

Facility: River Bend Station Scenario No.: 1 Op-Test No.: _____

Examiners: _____ Operators: _____

Initial Conditions:

Mode 1, Reactor power 68%. Power ascension in progress following downpower for Feedwater pump 'C' seal replacement. APRM B in bypass due to downscale failure. FWS-P1A & B in service.

Turnover: Shift priorities: 1) Start lube oil system for FWS-P1C in preparation for pump start. 2) Place 3rd Feed Reg Valve in service. 3) Raise reactor power in accordance with Reactivity Control Plan Step 20, then await further guidance from reactor engineering.

Event No.	Malf. No.	Event Type*	Event Description
1	NA	N (CRS,BOP)	Start Feedwater pump "C" lube oil system per SOP-0009.
2	NA	N (CRS,ATC)	Place 3 rd Feedwater Regulating Valve in service per SOP-0009.
3	NA	R (ATC)	Raise reactor power in accordance with the reactivity control plan Step 20.
4	NMS015F	I (CRS,ATC)	(Tech Spec) APRM F Upscale failure due to flow converter downscale failure and half scram.
5	MSC011	C(CRS)	(Tech Spec) 171' airlock inner door seal failure.
6	p870_54a: g_5 FAIL ON	C(CRS,BOP)	Steam Packing Exhauster failure requiring equipment rotation.
7	EHC001 RPS001A	M (ALL)	Main Turbine Trip/Anticipated Transient Without Scram with MSIVs open due to failure of RPS to completely de-energize.
8	FWS004B	C (CRS,ATC)	Feedwater Master Level Controller output fails high.
9	EHC002B	C (CRS,BOP)	Main Turbine Bypass Valves fail closed.

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

Total Malfunctions (5-8) **(7)**APRM F, 171' airlock, Stm Packing Exh., Turb trip, ATWS, Master Controller, Turb Bypass Valves.

Malfunctions after EOP entry (1-2) **(2)** Feedwater Master Controller, Turbine Bypass Valves

Abnormal Events (2-4) **(2)** AOP-2, AOP-3

Major Transients (1-2) **(1)** ATWS

EOPs entered (1-2) **(2)** EOP-1, EOP-2

EOP contingencies (0-2) **(1)** EOP-1A

Critical Tasks (2-3) **(2)** Terminate injection to <-56", Begin control rod insertion

Facility: River Bend Station Scenario No.: 2 Op-Test No.: _____

Examiners: _____ Operators: _____

Initial Conditions: Mode 1, 100% power, Division 1 work week, Div 1 DG tagged out

Turnover: Shift Priorities: 1) Alternate HDL Pumps from A to B due to report of seal leakage on A. 2) Run STP-402-0201 for scheduled surveillance.

Event No.	Malf. No.	Event Type*	Event Description
1	NA	N (CRS,ATC)	Alternate HDL Pumps from A to B due to reported seal leakage.
2	NA	N (CRS,BOP)	Run STP-402-0201, MAIN CONTROL ROOM A/C TRAIN A OPERABILITY TEST for scheduled surveillance.
3	CRDM2809 Uncoupled	R(ATC) C(CRS)	(Tech Spec) Control Rod Drop – Control Rod 28-09
4	CRD001A	C (CRS,BOP)	(Tech Spec) CRD pump trip
5	FWS001A	C (CRS, ATC)	Feedwater A pump trip
6	ED004F	C (ALL)	Trip of NJS-LDC1F/Loss of Feed/Reactor Scram
7	RCS007 E22MOV F004 BREAKER TRIP RCIC001	M (ALL)	Coolant leak in the drywell with loss of power to E22-F004 and trip of RCIC
8	ED003H RHR009B RHR001C	C (CRS,BOP)	ENS-SWG1A bus loss, RHR B fails to auto start, E12-F042C injection valve fails.

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

Total Malfunctions (5-8) **(6)** Rod drop, CRD trip, Feedpump trip, NJS Bus, Leak, E12-F042C
 Malfunctions after EOP entry (1-2) **(2)** Leak, E12-F042C
 Abnormal Events (2-4) **(3)**AOP-0061, AOP-0006, AOP-0003
 Major Transients (1-2) **(1)** Leak
 EOPs entered (1-2) **(2)** EOP-1, EOP-2
 EOP contingencies (0-2) **(2)** Alternate Level Control, Emergency Depressurization
 Critical Tasks (2-3) **(3)** Insert control rod 28-09, Open SRVs to depressurize vessel, manually start RHR B.

Facility: River Bend Station Scenario No.: 3 Op-Test No.: _____

Examiners: _____ Operators: _____

Initial Conditions: Mode 1, 100% power. Startup Feed Reg Valve in Augmentation Mode per SOP-0009 to support maintenance on Feed Reg Valve "C". Feed Reg Valve "C" has been returned to service. Downpower for sequence exchange this shift.

Turnover: Shift Priorities: 1)Remove Startup Feed Reg Valve from Augmentation Mode. 2)Start RHR B for STP-204-6302 and notify IST personnel when the pump is running at reference conditions. 3)Lower reactor power for sequence exchange per the reactivity control plan while field personnel gather data following RHR B pump start.

Event No.	Malf. No.	Event Type*	Event Description
1	NA	N (CRS,ATC)	Remove Startup Feedwater Regulating Valve from Augmentation Mode and place in standby
2	NA	N (CRS,BOP)	Perform STP-204-6302 Section 7.1, RHR B Quarterly Surveillance.
3	NA	R(ATC)	Lower reactor power with Reactor Recirculation flow in accordance with the Reactivity Control Plan Step 1.
4	RHR002B	C(CRS,BOP)	(Tech Spec) RHR B trips
5	DI-CNM-HA68A-CAM	C(CRS,ATC)	Feedwater Pump "A" minimum flow valve fails open.
6	RCIC005	I(CRS,BOP)	(Tech Spec) Inadvertent RCIC initiation.
7	RCIC004 RCIC006 RPS001B	M(ALL)	RCIC steam supply line break in the RCIC Room and Main Steam Tunnel with failure of RCIC Steam Supply Valves fail to isolate. Auto scram signals fail.
8	MSS008G MSS008D MSS008I	C(CRS,BOP)	Three Safety Relief Valves fail to energize when required for emergency depressurization.
9	FWS005A	C(CRS,ATC)	Startup Feedwater Regulating Valve fails closed.

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

Total Malfunctions (5-8) **(6)** RHR B trip, A min flow, RCIC initiation, RCIC steam leak, SRV failure, Startup Reg Valve Failure

Malfunctions after EOP entry (1-2) **(2)** SRV failure, Startup Reg Valve

Abnormal Events (2-4) **(2)** AOP-0006-Min flow failure, AOP-0003-Steam Leak

Major Transients (1-2) **(1)** Steam leak with failure to isolate affecting multiple areas

EOPs entered (1-2) **(2)** EOP-1, EOP-3

EOP contingencies (0-2) **(1)** Emergency Depressurization

Critical Tasks (2-3) **(2)** Place the mode switch in shutdown, Emergency Depressurize when more than one area exceeds Max Safe Temp or Rad Levels.

Facility: River Bend Station Scenario No.: 4 Op-Test No.: _____

Examiners: _____ Operators: _____

Initial Conditions: Mode 1, 75% power.

Turnover: Shift Priorities: 1) Start Feedwater Pump "A" 2) Continue power ascension with recirc flow per reactivity control plan. 3) Transfer Steam Seal Evaporator to Extraction Steam.

Event No.	Malf. No.	Event Type*	Event Description
1	NA	N (SRO, ATC)	Start a Reactor Feedwater Pump "A"
2	NA	R (ATC)	Raise reactor power with reactor recirculation flow
3	NA	N (SRO-BOP)	Transfer Steam Seal Evaporator to Extraction Steam
4	RMS016A	I(SRO)	(Technical Specification) Failure of RMS-RE16A Drywell Radiation Monitor
5	ED004Q	C (SRO, BOP)	(Technical Specification) Loss of EJS-LDC2B
6	FWS016A	I(SRO,ATC)	Feedwater flow input to Feedwater Level Control failure
7	ED001	M (ALL)	Loss of offsite power
8	RCIC003A	C(SRO,BOP)	RCIC Flow controller fails low
9	SWP-P2A BKR TRIP	C(SRO,ATC)	SWP-P2A pump breaker trip

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

Total Malfunctions (5-8) **(6)** EJS-LDC2B, RMS-RE16A, FWLC input, Loss of Offsite power, RCIC controller, SWP-P2A
 Malfunctions after EOP entry (1-2) **(2)** RCIC controller, SWP-P2A
 Abnormal Events (2-4) **(2)** AOP-0006, AOP-0001
 Major Transients (1-2) **(1)** Loss of offsite power
 EOPs entered (1-2) **(1)** EOP-0001
 EOP contingencies (0-2) **(1 potential)** Alternate Level Control
 Critical Tasks (2-3) **(2)** Take manual control of FW, Maintain reactor water level >-162" with RCIC

NRC

ES-301

Administrative Topics Outline

[Form ES-301-1](#)

Facility: <u>River Bend Station</u>		Date of Examination: 11/12/2012
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: _____
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	R,M	(A1) Determine when Hot Shutdown Boron has been injected into the core. KA 2.1.25; IR 3.9
Conduct of Operations	R,N	(A2) Determine maintenance requirements of an active license. KA 2.1.4; IR 3.3
Equipment Control	R,M	(A3) Use plant drawings to determine the effect of removing a fuse. KA 2.2.15; IR 3.9
Radiation Control	R,N	(A4) Obtain radiological information from a survey map. KA 2.3.7; IR 3.5
Emergency Procedures/Plan		
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)		

NRC

ES-301

Administrative Topics Outline

[Form ES-301-1](#)

Facility: <u>River Bend Station</u>		Date of Examination: 11/12/2012
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	(A5) Generate a manual LCO tracking sheet. KA 2.1.18; IR 3.8
Conduct of Operations	R,D	(A6) Determine Plant Safety Index during shutdown conditions KA 2.1.23; IR 4.4
Equipment Control	R,M	(A7) Review and Approve a Completed Surveillance Test Procedure. KA 2.2.12; IR 4.1
Radiation Control	R,M	(A8) Calculate Maximum Permissible Stay Time KA 2.3.7; IR 3.6
Emergency Procedures/Plan	R,M	(A9) Classify an Emergency. KA 2.4.41; IR 4.6
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) 1 (N)ew or (M)odified from bank (≥ 1) 4 (P)revious 2 exams (≤ 1; randomly selected) 0		

NRC

ES-301

Control Room/In-Plant Systems Outline

Form ES-301-2

Facility: <u>River Bend Station</u>		Date of Examination: <u>11/12/2012</u>
Exam Level: RO <input checked="" type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test No.: _____
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. (S1) Respond to High Radiation levels in the Auxiliary Building	A,S,EN,N	5
b. (S2) Transfer Reactor Recirculation Pumps from Fast to Slow Speed	A,S,D	1
c. (S3) Manual Isolation of a Main Steam Line During Power Operation	S,D	3
d. (S4) Shift Divisions of Control Building Chilled Water	A,S,D,EN	9
e. (S5) Secure High Pressure Core Spray Following Spurious Initiation	A,S,D,EN	2
f. (S6) Start Residual Heat Removal in the Shutdown Cooling Mode	S,D,L	4
g. (C1) Respond to a loss of Control Room Annunciators	C,N	6
h. (C2) Perform APRM Setdown Channel Functional Test for APRM B	C,N	7
In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. (P1) Transfer RCIC Steam Supply Isolation Valve to Alternate Power	E,L,N,R	2
j. (P2) Start of Fire Protection Water Pump	A,D,E	8
k. (P3) Initiate Full Scram and NSSSS Isolation from the Electrical Protection Assembly (EPA) breakers	D,E,EN	7
<p>[@] 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.</p>		
* Type Codes	Criteria for RO / SRO-I / SRO-U	
(A)lternate path	4-6 / 4-6 / 2-3 5 <input checked="" type="checkbox"/>	
(C)ontrol room	≤ 9 / ≤ 8 / ≤ 4 8 <input checked="" type="checkbox"/>	
(D)irect from bank	≥ 1 / ≥ 1 / ≥ 1 2 <input checked="" type="checkbox"/>	
(E)mergency or abnormal in-plant	- / - / ≥ 1 (control room system) -	
(EN)gineered safety feature	≥ 1 / ≥ 1 / ≥ 1 3 <input checked="" type="checkbox"/>	
(L)ow-Power / Shutdown	≥ 2 / ≥ 2 / ≥ 1 4; 1(A) <input checked="" type="checkbox"/>	
(N)ew or (M)odified from bank including 1(A)	≤ 3 / ≤ 3 / ≤ 2 (randomly selected) 0	
(P)revious 2 exams	≥ 1 / ≥ 1 / ≥ 1 1 <input checked="" type="checkbox"/>	
(R)CA		
(S)imulator		

NRC

ES-301

Control Room/In-Plant Systems Outline

Form ES-301-2

Facility: <u>River Bend Station</u>		Date of Examination: <u>11/12/2012</u>
Exam Level: RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/>		Operating Test No.: _____
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. (S1) Respond to High Radiation levels in the Auxiliary Building	A,S,EN,N	5
b. (S4) Shift Divisions of Control Building Chilled Water	A,S,D,EN	9
c. (C1) Respond to a loss of Control Room Annunciators	C,N	6
d.		
e.		
f.		
g.		
h.		
In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. (P1) Transfer RCIC Steam Supply Isolation Valve to Alternate Power	E,L,N,R	2
j. (P2) Start of Fire Protection Water Pump	A,D,E	8
k.		
<p>[@] 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.</p>		
* Type Codes	Criteria for RO / SRO-I / SRO-U	
(A)lternate path	4-6 / 4-6 / 2-3 3 <input checked="" type="checkbox"/>	
(C)ontrol room	$\leq 9 / \leq 8 / \leq 4$ 2 <input checked="" type="checkbox"/>	
(D)irect from bank	$\geq 1 / \geq 1 / \geq 1$ 2 <input checked="" type="checkbox"/>	
(E)mergency or abnormal in-plant	- / - / ≥ 1 (control room system) 2 <input checked="" type="checkbox"/>	
(EN)gineered safety feature	$\geq 1 / \geq 1 / \geq 1$ 2 <input checked="" type="checkbox"/>	
(L)ow-Power / Shutdown	$\geq 2 / \geq 2 / \geq 1$ 3: 1(A) <input checked="" type="checkbox"/>	
(N)ew or (M)odified from bank including 1(A)	$\leq 3 / \leq 3 / \leq 2$ (randomly selected) 0 <input checked="" type="checkbox"/>	
(P)revious 2 exams	$\geq 1 / \geq 1 / \geq 1$ 1 <input checked="" type="checkbox"/>	
(R)CA		
(S)imulator		

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	4	4	N/A			3	3	N/A			3	20			
	2	1	1	1	N/A			2	1	N/A			1	7			
	Tier Totals	4	5	5	N/A			5	4	N/A			4	27			
2. Plant Systems	1	2	2	2	2	2	3	2	3	3	2	3	26				
	2	2	1	1	1	1	1	1	1	1	1	1	12				
	Tier Totals	4	3	3	3	3	4	3	4	4	3	4	38				
3. Generic Knowledge and Abilities Categories				1		2		3		4		10		1	2	3	4
				3		3		2		2							

Note:

- 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).
- 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.
- Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
- 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.
- 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.
- Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- * 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.
- 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.
- 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.

ES-401		BWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO / SRO)						Form ES-401-1	
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4		X					K2.06 – Knowledge of the interrelationships between PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Reactor Power. (41.7)	3.8	1
295003 Partial or Complete Loss of AC / 6			X				K3.02 – Knowledge of the reasons for the following responses as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER: Selective tripping. (41.5)	2.9	2
295004 Partial or Total Loss of DC Pwr / 6				X			A1.01 – Ability to operate and/or monitor the following as they apply to PARTIAL OR COMPLETE LOSS OF D.C. POWER: D.C. Electrical distribution systems. (41.7)	3.3	3
295005 Main Turbine Generator Trip / 3					X		A.2.01 – Ability to determine and/or interpret the following as they apply to MAIN TURBINE GENERATOR TRIP: Turbine speed. (41.10)	2.6	4
295006 SCRAM / 1						X	2.4.46 – Ability to verify that the alarms are consistent with the plant conditions. SCRAM (41.10)	4.2	5
295016 Control Room Abandonment / 7		X					K2.03 – Knowledge of the interrelations between the CONTROL ROOM ABANDONMENT and the following: Control Room HVAC. (41.5)	2.9	6
295018 Partial or Total Loss of CCW / 8	X						K1.01 – Knowledge of the operational implications of the following concepts as they apply to PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER: Effects on component/system operation. (41.8)	3.5	7
295019 Partial or Total Loss of Inst. Air / 8			X				K3.02 – Knowledge of the reasons for the following responses as they apply to PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR: Standby air compressor operation. (41.5)	3.5	8
295021 Loss of Shutdown Cooling / 4		X					K2.03 – Knowledge of the interrelations between LOSS OF SHUTDOWN COOLING and RHR Shutdown Cooling (41.7)	3.6	9
295023 Refueling Acc / 8				X			A.1.02 – Ability to operate and/or monitor the following as they apply to REFUELING ACCIDENTS: Fuel pool cooling and cleanup system. (41.7)	2.9	10
295024 High Drywell Pressure / 5					X		A2.06 – Ability to determine and/or interpret the following as they apply to HIGH DRYWELL PRESSURE: Suppression pool temperature. (41.10)	4.1	11
295025 High Reactor Pressure / 3						X	2.1.32 – Ability to explain and apply system limits and precautions: High Reactor Pressure. (41.10)	3.8	12
295026 Suppression Pool High Water Temp. / 5	X						K1.02 – Knowledge of the operational implications of the following concepts as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: Steam Condensation. (41.8)	3.5	13
295027 High Containment Temperature / 5							Mark III only		
295028 High Drywell Temperature / 5			X				K3.01 – Knowledge of the reasons for the following responses as they apply to HIGH DRYWELL TEMPERATURE: Emergency Depressurization (41.5)	3.6	14
295030 Low Suppression Pool Wtr Lvl / 5				X			A1.03 – Ability to operate and/or monitor the following as they apply to LOW SUPPRESSION POOL WATER LEVEL: HPCS (41.7)	3.4	15

295031 Reactor Low Water Level / 2						X		A2.03 – Ability to determine and/or interpret the following as they apply to REACTOR LOW WATER LEVEL: Reactor Pressure. (41.10)	4.2	16
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1							X	2.2.37 – Ability to determine operability and/or availability of safety related equipment: (41.7)	3.6	17
295038 High Off-site Release Rate / 9	X							K1.01 – Knowledge of the operational implications of the following concepts as they apply to HIGH OFF-SITE RELEASE RATE: Biological effects of radioisotope injection. (41.8).	2.5	18
600000 Plant Fire On Site / 8		X						K2.04 – Knowledge of the interrelations between Plant Fire on Site and the following: Breakers, relays and disconnects.	2.5	19
700000 Generator Voltage and Electric Grid Disturbances / 6			X					K3.01 – Knowledge of the reasons for the following responses as they apply to GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES: Reactor and turbine trip criteria. (41.4,5 or 7)	3.9	20
K/A Category Totals:	3	4	4	3	3	3		Group Point Total:		20

K/A Category Point Totals:	1	1	1	2	1	1	Group Point Total:		7

ES-401	BWR Examination Outline Plant Systems - Tier 2/Group 1 (RO / SRO)											Form ES-401-1		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
203000 RHR/LPCI: Injection Mode								X				A2.09 - Ability to (a) predict the impacts of the following on the RHR/LPCI: INJECTION MODE (PLANT SPECIFIC) ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Inadequate system flow (41.5)	3.3	28
205000 Shutdown Cooling									X			A3.03 - Ability to monitor automatic operations of the SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE) including: Lights and alarms (41.7)	3.5	29
206000 HPCI												Suppressed K/A		
207000 Isolation (Emergency) Condenser												Suppressed K/A		
209001 LPCS										X		A4.03 - Ability to manually operate and/or monitor in the control room: Injection valves (41.7)	3.7	30
209002 HPCS											X	2.2.22 Knowledge of limiting conditions for operations and safety limits. (41.5)	4.0	31
211000 SLC	X											K1.07 - Knowledge of the physical connections and/or cause/effect relationships between STANDBY LIQUID CONTROL SYSTEM and the following: Jet pump differential pressure indication: Plant-Specific (41.2 to 41.9)	2.6	32
212000 RPS		X										K2.01 - Knowledge of electrical power supplies to the following: RPS motor-generator sets (41.7)	3.2	33
215003 IRM			X									K3.01 - Knowledge of the effect that a loss or malfunction of the INTERMEDIATE RANGE MONITOR (IRM) SYSTEM will have on following: RPS (41.7)	3.9	34
215004 Source Range Monitor				X								K4.05 - Knowledge of SOURCE RANGE MONITOR (SRM) SYSTEM design feature(s) and/or interlocks which provide for the following: Alarm seal-in (41.7)	2.5	35
215005 APRM / LPRM					X							K5.05 - Knowledge of the operational implications of the following concepts as they apply to AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM : Core flow effects on APRM trip setpoints (41.5)	3.6	36
217000 RCIC						X						K6.03 - Knowledge of the effect that a loss or malfunction of the following will have on the REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) : Suppression pool water supply (41.7)	3.5	37
218000 ADS							X					A1.04 - Ability to predict and/or monitor changes in parameters associated with operating the AUTOMATIC DEPRESSURIZATION SYSTEM controls including: Reactor pressure (41.5)	4.1	38

223002 PCIS/Nuclear Steam Supply Shutoff										X										A2.09 - Ability to (a) predict the impacts of the following on the PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: System initiation (41.5)	3.6	39
239002 SRVs											X									A3.06 - Ability to monitor automatic operations of the RELIEF/SAFETY VALVES including: Reactor pressure (41.7)	4.1	40
259002 Reactor Water Level Control												X								A4.01 - Ability to manually operate and/or monitor in the control room: All individual component controllers in the manual mode (41.7)	3.8	41
261000 SGTS													X							2.4.2 – Knowledge of system setpoints, interlocks and automatic actions associated with EOP entry. (41.7)	4.5	42
262001 AC Electrical Distribution	X																			K1.03 - Knowledge of the physical connections and/or cause/effect relationships between A.C. ELECTRICAL DISTRIBUTION and the following: Off-site power sources (41.2 to 41.9)	3.4	43
262002 UPS (AC/DC)				X																K3.01. Knowledge of the effect that a loss or malfunction of the Uninterruptible Power Supply (AC/DC) will have on Water Level Control	3.1	44
263000 DC Electrical Distribution		X																		K2.01 - Knowledge of electrical power supplies to the following: Major D.C. loads (CFR: 41.7)	3.1	45
264000 EDGs					X															K4.04 - Knowledge of EMERGENCY GENERATORS (DIESEL/JET) design feature(s) and/or interlocks which provide for the following: Field flashing (CFR: 41.7)	2.6	46
300000 Instrument Air						X														K5.01 - Knowledge of the operational implications of the following concepts as they apply to the INSTRUMENT AIR SYSTEM: Air compressors (41.5)	2.5	47
400000 Component Cooling Water							X													K6.05 - Knowledge of the effect that a loss or malfunction of the following will have on the CCWS: Motors (41.7)	2.8	48
203000 RHR/LPCI: Injection Mode								X												A1.01 - Ability to predict and/or monitor changes in parameters associated with operating the RHR/LPCI: INJECTION MODE (PLANT SPECIFIC) controls including: Reactor water level (41.5)	4.2	49
212000 RPS									X											A2.06 - Ability to (a) predict the impacts of the following on the REACTOR PROTECTION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: High reactor power (41.5)	4.1	50
262001 AC Electrical Distribution											X									A3.03 - Ability to monitor automatic operations of the A.C. ELECTRICAL DISTRIBUTION including: Load shedding (41.7)	3.4	51
262002 UPS (AC/DC)							X													K6.02 Knowledge of the effect that a loss or malfunction of the following will have on the Uninterruptible Power Supply (AC/DC) DC electrical power (41.7)	2.8	52
400000 Component Cooling Water														X						2.1.7 - Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation. +(41.5)	4.4	53
K/A Category Point Totals:	2	2	2	2	2	3	2	3	3	2	3									Group Point Total:		26

245000 Main Turbine Gen. / Aux.																							
256000 Reactor Condensate										X										A1.01 - Ability to predict and/or monitor changes in parameters associated with operating the REACTOR CONDENSATE SYSTEM controls including: System flow (41.5)	2.9	60	
259001 Reactor Feedwater																							
268000 Radwaste																							
271000 Offgas															X					A2.03 - Ability to (a) predict the impacts of the following on the OFFGAS SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Main steamline high radiation (41.5)	3.5	61	
272000 Radiation Monitoring																		X	A3.10 - Ability to monitor automatic operations of the RADIATION MONITORING SYSTEM including: Lights and alarms (41.7)	3.3	62		
286000 Fire Protection																			X	A4.04 - Ability to manually operate and/or monitor in the control room: Fire main pressure: Plant-Specific (41.7)	2.8	63	
288000 Plant Ventilation																				X	2.4.11 Knowledge of abnormal condition procedures. (41.10)	4.0	64
290001 Secondary CTMT		X																			K1.06 - Knowledge of the physical connections and/or cause/effect relationships between SECONDARY CONTAINMENT and the following: Auxiliary building isolation: BWR-6 (41.2 to 41.9)	3.4	65
290003 Control Room HVAC																							
290002 Reactor Vessel Internals																							
K/A Category Point Totals:	2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	Group Point Total:		12	

Facility:		Date of Exam:				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.20	Ability to interpret and execute procedure steps.(41.10)	4.6	66		
	2.1.25	Ability to interpret reference materials, such as graphs, curves, tables, etc. (41.10)	3.9	67		
	2.1.30	Ability to locate and operate components, including local controls. (41.7)	4.4	68		
		Subtotal			3	
2. Equipment Control	2.2.36	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations. (41.10)	3.1	69		
	2.2.40	Ability to apply Technical Specifications for a system. (41.10)	3.4	70		
	2.2.44	Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions. (41.5)	4.2	71		
		Subtotal			3	
3. Radiation Control	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions. (41.12)	3.2	72		
	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities. (41.12)	3.4	73		
		Subtotal			2	
4. Emergency Procedures / Plan	2.4.1	Knowledge of EOP entry conditions and immediate action steps. (41.10)	4.6	74		
	2.4.45	Ability to prioritize and interpret the significance of each annunciator or alarm. (41.10)	4.1	75		
		Subtotal			2	
Tier 3 Point Total				10		

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															4	3	7	
	2				N/A					N/A					1	2	3		
	Tier Totals														5	5	10		
2. Plant Systems	1														3	2	5		
	2													1	2	3			
	Tier Totals													4	4	8			
3. Generic Knowledge and Abilities Categories					1	2	3	4							1	2	3	4	7
															2	2	1	2	

Note:

- 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).
- 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.
- Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems/evolutions that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
- 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.
- 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.
- Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- * 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.
- 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.
- 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.

K/A Category Totals:					4	3	Group Point Total:				7

K/A Category Point Totals:					1	2	Group Point Total:		3
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263000 DC Electrical Distribution																
264000 EDGs								X						A2.07 – Ability to (a) predict the impacts of the following on the EMERGENCY GENERATORS (DIESEL/JET) ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Loss of off-site power during full-load testing (45.6)	3.7	90
300000 Instrument Air																
400000 Component Cooling Water																
K/A Category Point Totals:								3								
														Group Point Total:		5

271000 Offgas																
272000 Radiation Monitoring																
286000 Fire Protection																
288000 Plant Ventilation																
290001 Secondary CTMT																
290003 Control Room HVAC																
290002 Reactor Vessel Internals																
K/A Category Point Totals:										1						2
Group Point Total:															3	

Facility:		Date of Exam:				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.25	Ability to interpret reference materials, such as graphs, curves, tables, etc. (43.5)			4.2	94
	2.1.36	Knowledge of procedures and limitations involved in core alterations. (43.6)			4.1	95
	2.1.					
	2.1.					
	2.1.					
	2.1.					
	Subtotal					
2. Equipment Control	2.2.12	Knowledge of surveillance procedures. (45.13)			4.1	96
	2.2.40	Ability to apply Technical Specifications for a system. (43.2 / 43.5)			4.7	97
	2.2.					
	2.2.					
	2.2.					
	2.2.					
	Subtotal					
3. Radiation Control	2.3.6	Ability to approve release permits. (43.4)			3.8	98
	2.3.					
	2.3.					
	2.3.					
	2.3.					
	2.3.					
	Subtotal					
4. Emergency Procedures / Plan	2.4.18	Knowledge of the specific bases for EOPs. (43.1)			4.0	99
	2.4.40	Knowledge of SRO responsibilities in emergency plan implementation. (43.5)			4.5	100
	2.4.					
	2.4.					
	2.4.					
	2.4.					
	Subtotal					
Tier 3 Point Total						7

