local Rx Trip During ATWS	A,D,E	7

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

(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	

**ES-301****Control Room/In-Plant Systems Outline****Form ES-301-2****SROU**Facility: Seabrook StationDate of Examination: 2/19/2018Exam Level: RO ☐ SRO-I ☐ SRO-U ☒

Operating Test Number: \_\_\_\_\_

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

System/JPM Title	Type Code*	Safety Function
c. Isolate Accumulators	A,D,S	3
e. Transfer SW from Cooling Tower to Ocean	A,D, P,S	4 Secondary System
f. E-0, Attachment A	A, N,EN,L,S	5

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

i. Local Rapid Manual Boration	D,E,R	2
j. Shift SUFP Suction	D,E,L	4

\* 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



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

(A)lternate path	4-6/4-6 1/2-3
(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: Seabrook Station      Scenario No.: 1      Op-Test No.: \_\_\_\_\_

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_

Initial Conditions: 100% power, Middle of Life core, stable xenon

Turnover: Maintain 100% power. Emergency Diesel Generator "B" is out of service for maintenance.

**Critical Tasks:**

- 1) Energize at least one ac emergency bus before placing safeguards equipment control switches in pull-to-lock (ECA-0.0, Step 6)
- 2) Manually start electric driven EFW pump prior to exiting ECA-0.0
- 3) Manually start CC-P-11D prior to receiving "B" Charging Pump Bearing High Temperature Alarms (185°F)

Event No.	Malf. No.	Event Type*	Event Description
1		PSO R BOP N US N	Rapid downpower to 1100 MWe
2	1	BOP I US I, TS	Steam Generator pressure instrument fails high.
3	2	PSO C US C, TS	"A" Charging Pump trip
4	3	PSO C US C	"B" Pressurizer Spray Valve output signal drifts high
5		PSO M BOP M US M	Loss of offsite power w/ "A" emergency diesel generator trip
6	4	PSO C US C	Component Cooling Water Pump 11B trip with failure of standby pump to start
7	5	BOP C US C	Electric driven Emergency Feedwater Pump failure to automatically start with turbine driven pump tripped
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Facility: Seabrook Station      Scenario No.: 2      Op-Test No.: \_\_\_\_\_

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: 75% power, Middle of Life core, stable xenon

Turnover: Increase power to 100% at  $\geq 10\%/hr$

Critical Tasks:

- 1) Manually actuate Main Steam Isolation signal before transitioning to E-1, "Loss of Reactor or Secondary Coolant"
- 2) Manually start either SI-P-6A or 6B before transitioning to E-1, "Loss of Reactor or Secondary Coolant"

Event No.	Malf. No.	Event Type*	Event Description
1		PSO R BOP N US N	Power increase
2	1	BOP I,C US I, C, TS	"C" Feedwater Regulating Valve fails to 100% output concurrent with controlling level channel failing high
3	2	PSO I US I, TS	RCS Loop 1 Tcold instrument fails high
4	3	PSO C US C,TS	RCS Loop 3 Cold Leg Leak (30 gpm)
5		PSO M BOP M US M	RCS Cold Leg Break
6	4	BOP C US C	When the reactor trip occurs Main Turbine Stop Valve 1 and Control Valve 2 do not close automatically, and turbine does not trip manually, requiring the BOP to manually actuate a Main Steamline Isolation per E-0 immediate action step 2.
7	5	PSO C US C	When the Safety Injection occurs both Safety Injection Pumps and the "B" RHR Pump fail to start automatically, requiring the PSO to manually start the pumps per E-0, Attachment A.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Facility: Seabrook Station      Scenario No.: 3      Op-Test No.: \_\_\_\_\_

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_

Initial Conditions: 100% power, Middle of Life core, stable xenon

Turnover:

- Prepare to reduce power to 50% at 25%/hr to support removing the "B" Main Feedwater Pump from service for repairs.
- Startup Feedwater Pump out of service for maintenance. T.S. action entered.

Critical Tasks:

- 1) Start Steam Driven EFW Pump prior to exiting FR-S.1, "Response to Nuclear Power Generation/ATWS"
- 2) Start CBS-P-9A prior to transitioning to E-1, Loss of Reactor or Secondary Coolant"

Event No.	Malf. No.	Event Type*	Event Description
1		PSO R BOP N US N	Power decrease at 25%/hr
2	1	BOP C US C, TS	Loss of ocean Service Water pumps Train "A"
3	2	PSO C US C, TS	Pressurizer level instrument RC-LT-459 fails high
4	3	PSO C US C	2 dropped rods
5		PSO M BOP M US M	ATWS w/local reactor trip required followed by large break hot leg loss of coolant.
6	4	BOP C US C	EFW Pump "B" trips with no start of EFW Pump "A"
7	5	PSO I US I	No automatic CBS signal Train "A" w/ Train "B" CBS pump tripped.
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

**Appendix D****Scenario Outline****Form ES-D-1**

Facility: Seabrook Station      Scenario No.: 4      Op-Test No.: \_\_\_\_\_

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Initial Conditions: 100% power, Middle of Life core, stable xenon

Turnover: Maintain 100% power

**Critical Tasks:**

- 1) Energize at least one ac emergency bus prior to necessitating entry into ECA-0.0, "Loss of All AC"
- 2) Close the Pressurizer PORV Block Valve prior to necessitating entry into ECA-3.1, "SGTR With Loss of Reactor Coolant-Subcooled Recovery Desired"

Event No.	Malf. No.	Event Type*	Event Description
1	1	BOP I US I, TS	ASDV "D" fails open
2	2	PSO I US I	Inadvertent Train "B" HELB actuation
3	3	PSO C US C, TS	Steam Generator "C" tube leak
4		PSO R BOP N US N	Plant downpower to <50% within 1 hour
5	4	BOP C US C	Loss of offsite power. EDG "A" fails to automatically start and EDG "B" trips
6		PSO M BOP M US M	Steam Generator "C" tube rupture
7	5	BOP C US C	Emergency Diesel Generator "A" fails to automatically start
8	6	PSO C US C	PORV fails to close at E-3 depressurizaation

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

Facility:		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			6	
	2	1	2	2				1	2				1	9			4	
	Tier Totals	4	5	5				4	5				4	27			10	
2. Plant Systems	1	2	3	3	3	3	2	2	3	2	2	3	28				5	
	2	1	1	1	1	1	1	1	1	0	1	1	10				3	
	Tier Totals	3	4	4	4	4	3	3	4	2	3	4	38				8	
3. Generic Knowledge and Abilities Categories					1		2		3		4		10	1	2	3	4	7
					2		2		3		3							

- 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  $\pm 1$  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	#
000007 (EPE 7; BW E02&E10; CE E02) Reactor Trip, Stabilization, Recovery / 1	X						007EK1.02 - Shutdown margin		
000008 (APE 8) Pressurizer Vapor Space Accident / 3									
000009 (EPE 9) Small Break LOCA / 3				X			009EA1.14 - Secondary pressure control		
000011 (EPE 11) Large Break LOCA / 3			X				011EK3.13 - Hot-leg injection/recirculation		
000015 (APE 15) Reactor Coolant Pump Malfunctions / 4					X		015AA2.11 - When to jog RCPs during ICC		
000022 (APE 22) Loss of Reactor Coolant Makeup / 2					X		022AA2.01 - Whether charging line leak exists		
000025 (APE 25) Loss of Residual Heat Removal System / 4						X	025AG2.4.21 - Knowledge of the parameters and logic used to assess the status of safety functions		
000026 (APE 26) Loss of Component Cooling Water / 8						X	026AG2.4.41 - Knowledge of the emergency action level thresholds and classifications.		
000027 (APE 27) Pressurizer Pressure Control System Malfunction / 3		X					027AK2.03 - Controllers and positioners		
000029 (EPE 29) Anticipated Transient Without Scram / 1		X					029EK2.06 - Breakers, relays, and disconnects.		
000038 (EPE 38) Steam Generator Tube Rupture / 3	X						038EK1.02 - Leak rate vs. pressure drop		
000040 (APE 40; BW E05; CE E05; W E12) Steam Line Rupture—Excessive Heat Transfer / 4									
000054 (APE 54; CE E06) Loss of Main Feedwater / 4									
000055 (EPE 55) Station Blackout / 6			X				055EK3.02 - Actions contained in EOP for loss of offsite and onsite power		
000056 (APE 56) Loss of Offsite Power / 6									
000057 (APE 57) Loss of Vital AC Instrument Bus / 6					X		057AA2.04 - ESF system panel alarm annunciators and channel status indicators		
000058 (APE 58) Loss of DC Power / 6				X			058AA1.03 - Vital and battery bus components		
000062 (APE 62) Loss of Nuclear Service Water / 4			X				062AK3.04 - Effect on the nuclear service water discharge flow header of a loss of CCW		
000065 (APE 65) Loss of Instrument Air / 8				X			065AA1.02 - Components served by instrument air to minimize drain on system		
000077 (APE 77) Generator Voltage and Electric Grid Disturbances / 6		X					077AK2.06 - Reactor Power		
(W E04) LOCA Outside Containment / 3						X	we04EG2.4.4 - Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.		

(W E11) Loss of Emergency Coolant Recirculation / 4	X							WE11EK1.3 - Annunciators and conditions indicating signals, and remedial actions associated with the (Loss of Emergency Coolant Recir).		
(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4										
K/A Category Totals:	3	3	3	3	3	3		Group Point Total:		18/6





(BW E08; W E03) LOCA Cooldown—Depressurization / 4	X						WE08EK1.1 - Components, capacity, and function of emergency systems.		
(BW E09; CE A13**; W E09 & E10) Natural Circulation/4		X					WE10EK2.1 - Components and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes and automatic and manual features.		
(BW E13 & E14) EOP Rules and Enclosures									
(CE A11**; W E08) RCS Overcooling—Pressurized Thermal Shock / 4									
(CE A16) Excess RCS Leakage / 2									
(CE E09) Functional Recovery									
(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4									
K/A Category Point Totals:	1	2	2	1	2	1	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						X						003K6.14 - Starting requirements		
004 (SF1; SF2 CVCS) Chemical and Volume Control			X								X	004G2.4.6 - Knowledge symptom based EOP mitigation strategies. 004K3.01 - CRDS (automatic)		
005 (SF4P RHR) Residual Heat Removal					X							005K5.05 - Plant response during "solid plant": pressure change due to the relative incompressibility of water		
006 (SF2; SF3 ECCS) Emergency Core Cooling	X											006K1.14 - IAS		
007 (SF5 PRTS) Pressurizer Relief/Quench Tank					X							007K5.02 - Method of forming a steam bubble in the PZR		
008 (SF8 CCW) Component Cooling Water								X				008A2.07 - Consequences of high or low CCW flow rate and temperature; the flow rate at which the CCW standby pump will start		
010 (SF3 PZR PCS) Pressurizer Pressure Control	X											010K1.07 - Containment		
012 (SF7 RPS) Reactor Protection									X			012A3.05 - Single and multiple channel trip indicators		
013 (SF2 ESFAS) Engineered Safety Features Actuation		X										013K2.01 - ESFAS/safeguards equipment control		
022 (SF5 CCS) Containment Cooling		X								X		022A3.01 - Initiation of safeguards mode of operation 022K2.01 - Containment cooling fans		
025 (SF5 ICE) Ice Condenser														
026 (SF5 CSS) Containment Spray											X	026G2.1.7 - Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior and instrument interpretation.		
039 (SF4S MSS) Main and Reheat Steam										X		039A4.04 - Emergency feedwater pump turbines		
059 (SF4S MFW) Main Feedwater								X				059A2.05 - Rupture in MFW suction or discharge line 059A2.12 - Failure of feedwater regulating valves		
061 (SF4S AFW) Auxiliary/Emergency Feedwater					X	X						061K5.01 - Relationship between AFW flow and RCS heat transfer 061K6.02 - Pumps		
062 (SF6 ED AC) AC Electrical Distribution			X									062K3.03 - DC system		

063 (SF6 ED DC) DC Electrical Distribution								X				X	063A1.01 - Battery capacity as it is affected by discharge rate		
													063A4.01 - Major breakers and control power fuses		
064 (SF6 EDG) Emergency Diesel Generator								X					064A1.04 - Crankcase temperature and pressure		
073 (SF7 PRM) Process Radiation Monitoring				X	X								073K3.01 - Radioactive effluent releases		
													073K4.02 - Letdown isolation on high-RCS activity		
076 (SF4S SW) Service Water				X									076K2.04 - Reactor building closed cooling water		
					X								076K4.01 - Conditions initiating automatic closure of closed cooling water auxiliary building header supply and return valves		
078 (SF8 IAS) Instrument Air												X	078G2.2.3 - (multi-unit license) Knowledge of the design, procedural and operational differences between units.		
103 (SF5 CNT) Containment					X								103K4.04 - Personnel access hatch and emergency access hatch		
053 (SF1; SF4P ICS*) Integrated Control															
K/A Category Point Totals:	2	3	3	3	3	2	2	3	2	2	3		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	#		
001 (SF1 CRDS) Control Rod Drive					X							001K5.88 - Effects of boron on temperature coefficient				
002 (SF2; SF4P RCS) Reactor Coolant																
011 (SF2 PZR LCS) Pressurizer Level Control		X										011K2.01 - Charging pumps				
014 (SF1 RPI) Rod Position Indication																
015 (SF7 NI) Nuclear Instrumentation						X						015K6.03 - Component interconnections				
016 (SF7 NNI) Nonnuclear Instrumentation																
017 (SF7 ITM) In-Core Temperature Monitor			X									017K3.01 - Natural circulation indications				
027 (SF5 CIRS) Containment Iodine Removal																
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control							X					028A1.02 - Containment pressure				
029 (SF8 CPS) Containment Purge																
033 (SF8 SFPCS) Spent Fuel Pool Cooling																
034 (SF8 FHS) Fuel-Handling Equipment																
035 (SF 4P SG) Steam Generator																
041 (SF4S SDS) Steam Dump/Turbine Bypass Control										X		041A4.08 - Steam dump valves				
045 (SF 4S MTG) Main Turbine Generator								X				045A2.12 - Control rod insertion limits exceeded (stabilize secondary)				
055 (SF4S CARS) Condenser Air Removal											X	055G2.2.42 - Ability to recognize system parameters that are entry-level conditions for Technical Specifications				
056 (SF4S CDS) Condensate	X											056K1.03 - MFW				
068 (SF9 LRS) Liquid Radwaste				X								068K4.01 - Safety and environmental precautions for handling hot, acidic and radioactive liquids				
071 (SF9 WGS) Waste Gas Disposal																
072 (SF7 ARM) Area Radiation Monitoring																
075 (SF8 CW) Circulating Water																
079 (SF8 SAS**) Station Air																
086 Fire Protection																
050 (SF 9 CRV*) Control Room Ventilation																
K/A Category Point Totals:	1	1	1	1	1	1	1	1	0	1	1	Group Point Total:		10/3		

Category	K/A #	Topic	RO	
			IR	#
1. Conduct of Operations	G2.1.3 7	Knowledge of procedures, guidelines or limitations associated with reactivity management		
	G2.1.4 2	Knowledge of new and spent fuel movement procedures		
	Subtotal			2
2. Equipment Control	G2.2.1 5	Ability to determine the expected plant configuration using design and configuration control documentaion		
	G2.2.3 7	Ability to determine operability and/or availability of safety related equipment		
	Subtotal			2
3. Radiation Control	G2.3.1 3	Knowledge of radiological safety procedures pertaining to licensed operator duties		
	G2.3.1 4	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities		
	G2.3.4	Knowledge of radiation exposure limits under normal and emergency conditions		
	Subtotal			3
4. Emergency Procedures / Plan	G2.4.1 2	Knowledge of general operating crew responsibilities during emergency operations.		
	G2.4.5	Knowledge of the organization of the operating procedures network for normal, abnormal and emergency evolutions.		
	G2.4.6	Knowledge symptom based EOP mitigation strategies.		
	Subtotal			3
Tier 3 Point Total				10

Facility:		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												18	3	3	6					
	2												9	2	2	4					
	Tier Totals												27	5	5	10					
2. Plant Systems	1												28	3	2	5					
	2												10	2	1	3					
	Tier Totals												38	5	3	8					
3. Generic Knowledge and Abilities Categories		1		2		3		4		10		1		2		3		4		7	
												1		2		2		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  $\pm 1$  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****3****Form ES-401-2**

(BW E04; W E05) Inadequate Heat Transfer—Loss of Secondary Heat Sink / 4					X		WE05EA2.1 - Facility conditions and selection of appropriate procedures during abnormal and emergency operations.		
K/A Category Totals:					3	3	Group Point Total:		18/6

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**ES-401****5****Form ES-401-2**

(CE E13*) Loss of Forced Circulation/LOOP/Blackout / 4									
K/A Category Point Totals:					2	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																
004 (SF1; SF2 CVCS) Chemical and Volume Control																
005 (SF4P RHR) Residual Heat Removal																
006 (SF2; SF3 ECCS) Emergency Core Cooling																
007 (SF5 PRTS) Pressurizer Relief/Quench Tank																
008 (SF8 CCW) Component Cooling Water																
010 (SF3 PZR PCS) Pressurizer Pressure Control																
012 (SF7 RPS) Reactor Protection								X				012A2.05 - Faulty or erratic operation of detectors and function generators				
013 (SF2 ESFAS) Engineered Safety Features Actuation								X				013A2.03 - Rapid depressurization				
022 (SF5 CCS) Containment Cooling																
025 (SF5 ICE) Ice Condenser																
026 (SF5 CSS) Containment Spray																
039 (SF4S MSS) Main and Reheat Steam																
059 (SF4S MFW) Main Feedwater																
061 (SF4S AFW) Auxiliary/Emergency Feedwater																
062 (SF6 ED AC) AC Electrical Distribution																
063 (SF6 ED DC) DC Electrical Distribution																
064 (SF6 EDG) Emergency Diesel Generator																
073 (SF7 PRM) Process Radiation Monitoring																
076 (SF4S SW) Service Water											X	076G2.2.40 - Ability to apply technical specifications for a system.				
078 (SF8 IAS) Instrument Air								X				078A2.01 - Air dryer and filter malfunctions				
103 (SF5 CNT) Containment											X	103G2.1.30 - Ability to locate and operate components, including local controls.				
053 (SF1; SF4P ICS*) Integrated Control																
K/A Category Point Totals:								3			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	#
001 (SF1 CRDS) Control Rod Drive								X				001A2.04 - Positioning of axial shaping rods and their effect on SDM		
002 (SF2; SF4P RCS) Reactor Coolant														
011 (SF2 PZR LCS) Pressurizer Level Control														
014 (SF1 RPI) Rod Position Indication														
015 (SF7 NI) Nuclear Instrumentation											X	015G2.4.9 - Knowledge of low power / shutdown implications in accident (e.g. LOCA or loss of RHR) mitigation strategies.		
016 (SF7 NNI) Nonnuclear Instrumentation														
017 (SF7 ITM) In-Core Temperature Monitor														
027 (SF5 CIRS) Containment Iodine Removal														
028 (SF5 HRPS) Hydrogen Recombiner and Purge Control														
029 (SF8 CPS) Containment Purge														
033 (SF8 SFPCS) Spent Fuel Pool Cooling														
034 (SF8 FHS) Fuel-Handling Equipment														
035 (SF 4P SG) Steam Generator														
041 (SF4S SDS) Steam Dump/Turbine Bypass Control								X				041A2.02 - Steam valve stuck open		
045 (SF 4S MTG) Main Turbine Generator														
055 (SF4S CARS) Condenser Air Removal														
056 (SF4S CDS) Condensate														
068 (SF9 LRS) Liquid Radwaste														
071 (SF9 WGS) Waste Gas Disposal														
072 (SF7 ARM) Area Radiation Monitoring														
075 (SF8 CW) Circulating Water														
079 (SF8 SAS**) Station Air														
086 Fire Protection														
050 (SF 9 CRV*) Control Room Ventilation														
K/A Category Point Totals:								2			1	Group Point Total:		10/3

Category	K/A #	Topic	RO	
			IR	#
1. Conduct of Operations	G2.1.25	Ability to interpret reference materials such as graphs, monographs and tables which contain performance data.		
	Subtotal			1
2. Equipment Control	G2.2.13	Knowledge of tagging and clearance procedures.		
	G2.2.18	Knowledge of the process for managing maintenance activities during shutdown operations.		
	Subtotal			2
	G2.3.12	Knowledge of radiological safety principles pertaining to licensed operator duties		
	G2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities		
	Subtotal			2
	G2.4.30	Knowledge of events related to system operations/status that must be reported to internal organizations or outside agencies.		
	G2.4.46	Ability to verify that the alarms are consistent with the plant conditions.		
	Subtotal			2
Tier 3 Point Total				7

Tier/Group	Randomly Selected K/A	Reason for Rejection
RO/T1/G1	WE11G2.2.3	NRC replaced with WE11EK1.3 because Seabrook is not a multi-unit site.
RO/T1/G1	000026G2.4.41	NRC replaced KA because ROs have very little EPlan responsibility and none with EALS. KA was replaced with G2.4.34 - Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.
RO/T1/G1	000062AK3.04	Licensee not able to write operationally oriented question for this KA. Replaced with AK3.03 – Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: Guidance actions contained in EOP for Loss of Nuclear Service Water.
RO/T1/G2	000060 AK3.02	Unable to write a question to match the KA because there are no automatic isolations of aux building ventilation from the rad waste system. KA was replaced with AK3.03 – Knowledge of the reasons for the following responses as they apply to Accidental Gaseous Radwaste Release: Actions contained in EOP for accidental gaseous waste release.
RO/T1/G2	000068G2.4.30	NRC replaced KA because of limited RO responsibilities in contacting internal or external organizations especially during a control room evacuation. Replaced with G2.1.23 - Ability to perform specific system and integrated plant procedures during all modes of plant operation.
RO/T2/G1	007K5.02	This KA is not applicable to Seabrook. KA was replaced with A2.03 – Ability to (a) predict the impacts of the following malfunctions or operations on the PRTS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Overpressurization of the PZR.

RO/T2/G1	008A2.07	This KA is not applicable to Seabrook. KA was replaced with A2.07 - Ability to (a) predict the impacts of the following malfunctions or operations on the CCWS, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Consequences of high or low CCW flow rate and temperature; the flow rate at which the CCW standby pump will start.
RO/T2/G1	059A2.12	NRC replaced KA because system 059 was selected twice and two A2's were selected. The second A2 was replaced with A.306 - Ability to monitor automatic operation of the MFW, including: Feedwater isolation.
RO/T2/G1	073K4.02	The KA is not applicable to Seabrook. KA was replace with K4.01 - Knowledge of PRM system design feature(s) and/or interlock(s) which provide for the following: Release termination when radiation exceeds setpoint.
RO/T2/G1	076 K2.04	The KA is not applicable to Seabrook. KA was replace with K2.08 - Knowledge of bus power supplies to the following: ESF-actuated MOVs.
RO/T2/G1	078G2.2.3	NRC replaced KA because Seabrook is not a multi-unit site. KA was replaced with G2.4.47 - Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material.
RO/T2/G2	001A2.04	NRC replaced KA because shaping rods are not used at Seabrook. KA was replaced with K5.88 – Knowledge of the following operation implications as they apply to the CRDS: Effects of boron on temperature coefficient.
RO/T2/G2	028A1.02	Difficult to write a discriminating question for this KA. KA was replaced with A1.01 - Ability to predict and/or monitor changes in parameter (to prevent exceeding design limits) associated with operating the HRPS controls including: Hydrogen concentration.
RO/T2/G2	055G2.2.42	NRC replaced KA because of lack of Tech Spec applicability for RO applicants regarding condenser air removal. KA was replaced with K1.06 – Knowledge of the physical connections and/or cause effect relationships between the Condensate System and the following: PRM system.



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