

Facility: Cooper Nuclear Station

Date of Examination: _____

Examination Level (circle one): SRO

Operating Test Number: _____

Administrative Topic/Subject Description		Describe method of evaluation: 1. ONE Administrative JPM, OR 2. TWO Administrative Questions
A.1	Security	JPM Respond to a security Threat.(SKL034-30-26) 2.4.28 Knowledge of procedures relating to emergency response to sabotage.(CFR: 41.10 / 43.5 / 45.13) 2.2/3.3
	Plant Parameters	JPM Perform Drywell Temperature Calculation (Alternate Path) SKL0342138 223001 A1.01 Ability to predict and/or monitor changes in parameters associated with operating the PRIMARY CONTAINMENT SYSTEM AND AUXILIARIES controls including: Drywell temperature (CFR: 41.5 / 45.5) Imp. 3.5/3.6
A.2	Post Maintenance Testing	JPM Determine post-maintenance testing requirements. 2.2.7 Knowledge of the process for conducting tests or experiments not described in the safety analysis report.(CFR: 43.3 / 45.13)Imp. 2.0/3.2
A.3	Radiation Control	JPM Determine the need for KI distribution during a refueling accident with injured personnel and to whom it would be administered. 2.3.10 Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.(CFR: 43.4 / 45.10)
A.4	PARs	JPM Determine Protective Action Recommendations 2.4.44 Knowledge of emergency plan protective action recommendations.(CFR: 43.5 / 45.11) Imp.2.1/4.0

Facility: Cooper Nuclear Station

Date of Examination: _____

Exam Level (circle one): RO / SRO(U) / SRO(I)

Operating Test No.: _____

B.1 Control Room Systems

****Similar colors indicate JPMs that may be performed simultaneously.**

	System / JPM Title	Type Code*	Safety Function
1-1	Respond To A Control Rod Drifting Out ALTERNATE PATH: Control rod continues to move out after notched in.	A, S, N	1
1-2	Transfer Governor Valve Control from Manual to Auto with DEH in Mode IV	S, N	3
1-3	Respond to a trip of a Reactor Recirc pump. ALTERNATE PATH: Flow subtraction network fails.	A, S, N	4
1-4	Vent primary containment per 2.4PC.	S, N	5
1-5	Perform a Quick Restart of RFPT. ALTERNATE PATH: Trip reset requires the use of overspeed trip block. SRO UPGRADE	A, L, S, M	2
1-6	Transfer the 4160 G from the Diesel Generator to the Emergency Transformer. SRO UPGRADE	S, D	6
1-7	Install EOP PTM 97-100. SRO UPGRADE	C, N	7

B.2 Facility Walk-Through		
2-1	Locally Start the Diesel Fire Pump. <i>ALTERNATE PATH: Starting requires the use of the alternate battery.</i> SRO UPGRADE	A, D 8
2-2	Conduct Manual Draining of the SDV SRO UPGRADE	R, D 1
2-3	Refill FPC Skimmer Surge Tank	R, N 9
* Type Codes: (D)irect from bank, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow-Power, (R)CA		

Facility: <u>Cooper Nuclear Station</u>		Date of Examination: _____
Examination Level (circle one): <u>RO</u>		Operating Test Number: _____
Administrative Topic/Subject Description		Describe method of evaluation: 1. ONE Administrative JPM, OR 2. TWO Administrative Questions
A.1	Plant Parameter Verification	JPM Perform Drywell Temperature Calculation SKL0342152 223001 A1.01 Ability to predict and/or monitor changes in parameters associated with operating the PRIMARY CONTAINMENT SYSTEM AND AUXILIARIES controls including: Drywell temperature (CFR: 41.5 / 45.5) Imp. 3.5/3.6
	Staffing Requirements	Open Reference When is a coupling check of control rods required? 2.2.1 Ability to perform pre-startup procedures for the facility / including operating those controls associated with plant equipment that could affect reactivity.(CFR: 45.1) Imp 3.7/3.6
		Open Reference What requirements must be met for the second checking of control rod movement during a start up? 2.1.2 Knowledge of operator responsibilities during all modes of plant operation.(CFR: 41.10 / 45.13) Imp 3.0/4.0
A.2	Surveillance Testing	JPM Perform jet pump surveillance. 2.2.12 Knowledge of surveillance procedures.(CFR: 41.10 / 45.13) Imp. 3.0/3.4
A.3	Radiation Protection	JPM Determine the radiological protection requirements for a given task (given actual survey data). 2.3.10 Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.(CFR: 43.4 / 45.10) Imp 2.9/3.3
A.4	EPIP	JPM Perform Dose Assessment 2.4.39 Knowledge of the RO's responsibilities in emergency plan implementation.(CFR: 45.11) Imp 3.3/3.1

Cooper Nuclear Station

2003 NRC Exam

Scenario Outlines

Cooper Nuclear Station June 2003 NRC Exam	Scenario #1	Torus Leak
<p><u>Description:</u></p> <p>The plant is near the end of cycle at 70% power with SLC pump 1A, "C" Condensate Booster Pump and the "A" CRD pump out of service for maintenance. The "C" Condensate Booster Pump is expected to be returned to service at the beginning of the shift. An ice storm with accumulation is in progress.</p> <p>After the crew takes the watch, the "C" Condensate Booster Pump will be returned to service. After the Booster Pump is returned to service, the dispatcher contacts the control room and requests that Cooper increase power to maximum to relieve overloading on the transmission lines. The crew increases power at the load dispatchers request.</p> <p>After power is increased to 80%, a loss of the 69KV line occurs. The crew responds to the failure and addresses Technical Specifications.</p> <p>After Technical Specifications are addressed for the loss of the 69KV line, the "C" Main Steam Line steam flow detector fails downscale. The crew responds per 2.4RXLVL. Then the PCV for the steam jet air ejectors fails closed resulting in a loss of steam to the steam jets and a subsequent lowering of vacuum. The crew restores pressure to the steam jets and prevents a loss of vacuum.</p> <p>A Suppression Pool leak then develops resulting in a lowering torus level and entrance into EOP Flowchart 5A due to Secondary Containment Water Levels and 3A due to lowering Suppression Pool Level. When level decreases to 11', HPCI operation is prevented. Before SP water level drops to 9.6 ft., the crew initiates a manual reactor scram, which is unsuccessful. The crew is able to complete the scram using the RPS test switches.</p> <p>The reactor is depressurized either by anticipation of emergency depressurization, emergency depressurization or both before primary containment water level goes below 9.6 ft. When the crew opens 6 SRVs, SRV E fails to open, requiring the crew to open a LLS valve.</p> <p>When the reactor is depressurized and reactor water level is stable the scenario is terminated.</p>		

Cooper Nuclear Station June 2003 NRC Exam		Scenario #1		Torus Leak	
Event No.	Malf. No.	Type	Event Description		
1	N/A	N	Restore C CBP		
2	N/A	R	Raise Power per the Load Schedule		
3	ED21	C (BOP)	Loss of the 69KV line		
4	FW13	I (RO)	Steam Flow Signal Failure to RVLC System		
5	MC04	I (BOP)	Steam Jet Air Ejector Steam Supply Pressure Control Fail		
6	PC08	M	Suppression Pool Leak		
7	Various	C (RO)	Electrical ATWS		
8	N/A	M	Reactor Depressurization		
9	Override	C	SRV Fails to Open		
Critical Tasks:					
1. Scram prior to depressurization.					
2. Initiate emergency depressurization before primary containment water level goes below 9.6 ft.					

Cooper Nuclear Station June 2003 NRC Exam	Scenario #2	Stop and Prevent ATWS
<p><u>Description:</u></p> <p>The plant is operating at 90% power with SLC pump 1A is out of service for corrective maintenance.</p> <p>After the crew takes the watch, they perform surveillance 6.1RPS.301 "Manual Scram Functional Test (DIV 1)." When the half scram is inserted for the surveillance, control rod 22-23 scrams due to a blown fuse for the 118 valve (if fuses checked prior to the test, all fuses indicate continuity). The crew responds per 2.4CRD. The reactor engineer recommends that the crew reduces reactor power to 80% then recover the control rod.</p> <p>After the crew has addressed the Technical Specifications for the control rod LT-52A (NR GEMAC) fails.</p> <p>After the crew responds to the failure of LT-52A, an operating TEC pump trips requiring the crew to start the standby pump.</p> <p>Following the loss of the TEC pump, a main turbine bearing failure occurs with associated high vibration. Eventually the vibration reaches a level that requires a scram and turbine trip.</p> <p>When the manual scram is attempted very little rod movement occurs. Crew attempts to insert the control rods with ARI also fail. The crew will be required to stop and prevent injection to suppress power oscillations. After the crew stops and prevents injection, a steam leak develops in the steam tunnel resulting in a high steam tunnel temperature, the crew must manually close the MSIVs due to a failure of the automatic group 1 isolation.</p> <p>RPV pressure control is established with SRVs and control rods are inserted using Alternate Rod Insertion methods IAW ESP 5.8.3.</p> <p>The scenario ends when all control rods are inserted.</p>		

Cooper Nuclear Station June 2003 NRC Exam		Scenario #2		Stop and Prevent ATWS
Event No.	Malf. No.	Type	Event Description	
N/A	RP04	N/A	Group 1 Isolation Failure	
1	N/A	N	Manual Scram Surveillance	
2	RD14	C (RO)	Single Rod Scram	
3	N/A	R	Reduce Reactor Power to Recover Rod	
4	RR27A	I (RO)	Water Level Instrument Failure (Non-Selected Level)	
5	SW07	C (BOP)	TEC Pump Trip / Start Standby Pump	
6	TU03	C (BOP)	Turbine Bearing Failure/High Vibration	
7	RD02, Various	M	Turbine Trip, ATWS	
8	MS03	M	Steam Leak	
Critical Tasks:				
1. Fully insert all control rods.				
2. Close MSIVs prior to 2 secondary containment areas exceeding maximum operating temperature.				
3. Inhibit ADS prior to exceeding cooldown rate limit.				

Cooper Nuclear Station June 2003 NRC Exam	Scenario #3	HPCI Leak/MSOT 2 Areas
<p><u>Description:</u></p> <p>The plant is initially operating at 100% power with SLC pump 1A out of service for corrective maintenance. After the crew takes the watch, B CRD pump is started and the A CRD pump is removed from service to support maintenance on the pump.</p> <p>Following the shift of the CRD pumps, the A SW pump trips. The crew responds to the loss of the SW pump and evaluates Technical Specifications for the loss of the SW pump.</p> <p>After the crew has addressed the Technical Specifications for the SW pumps, the Vessel Flange Seal Leakage annunciates. The crew responds per procedure 4.6.3.</p> <p>Following the initial actions for the flange seal leak, a loss of feedwater heating occurs resulting in a power transient. and small fuel element failure (delayed response). The crew reduces power in response to the power excursion cause by the loss of FW heating.</p> <p>After power is stabilized and the APRM operability is assessed, a HPCI steam line break occurs and the HPCI isolation valves fail to close automatically. Manual attempts to close the valves are unsuccessful. The crew inserts a manual scram prior to exceeding Maximum Safe Operating Levels for temperature. The group 6 isolation fails to occur automatically and the crew manually isolates group 6 and starts SGT.</p> <p>Following the scram, the fuel failure caused by the power excursion becomes evident, resulting in an off-site release of radiation if the release is not isolated (group 6).</p> <p>Emergency Depressurization is required due to the primary system discharging into the secondary containment, resulting in 2 areas exceeding Maximum Safe Operating temperature.</p> <p>The scenario ends when the group 6 isolation is actuated by the operators, RPV Depressurization has taken place and RPV level is being maintained.</p>		

Cooper Nuclear Station June 2003 NRC Exam		Scenario #3		HPCI Leak/MSOT 2 Areas	
Event No.	Malf. No.	Type	Event Description		
N/A	CR01	N/A	Fuel Failure		
N/A	RP05	C (BOP)	Group 6 isolation failure		
1	N/A	N (RO)	Shift CRD pumps		
2	SW01	C (BOP)	SW Pump Trip		
3	RR21	I (RO)	Vessel Head Inner Seal Leakage		
4	various	C (BOP)	Loss of Feedwater Heating		
5	N/A	R	Reduce Power Due to Loss of Feedwater Heating		
6	HP06	M	HPCI Steam Leak		
7	N/A	M	Emergency Depressurization		
Critical Tasks:					
1. Scram prior to emergency depressurization.					
2. Emergency Depressurize within 10 minutes of Exceeding Maximum Safe Operating Temperature in two areas.					
3. Manually isolate reactor building release prior to reactor building vent radiation monitor exceeding 49 mrem.					

Cooper Nuclear Station June 2003 NRC Exam	Scenario #4	LOOP/LOCA
<p><u>Description:</u></p> <p>The plant is operating at 100% power near the end of the fuel cycle. Slight grid instabilities are present due to record grid loading. The load schedule requires that CNS maintain 100% power. SLC pump 1A is tagged out for corrective maintenance.</p> <p>The crew shifts the operating bus duct fan following a request by maintenance in order to equalize run times.</p> <p>After the crew completes the swap of the bus duct fans, HPCI-TE-105B fails upscale. The crew determines that the temperature element has failed and addresses Technical Specifications.</p> <p>After Technical Specifications are addressed for the failed temperature element, the running air compressor trips. The crew responds to the loss of the air compressor and initiates an investigation into the cause.</p> <p>After the air system is stabilized, condenser vacuum begins to slowly lower due to increased air in-leakage. The crew responds to the lowering vacuum and commences a reduction in power in order to maintain vacuum. These efforts are initially successful in the maintenance of condenser vacuum but the condenser air in-leakage eventually increases to the point that requires the turbine to be tripped. After the turbine trip, air in-leakage continues to increase resulting in complete loss of vacuum and Group I isolation.</p> <p>Shortly after the turbine is tripped, a loss of off-site power (LOOP) occurs due to collapse of the grid following the loss of Cooper's generation. Both DGs fail to auto start following the loss of offsite power, but are both manually started by the crew.</p> <p>The transient caused by the turbine trip, scram and Group 1 isolation results in a LOCA. The LOCA results in a rising containment temperature and pressure. EOP 1A and 3A are entered. HPCI fails to auto start, but can be manually initiated for RPV level control. The crew stabilizes level with HPCI and RCIC initially, then with low pressure systems.</p> <p>Torus and drywell sprays are initiated by the crew. When the sprays are in service with a stable reactor water level utilizing low pressure systems, the scenario is terminated.</p>		

Cooper Nuclear Station June 2003 NRC Exam		Scenario #4		LOOP/LOCA
Event No.	Malf. No.	Type	Event Description	
N/A	ED20	N/A	Grid Instabilities	
1	LD01	I (RO)	Temperature Element Failure	
2	IA04	C (BOP)	Air Compressor Trip	
3	N/A	N	Shift the Bus Duct Cooling Fans	
4	MC01	R	Lowering Condenser Vacuum, Power Reduction Following Lowering Vacuum	
5	ED05 ED06	M	Loss of Offsite Power following turbine trip	
6	DG06	C (BOP)	Failure of Both DGs to Start.	
7	RR31	M	LOCA	
8	HP01	C (RO)	HPCI Fails to Auto Start	
CRITICAL TASKS:				
1. Start the Diesel Generators prior to reactor water level reaching TAF and prior exceeding PSP.				
2. Initiate DW sprays prior to exceeding PSP.				
3. Maintain RPV water level above TAF (0 inches corrected Fuel Zone)				

Facility:		Date of Exam:		Exam Level:									
Tier	Group	K/A Category Points											Point Total
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	
1. Emergency & Abnormal Plant Evolutions	1	3	2	2				2	2			2	13
	2	3	3	3				3	4			3	19
	3	1	0	1				1	1			0	4
	Tier Totals	7	5	6				6	7			5	36
2. Plant Systems	1	3	1	2	2	3	3	2	3	3	4	2	28
	2	2	2	1	2	2	3	1	2	0	2	2	19
	3	0	0	1	0	1	0	1	0	0	1	0	4
	Tier Totals	5	3	4	4	6	6	4	5	3	7	4	51
3. Generic Knowledge and Abilities				Cat 1		Cat 2		Cat 3		Cat 4		13	
				4		2		4		3			
<p>Note: 1. Ensure that at least two topics from every K/A category are sampled within each tier (i.e., the "Tier Totals" in each K/A category shall not be less than two).</p> <p>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 exam must total 100 points.</p> <p>3. Select topics from many systems; avoid selecting more than two or three K/A topics from a given system unless they relate to plant-specific priorities.</p> <p>4. Systems/evolutions within each group are identified on the associated outline.</p> <p>5. The shaded areas are not applicable to the category/tier.</p> <p>6.* The generic 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.</p> <p>7. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings for the SRO license level, and the point totals for each system and category. K/As below 2.5 should be justified on the basis of plant-specific priorities. Enter the tier totals for each category in the table above.</p>													

aaaa

E/APE # / Name / Safety Function N/A to CNS

E/APE # / Name / Safety Function not randomly selected

ES-401		BWR RO Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1						Form ES-401-2 (R8, S1)	
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
295005 Main Turbine Generator Trip / 3					X		AA2.03 Ability to determine and/or interpret the following as they apply to MAIN TURBINE GENERATOR TRIP: Turbine valve position (CFR: 41.10 / 43.5 / 45.13)	3.1/3.1	1
295006 SCRAM / 1					X		AA2.05 Ability to determine and/or interpret the following as they apply to SCRAM: Whether a reactor SCRAM has occurred (CFR: 41.10 / 43.5 / 45.13)	4.6/4.6	1
295007 High Reactor Pressure / 3	X						AK1.02 Knowledge of the operational implications of the following concepts as they apply to HIGH REACTOR PRESSURE: Decay heat generation (CFR: 41.8 to 41.10)	3.1/3.4	1
295009 Low Reactor Water Level / 2						X	2.4.2 Knowledge of system set points / interlocks and automatic actions associated with EOP entry conditions. (CFR: 41.7 / 45.7 / 45.8)	3.9/4.1	1
295010 High Drywell Pressure / 5	X						AK1.03 Knowledge of the operational implications of the following concepts as they apply to HIGH DRYWELL PRESSURE: Temperature increases (CFR: 41.8 to 41.10)	3.2/3.4	1
295014 Inadvertent Reactivity Addition / 1			X				AK3.01 Knowledge of the reasons for the following responses as they apply to INADVERTENT REACTIVITY ADDITION: Reactor SCRAM (CFR: 41.5 / 45.6)	4.1/4.1	1
295015 Incomplete SCRAM / 1	X						AK1.04 Knowledge of the operational implications of the following concepts as they apply to INCOMPLETE SCRAM: Reactor pressure: (CFR: 41.8 to 41.10)	3.8/3.8	1
295015 Incomplete SCRAM / 1		X					AK2.04 Knowledge of the interrelations between INCOMPLETE SCRAM and the following: RPS (CFR: 41.7 / 45.8)	4.0/4.1	1
295024 High Drywell Pressure / 5						X	2.4.48 Ability to interpret control room indications to verify the status and operation of system / and understand how operator actions and directives affect plant and system conditions. (CFR: 43.5 / 45.12)	3.5/3.8	1
295025 High Reactor Pressure / 3				X			EA1.02 Ability to operate and/or monitor the following as they apply to HIGH REACTOR PRESSURE: Reactor/turbine pressure regulating system (CFR: 41.7 / 45.6)	3.8/3.8	1
295031 Reactor Low Water Level / 2				X			EA1.12 Ability to operate and/or monitor the following as they apply to REACTOR LOW WATER LEVEL: Feedwater (CFR: 41.7 / 45.6)	3.9/4.1	1
295037 SCRAM Condition Present and Power Above APRM Downscale or Unknown / 1		X					EK2.05 Knowledge of the interrelations between SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN and the following: CRD hydraulic system (CFR: 41.7 / 45.8)	4.0/4.1	1
500000 High Containment Hydrogen Conc. / 5			X				EK3.04 Knowledge of the reasons for the following responses as they apply to HIGH PRIMARY CONTAINMENT HYDROGEN CONCENTRATIONS: Emergency depressurization (CFR: 41.5 / 45.6)	3.1/3.9	1
K/A Category Totals:	3	2	2	2	2	2	Group Point Total:		13

<div>ES-401</div> <div>BWR RO Examination Outline</div> <div>Emergency and Abnormal Plant Evolutions - Tier 1/Group 2</div> <div>Form ES-401-2 (R8, S1)</div>									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4				X			AA1.07 Ability to operate and/or monitor the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Nuclear boiler instrumentation system (CFR: 41.7 / 45.6)	3.1/3.2	1
295002 Loss of Main Condenser Vacuum / 3									0
295003 Partial or Complete Loss of AC Pwr / 6					X		AA2.01 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER: Cause of partial or complete loss of A.C. power (CFR: 41.10 / 43.5 / 45.13)	3.4/3.7	1
295004 Partial or Complete Loss of DC Pwr / 6									0
295008 High Reactor Water Level / 2						X	2.1.32 Ability to explain and apply system limits and precautions.(CFR: 41.10 / 43.2 / 45.12)	3.4/3.8	1
295011 High CTMT Temperature / 5									0
295012 High Drywell Temperature / 5					X		AA2.02 Ability to determine and/or interpret the following as they apply to HIGH DRYWELL TEMPERATURE: Drywell pressure (CFR: 41.10 / 43.5 / 45.13)	3.9/4.1	1
295013 High Suppression Pool Temp. / 5					X		AA2.01 Ability to determine and/or interpret the following as they apply to HIGH SUPPRESSION POOL TEMPERATURE: Suppression pool temperature (CFR: 41.10 / 43.5 / 45.13)	3.8/4.0	1
295016 Control Room Abandonment / 7			X				AK3.03 Knowledge of the reasons for the following responses as they apply to CONTROL ROOM ABANDONMENT: Disabling control room controls (CFR: 41.5 / 45.6)	3.5/3.7	1
295017 High Off-site Release Rate / 9						X	2.4.31 Knowledge of annunciators alarms and indications / and use of the response instructions. (CFR: 41.10 / 45.3)	3.3/3.4	1
295018 Partial or Complete Loss of CCW / 8		X					AK2.01 Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER and the following: System loads (CFR: 41.7 / 45.8)	3.3/3.4	1
295019 Part. or Comp. Loss of Inst. Air / 8		X					AK2.09 Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR and the following: Containment (CFR: 41.7 / 45.8)	3.3/3.3	1
295020 Inadvertent Cont. Isolation / 5 & 7					X		AA2.03 Ability to determine and/or interpret the following as they apply to INADVERTENT CONTAINMENT ISOLATION: Reactor power (CFR: 41.10 / 43.5 / 45.13)	3.7/3.7	1
295022 Loss of CRD Pumps / 1		X					AK2.03 Knowledge of the interrelations between LOSS OF CRD PUMPS and the following: Accumulator pressures (CFR: 41.7 / 45.8)	3.4/3.4	1
295026 High Suppression Pool Water Temp. / 5				X			EA1.02 Ability to operate and/or monitor the following as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: Suppression pool spray: Plant-Specific (CFR: 41.7 / 45.6)	3.6/3.8	1
295027 High Containment Temperature / 5									0
295028 High Drywell Temperature / 5			X				EK3.05 Knowledge of the reasons for the following responses as they apply to HIGH DRYWELL TEMPERATURE: Reactor SCRAM (CFR: 41.5 / 45.6)	3.6/3.7	1

<div>ES-401</div> <div>BWR RO Examination Outline</div> <div>Emergency and Abnormal Plant Evolutions - Tier 1/Group 2</div> <div>Form ES-401-2 (R8, S1)</div>									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
295029 High Suppression Pool Water Level / 5						X	2.1.20 Ability to execute procedure steps.(CFR: 41.10 / 43.5 / 45.12)	4.3/4.2	1
295030 Low Suppression Pool Water Level / 5	X						EK1.03 Knowledge of the operational implications of the following concepts as they apply to LOW SUPPRESSION POOL WATER LEVEL: Heat capacity (CFR: 41.8 to 41.10)	3.8/4.1	1
295033 High Sec. Cont. Area Rad. Levels / 9	X						EK1.02 Knowledge of the operational implications of the following concepts as they apply to HIGH SECONDARY CONTAINMENT AREA RADIATION LEVELS: Personnel protection (CFR: 41.8 to 41.10)	3.9/4.2	1
295034 Sec. Cont. Ventilation High Rad. / 9	X						EK1.02 Knowledge of the operational implications of the following concepts as they apply to SECONDARY CONTAINMENT VENTILATION HIGH RADIATION:†Radiation releases (CFR: 41.8 to 41.10)	3.8/4.1	1
295038 High Off-site Release Rate / 9			X				EK3.04 Knowledge of the reasons for the following responses as they apply to HIGH OFF-SITE RELEASE RATE: †Emergency depressurization (CFR: 41.5 / 45.6)	3.6/3.9	1
600000 Plant Fire On Site / 8				X			AA1.05 Ability to operate and / or monitor the following as they apply to PLANT FIRE ON SITE: Plant and control room ventilation systems	3.0/3.1	1
K/A Category Point Totals:	3	3	3	3	4	3	Group Point Total:		19

ES-401		BWR RO Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 3						Form ES-401-2 (R8, S1)	
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
295021 Loss of Shutdown Cooling / 4					X		AA2.07 Ability to determine and/or interpret the following as they apply to LOSS OF SHUTDOWN COOLING: Reactor recirculation flow (CFR: 41.10 / 43.5 / 45.13)	2.9/3.1	1
295023 Refueling Accidents / 8									0
295032 High Secondary Containment Area Temperature / 5				X			EA1.03 Ability to operate and/or monitor the following as they apply to HIGH SECONDARY CONTAINMENT AREA TEMPERATURE: (CFR: 41.7 / 45.6)	3.7/3.7	1
295035 Secondary Containment High Differential Pressure / 5	X						EK1.01 Knowledge of the operational implications of the following concepts as they apply to SECONDARY CONTAINMENT HIGH DIFFERENTIAL PRESSURE: Secondary containment integrity (CFR: 41.8 to 41.10)	3.9/4.2	1
295036 Secondary Containment High Sump/Area Water Level / 5			X				EK3.02 Knowledge of the reasons for the following responses as they apply to SECONDARY CONTAINMENT HIGH SUMP/AREA WATER LEVEL: Reactor SCRAM (CFR: 41.5 / 45.6)	2.8/2.8	1
K/A Category Point Totals:	1	0	1	1	1	0	Group Point Total:		4

ES-401		BWR RO Examination Outline Plant Systems - Tier 2/Group 1										Form ES-401-2 (R8, S1)		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
201001 CRD Hydraulic						X						K6.05 Knowledge of the effect that a loss or malfunction of the following will have on the CONTROL ROD DRIVE HYDRAULIC System :A.C. power (CFR: 41.7 / 45.7)	3.3/3.3	1
201002 RMCS										X		A4.03 Ability to manually operate and/or monitor in the control room: Rod drift test switch (CFR: 41.7 / 45.5 to 45.8)	2.8/2.8	1
201005 RGIS														0
202002 Recirculation Flow Control										X		Ability to manually operate and/or monitor in the control room: MG sets (CFR: 41.7 / 45.5 to 45.8)	3.3/3.1	1
203000 RHR/LPCI: Injection Mode								X				A2.06 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: Emergency generator failure (CFR: 41.5 / 45.6)	3.8/3.9	1
203000 RHR/LPCI: Injection Mode										X		A4.02 Ability to manually operate and/or monitor in the control room: System valves (CFR: 41.7 / 45.5 to 45.8)	4.1/4.1	1
206000 HPCI										X		A4.07 Ability to manually operate and/or monitor in the control room: Condensate storage tank level: BWR-2,3,4 (CFR: 41.7 / 45.5 to 45.8)	3.5/3.5	1
207000 Isolation (Emerg.) Condenser														0
209001 LPCS									X			A3.03 Ability to monitor automatic operations of the LOW PRESSURE CORE SPRAY SYSTEM including: System pressure (CFR: 41.7 / 45.7)	3.5/3.5	1
209002 HPSCS														0
211000 SLC	X											K1.09 Knowledge of the physical connections and/or cause-effect relationships between STANDBY LIQUID CONTROL SYSTEM and the following: Core spray system: Plant-Specific (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.2/3.4	1
211000 SLC					X							K5.07 Knowledge of the operational implications of the following concepts as they apply to STANDBY LIQUID CONTROL SYSTEM: Tank heater operation (CFR: 41.5 / 45.3)	2.7/2.9	1
212000 RPS								X				A2.09 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 containment/drywell pressure(CFR: 41.5 / 45.6)	4.1/4.3	1

ES-401		BWR RO Examination Outline Plant Systems - Tier 2/Group 1										Form ES-401-2 (R8, S1)		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
215003 IRM									X			A3.03 Ability to monitor automatic operations of the INTERMEDIATE RANGE MONITOR (IRM) SYSTEM including: RPS status (CFR: 41.7 / 45.7)	3.7/3.6	1
215004 SRM			X									K3.02 Knowledge of the effect that a loss or malfunction of the SOURCE RANGE MONITOR (SRM) SYSTEM will have on following: Reactor manual control: Plant-Specific (CFR: 41.7 / 45.4)	3.4/3.4	1
215005 APRM / LPRM								X				A2.01 Ability to (a) predict the impacts of the following on the AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Power supply degraded(CFR: 41.5 / 45.6)	2.7/3.1	1
216000 Nuclear Boiler Instrumentation	X											K1.16 Knowledge of the physical connections and/or cause- effect relationships between NUCLEAR BOILER INSTRUMENTATION and the following:Main turbine (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.0/3.1	1
216000 Nuclear Boiler Instrumentation			X									K3.25 Knowledge of the effect that a loss or malfunction of the NUCLEAR BOILER Instrumentation will have on following:Vessel pressure monitoring (CFR: 41.7 / 45.4)	3.9/4.1	1
217000 RCIC					X							K5.04 Knowledge of the operational implications of the following concepts as they apply to REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) : Testable check valve operation (CFR: 41.5 / 45.3)	2.6/2.7	1
218000 ADS		X										K2.01 Knowledge of electrical power supplies to the following: ADS logic (CFR: 41.7)	3.1/3.3	1
223001 Primary CTMT and Auxiliaries						X						K6.09 Knowledge of the effect that a loss or malfunction of the following will have on the PRIMARY CONTAINMENT SYSTEM AND AUXILIARIES: Drywell vacuum relief system (CFR: 41.7 / 45.7)	3.4/3.6	1
223001 Primary CTMT and Auxiliaries									X			A3.03 Ability to monitor automatic operations of the PRIMARY CONTAINMENT SYSTEM AND AUXILIARIES including: System indicating light and alarms(CFR: 41.7 / 45.7)	3.4/3.3	1
223002 PCIS/Nuclear Steam Supply Shutoff											X	2.1.23 Ability to perform specific system and integrated plant procedures during different modes of plant operation.(CFR: 45.2 / 45.6)	3.9/4.0	1

BWR RO Examination Outline Plant Systems - Tier 2/Group 1													Form ES-401-2 (R8, S1)	
ES-401														
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
239002 SRVs						X						K6.03 Knowledge of the effect that a loss or malfunction of the following will have on the RELIEF/SAFETY VALVES : A.C. power: Plant-Specific (CFR: 41.7 / 45.7)	2.7/2.9	1
241000 Reactor/Turbine Pressure Regulator				X								K4.01 Knowledge of REACTOR/TURBINE PRESSURE REGULATING SYSTEM design feature(s) and/or interlocks which provide for the following: Reactor pressure control (CFR: 41.7)	3.8/3.8	1
259001 Reactor Feedwater				X								K4.03 Knowledge of REACTOR FEEDWATER SYSTEM design feature(s) and/or interlocks which provide for the following: RFP minimum flow (CFR: 41.7)	2.7/2.7	1
259002 Reactor Water Level Control							X					A1.04 Ability to predict and/or monitor changes in parameters associated with operating the REACTOR WATER LEVEL CONTROL SYSTEM controls including: Reactor water level control controller indications (CFR: 41.5 / 45.5)	3.6/3.6	1
261000 SGTS							X					A1.01 Ability to predict and/or monitor changes in parameters associated with operating the STANDBY GAS TREATMENT SYSTEM controls including: System flow (CFR: 41.5 / 45.5)	2.9/3.1	1
261000 SGTS											X	2.2.12 Knowledge of surveillance procedures.(CFR: 41.10 / 45.13)	3.0/3.4	1
264000 EDGs					X							K5.06 Knowledge of the operational implications of the following concepts as they apply to EMERGENCY GENERATORS (DIESEL/JET): Load sequencing (CFR: 41.5 / 45.3)	3.4/3.5	1
264000 EDGs	X											K1.02 Knowledge of the physical connections and/or cause- effect relationships between EMERGENCY GENERATORS (DIESEL/JET) and the following:D.C. electrical distribution (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.3/3.4	1
K/A Category Point Totals:	3	1	2	2	3	3	2	3	3	4	2			28

[illegible]

ES-401		BWR RO Examination Outline Plant Systems - Tier 2/Group 2										Form ES-401-2 (R8, S1)		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
245000 Main Turbine Gen. and Auxiliaries										X		A4.14 Ability to manually operate and/or monitor in the control room: Generator megavar output (CFR: 41.7 / 45.5 to 45.8)	2.5/2.5	1
256000 Reactor Condensate				X								K4.10 Knowledge of REACTOR CONDENSATE SYSTEM design feature(s) and/or interlocks which provide for the following: Non-condensable gas removal (CFR: 41.7)	2.7/2.7	1
262001 AC Electrical Distribution										X		A4.05 Ability to manually operate and/or monitor in the control room: Voltage, current, power, and frequency on A.C. buses (CFR: 41.7 / 45.5 to 45.8)	3.3/3.3	1
262002 UPS (AC/DC)	X											K1.06 Knowledge of the physical connections and/or cause- effect relationships between UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) and the following: Unit computer: Plant-Specific (CFR: 41.2 to 41.9 / 45.7 to 45.8)	2.6/2.7	1
263000 DC Electrical Distribution				X								K4.02 Knowledge of D.C. ELECTRICAL DISTRIBUTION design feature(s) and/or interlocks which provide for the following: Breaker interlocks, permissives, bypasses and cross ties: Plant-Specific (CFR: 41.7)	3.1/3.5	1
271000 Offgas											X	2.1.28 Knowledge of the purpose and function of major system components and controls. (CFR: 41.7)	3.2/3.3	1
272000 Radiation Monitoring					X							K5.01 Knowledge of the operational implications of the following concepts as they apply to RADIATION MONITORING SYSTEM: Hydrogen injection operation's effect on process radiation indications: Plant-Specific(CFR: 41.7 / 45.4)	3.2/3.5	1
286000 Fire Protection					X							K5.07 Knowledge of the operational implications of the following concepts as they apply to FIRE PROTECTION SYSTEM: Smoke detection (CFR: 41.5 / 45.3)	2.6/2.7	1
290001 Secondary CTMT											X	2.3.1 Knowledge of 10 CFR: 20 and related facility radiation control requirements.(CFR: 41.12 / 43.4. 45.9 / 45.10)	2.6/3.0	1
290003 Control Room HVAC	X											K1.05 Knowledge of the physical connections and/or cause- effect relationships between CONTROL ROOM HVAC and the following: Component cooling water systems (CFR: 41.2 to 41.9 / 45.7 to 45.8)	2.8/3.0	1

ES-401																BWR RO Examination Outline Plant Systems - Tier 2/Group 2										Form ES-401-2 (R8, S1)	
System # / Name		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)		Imp.	Points											
300000 Instrument Air				X									K3.02 Knowledge of the effect that a loss or malfunction of the (INSTRUMENT AIR SYSTEM) will have on the following: Systems having pneumatic valves and controls (CFR: 41.7 / 45.6)		3.3/3.4	1											
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 (CFR: 41.7 / 45.7)		2.8/2.9	1											
K/A Category Point Totals:		2	2	1	2	2	3	1	2	0	2	2	Group Point Total:			19											

ES-401		BWR RO Examination Outline Plant Systems - Tier 2/Group 3										Form ES-401-2 (R8, S1)		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
215001 Traversing In-core Probe										X		A4.03 Ability to manually operate and/or monitor in the control room: Isolation valves: Mark-I&II(Not-BWR1) (CFR: 41.7 / 45.5 to 45.8)	3.0/3.1	1
233000 Fuel Pool Cooling and Cleanup							X					A1.07 Ability to predict and/or monitor changes in parameters associated with operating the FUEL POOL COOLING AND CLEAN-UP controls including: System temperature (CFR: 41.5 / 45.5)	2.7/2.8	1
234000 Fuel Handling Equipment														0
239003 MSIV Leakage Control														0
268000 Radwaste			X									K3.04 Knowledge of the effect that a loss or malfunction of the RADWASTE will have on following: Drain sumps (CFR: 41.5 / 45.3)	2.7/2.8	1
288000 Plant Ventilation														0
290002 Reactor Vessel Internals					X							K5.07 Knowledge of the operational implications of the following concepts as they apply to REACTOR VESSEL INTERNALS: †Safety limits (CFR: 41.5 / 45.3)	3.9/4.4	1
K/A Category Point Totals:	0	0	1	0	1	0	1	0	0	1	0	Group Point Total:		4
Plant-Specific Priorities														
System / Topic						Recommended Replacement for...					Reason		Points	
Plant-Specific Priority Total: (limit 10)														

Facility:		Date of Exam:	Exam Level:	
Category	K/A #	Topic	Imp.	Points
Conduct of Operations	2.1.18	Ability to make accurate / clear and concise logs / records / status boards / and reports. (CFR: 45.12 / 45.13)	2.9/3.0	1
	2.1.31	Ability to locate control room switches / controls and indications and to determine that they are correctly reflecting the desired plant lineup.(CFR: 45.12)	4.2/3.9	1
	2.1.19	Ability to use plant computer to obtain and evaluate parametric information on system or component status.(CFR: 45.12)	3.0/3.0	1
	2.1.28	Knowledge of the purpose and function of major system components and controls. (CFR: 41.7)	3.2/3.3	1
	Total			4
Equipment Control	2.2.1	Ability to perform pre-startup procedures for the facility / including operating those controls associated with plant equipment that could affect reactivity. (CFR: 45.1)	3.7/3.6	1
	2.2.27	2.2.27 Knowledge of the refueling process. (CFR: 43.6 / 45.13)	2.6/3.5	1
	Total			2
Radiation Control	2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure. (CFR: 43.4 / 45.10)	2.9/3.3	1
	2.3.1	Knowledge of 10 CFR: 20 and related facility radiation control requirements.(CFR: 41.12 / 43.4. 45.9 / 45.10)	2.6/3.0	1
	2.3.2	Knowledge of facility ALARA program. (CFR: 41.12 / 43.4 / 45.9 / 45.10)	2.5/2.9	1
	2.3.11	Ability to control radiation releases. (CFR: 45.9 / 45.10)	2.7/3.2	1
	Total			4
Emergency Procedures/ Plan	2.4.2	Knowledge of system set points / interlocks and automatic actions associated with EOP entry conditions. (CFR: 41.7 / 45.7 / 45.8)	3.9/4.1	1
	2.4.34	Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications. (CFR: 43.5 / 45.13)	3.8/3.6	1
	2.4.31	Knowledge of annunciators alarms and indications / and use of the response instructions. (CFR: 41.10 / 45.3)	3.3/3.4	1
	Total			3
Tier 3 Point Total (RO)				13

Facility:		Date of Exam:		Exam Level:									
Tier	Group	K/A Category Points											Point Total
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	
1. Emergency & Abnormal Plant Evolutions	1	6	2	4				4	6			4	26
	2	2	3	4				1	4			3	17
	Tier Totals	8	5	8				5	10			7	43
2. Plant Systems	1	1	1	1	1	3	3	3	2	1	3	4	23
	2	3	1	0	1	1	3	0	1	1	2	0	13
	3	0	0	1	0	1	0	0	0	0	1	1	4
	Tier Totals	4	2	2	2	5	6	3	3	2	6	5	40
3. Generic Knowledge and Abilities					Cat 1		Cat 2		Cat 3		Cat 4		17
					4		4		5		4		
<p>Note: 1. Ensure that at least two topics from every K/A category are sampled within each tier (i.e., the "Tier Totals" in each K/A category shall not be less than two).</p> <p>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 exam must total 100 points.</p> <p>3. Select topics from many systems; avoid selecting more than two or three K/A topics from a given system unless they relate to plant-specific priorities.</p> <p>4. Systems/evolutions within each group are identified on the associated outline.</p> <p>5. The shaded areas are not applicable to the category/tier.</p> <p>6.* The generic 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.</p> <p>7. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings for the SRO license level, and the point totals for each system and category. K/As below 2.5 should be justified on the basis of plant-specific priorities. Enter the tier totals for each category in the table above.</p>													

	SRO - only
aaaa	E/APE # / Name / Safety Function N/A to CNS
	E/APE # / Name / Safety Function not randomly selected

<div>ES-401</div> <div>BWR SRO Examination Outline</div> <div>Emergency and Abnormal Plant Evolutions - Tier 1/Group 1</div> <div>Form ES-401-1 (R8, S1)</div>									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
295003 Partial or Complete Loss of AC Pwr / 6					X		AA2.01 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER: Cause of partial or complete loss of A.C. power (CFR: 41.10 / 43.5 / 45.13)	3.4/3.7	1
295006 SCRAM / 1					X		AA2.05 Ability to determine and/or interpret the following as they apply to SCRAM: Whether a reactor SCRAM has occurred (CFR: 41.10 / 43.5 / 45.13)	4.6/4.6	1
295007 High Reactor Pressure / 3					X		AA2.02 Ability to determine and/or interpret the following as they apply to HIGH REACTOR PRESSURE: Reactor power (CFR: 41.10 / 43.5 / 45.13)	4.1/4.1	1
295007 High Reactor Pressure / 3	X						AK1.02 Knowledge of the operational implications of the following concepts as they apply to HIGH REACTOR PRESSURE: Decay heat generation (CFR: 41.8 to 41.10)	3.1/3.4	1
295009 Low Reactor Water Level / 2						X	2.4.2 Knowledge of system set points / interlocks and automatic actions associated with EOP entry conditions. (CFR: 41.7 / 45.7 / 45.8)	3.9/4.1	1
295010 High Drywell Pressure / 5						X	2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics / reactor behavior / and instrument interpretation. (CFR: 43.5 / 45.12 / 45.13)	3.7/4.4	1
295010 High Drywell Pressure / 5	X						AK1.03 Knowledge of the operational implications of the following concepts as they apply to HIGH DRYWELL PRESSURE: Temperature increases (CFR: 41.8 to 41.10)	3.2/3.4	1
295013 High Suppression Pool Temp. / 5	X						AK1.04 Knowledge of the operational implications of the following concepts as they apply to HIGH SUPPRESSION POOL TEMPERATURE: Complete condensation (CFR: 41.8 to 41.10)	2.9/3.2	1
295013 High Suppression Pool Temp. / 5					X		AA2.01 Ability to determine and/or interpret the following as they apply to HIGH SUPPRESSION POOL TEMPERATURE: Suppression pool temperature (CFR: 41.10 / 43.5 / 45.13)	3.8/4.0	1
295014 Inadvertent Reactivity Addition / 1			X				AK3.01 Knowledge of the reasons for the following responses as they apply to INADVERTENT REACTIVITY ADDITION: Reactor SCRAM (CFR: 41.5 / 45.6)	4.1/4.1	1
295014 Inadvertent Reactivity Addition / 1					X		AA2.03 Ability to determine and/or interpret the following as they apply to INADVERTENT REACTIVITY ADDITION: Cause of reactivity addition (CFR: 41.10 / 43.5 / 45.13)	4.0/4.3	1
295015 Incomplete SCRAM / 1		X					AK2.04 Knowledge of the interrelations between INCOMPLETE SCRAM and the following: RPS (CFR: 41.7 / 45.8)	4.0/4.1	1
295015 Incomplete SCRAM / 1	X						AK1.04 Knowledge of the operational implications of the following concepts as they apply to INCOMPLETE SCRAM: Reactor pressure: (CFR: 41.8 to 41.10)	3.8/3.8	1
295016 Control Room Abandonment / 7					X		AA2.06 Ability to determine and/or interpret the following as they apply to CONTROL ROOM ABANDONMENT: Cooldown rate (CFR: 41.10 / 43.5 / 45.13)	3.3/3.5	1

<div>ES-401</div> <div>BWR SRO Examination Outline</div> <div>Emergency and Abnormal Plant Evolutions - Tier 1/Group 1</div> <div>Form ES-401-1 (R8, S1)</div>									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
295016 Control Room Abandonment / 7			X				AK3.03 Knowledge of the reasons for the following responses as they apply to CONTROL ROOM ABANDONMENT: Disabling control room controls (CFR: 41.5 / 45.6)	3.5/3.7	1
295017 High Off-site Release Rate / 9						X	2.4.31 Knowledge of annunciators alarms and indications / and use of the response instructions. (CFR: 41.10 / 45.3)	3.3/3.4	1
295023 Refueling Accidents Cooling Mode / 8	X						AK1.02 Knowledge of the operational implications of the following concepts as they apply to REFUELING ACCIDENTS: Shutdown margin.(CFR: 41.8 to 41.10)	3.2/3.6	1
295024 High Drywell Pressure / 5						X	2.4.48 Ability to interpret control room indications to verify the status and operation of system / and understand how operator action s and directives affect plant and system conditions. (CFR: 43.5 / 45.12)	3.5/3.8	1
295025 High Reactor Pressure / 3				X			EA1.02 Ability to operate and/or monitor the following as they apply to HIGH REACTOR PRESSURE: Reactor/turbine pressure regulating system (CFR: 41.7 / 45.6)	3.8/3.8	1
295026 Suppression Pool High Water Temp. / 5				X			EA1.02 Ability to operate and/or monitor the following as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: Suppression pool spray: Plant-Specific (CFR: 41.7 / 45.6)	3.6/3.8	1
295027 High Containment Temperature / 5									0
295030 Low Suppression Pool Water Level / 5				X			EA1.05 Ability to operate and/or monitor the following as they apply to LOW SUPPRESSION POOL WATER LEVEL: HPCI (CFR: 41.7 / 45.6)	3.5/3.5	1
295030 Low Suppression Pool Water Level / 5	X						EK1.03 Knowledge of the operational implications of the following concepts as they apply to LOW SUPPRESSION POOL WATER LEVEL: Heat capacity (CFR: 41.8 to 41.10)	3.8/4.1	1
295031 Reactor Low Water Level / 2				X			EA1.12 Ability to operate and/or monitor the following as they apply to REACTOR LOW WATER LEVEL: Feedwater (CFR: 41.7 / 45.6)	3.9/4.1	1
295037 SCRAM Condition Present and Power Above APRM Downscale or Unknown / 1		X					EK2.05 Knowledge of the interrelations between SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN and the following: CRD hydraulic system (CFR: 41.7 / 45.8)	4.0/4.1	1
295038 High Off-site Release Rate / 9			X				EK3.04 Knowledge of the reasons for the following responses as they apply to HIGH OFF-SITE RELEASE RATE: †Emergency depressurization (CFR: 41.5 / 45.6)	3.6/3.9	1
500000 High Containment Hydrogen Conc. / 5			X				EK3.04 Knowledge of the reasons for the following responses as they apply to HIGH PRIMARY CONTAINMENT HYDROGEN CONCENTRATIONS: Emergency depressurization (CFR: 41.5 / 45.6)	3.1/3.9	1
K/A Category Totals:	6	2	4	4	6	4	Group Point Total:		26

<div>ES-401</div> <div>BWR SRO Examination Outline</div> <div>Emergency and Abnormal Plant Evolutions - Tier 1/Group 2</div> <div>Form ES-401-1 (R8, S1)</div>									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4				X			AA1.07 Ability to operate and/or monitor the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Nuclear boiler instrumentation system (CFR: 41.7 / 45.6)	3.1/3.2	1
295002 Loss of Main Condenser Vacuum / 3									0
295004 Partial or Total Loss of DC Pwr / 6									0
295005 Main Turbine Generator Trip / 3					X		AA2.03 Ability to determine and/or interpret the following as they apply to MAIN TURBINE GENERATOR TRIP: Turbine valve position (CFR: 41.10 / 43.5 / 45.13)	3.1/3.1	1
295008 High Reactor Water Level / 2						X	2.1.32 Ability to explain and apply system limits and precautions.(CFR: 41.10 / 43.2 / 45.12)	3.4/3.8	1
295011 High Containment Temperature / 5									0
295012 High Drywell Temperature / 5					X		AA2.02 Ability to determine and/or interpret the following as they apply to HIGH DRYWELL TEMPERATURE: Drywell pressure (CFR: 41.10 / 43.5 / 45.13)	3.9/4.1	1
295018 Partial or Total Loss of CCW / 8		X					AK2.01 Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER and the following: System loads (CFR: 41.7 / 45.8)	3.3/3.4	1
295019 Partial or Total Loss of Inst. Air / 8		X					AK2.09 Knowledge of the interrelations between PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR and the following: Containment (CFR: 41.7 / 45.8)	3.3/3.3	1
295020 Inadvertent Cont. Isolation / 5 & 7			X				AK3.03 Knowledge of the reasons for the following responses as they apply to INADVERTENT CONTAINMENT ISOLATION: Drywell/containment pressure response(CFR: 41.5 / 45.6)	3.2/3.2	1
295021 Loss of Shutdown Cooling / 4					X		AA2.07 Ability to determine and/or interpret the following as they apply to LOSS OF SHUTDOWN COOLING: Reactor recirculation flow (CFR: 41.10 / 43.5 / 45.13)	2.9/3.1	1
295022 Loss of CRD Pumps / 1		X					AK2.03 Knowledge of the interrelations between LOSS OF CRD PUMPS and the following: Accumulator pressures (CFR: 41.7 / 45.8)	3.4/3.4	1
295028 High Drywell Temperature / 5			X				EK3.05 Knowledge of the reasons for the following responses as they apply to HIGH DRYWELL TEMPERATURE: Reactor SCRAM (CFR: 41.5 / 45.6)	3.6/3.7	1
295029 High Suppression Pool Water Level / 5						X	2.1.20 Ability to execute procedure steps.(CFR: 41.10 / 43.5 / 45.12)	4.3/4.2	1
295032 High Secondary Containment Area Temperature / 5					X		EA2.01 Ability to determine and/or interpret the following as they apply to HIGH SECONDARY CONTAINMENT AREA TEMPERATURE: Area temperature(CFR: 41.10 / 43.5 / 45.13)	3.8/3.8	1
295033 High Secondary Containment Area Radiation Levels / 9	X						EK1.02 Knowledge of the operational implications of the following concepts as they apply to HIGH SECONDARY CONTAINMENT AREA RADIATION LEVELS: Personnel protection (CFR: 41.8 to 41.10)	3.9/4.2	1

<div>ES-401</div> <div>BWR SRO Examination Outline</div> <div>Emergency and Abnormal Plant Evolutions - Tier 1/Group 2</div> <div>Form ES-401-1 (R8, S1)</div>									
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
295034 Secondary Containment Ventilation High Radiation / 9	X						EK1.02 Knowledge of the operational implications of the following concepts as they apply to SECONDARY CONTAINMENT VENTILATION HIGH RADIATION:†Radiation releases (CFR: 41.8 to 41.10)	3.8/4.1	1
295035 Secondary Containment High Differential Pressure / 5			X				EK3.01Knowledge of the reasons for the following responses as they apply to SECONDARY CONTAINMENT HIGH DIFFERENTIAL PRESSURE: Blow-out panel operation: Plant-Specific(CFR: 41.5 / 45.6)	2.8/3.1	1
295036 Secondary Containment High Sump/Area Water Level / 5			X				EK3.02 Knowledge of the reasons for the following responses as they apply to SECONDARY CONTAINMENT HIGH SUMP/AREA WATER LEVEL: Reactor SCRAM (CFR: 41.5 / 45.6)	2.8/2.8	1
600000 Plant Fire On Site / 8						X	2.4.25 Knowledge of fire protection procedures.(CFR: 41.10 / 45.13)	2.9/3.4	1
K/A Category Point Totals:	2	3	4	1	4	3	Group Point Total:		17

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BWR SRO Examination Outline
Plant Systems - Tier 2/Group 1

Form ES-401-1 (R8, S1)

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
201005 RGIS														0
202002 Recirculation Flow Control										X		A4.01 Ability to manually operate and/or monitor in the control room: MG sets (CFR: 41.7 / 45.5 to 45.8)	3.3/3.1	1
203000 RHR/LPCI: Injection Mode								X				A2.06 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: Emergency generator failure (CFR: 41.5 / 45.6)	3.8/3.9	1
206000 HPCI										X		A4.07 Ability to manually operate and/or monitor in the control room: Condensate storage tank level: BWR-2,3,4 (CFR: 41.7 / 45.5 to 45.8)	3.5/3.5	1
207000 Isolation (Emergency) Condenser														0
209001 LPCS									X			A3.03 Ability to monitor automatic operations of the LOW PRESSURE CORE SPRAY SYSTEM including: System pressure (CFR: 41.7 / 45.7)	3.5/3.5	1
209002 HPCS														0
211000 SLC	X											K1.09 Knowledge of the physical connections and/or cause-effect relationships between STANDBY LIQUID CONTROL SYSTEM and the following: Core spray system: Plant-Specific (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.2/3.4	1
212000 RPS								X				A2.09 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 containment/drywell pressure(CFR: 41.5 / 45.6)	4.1/4.3	1
215004 Source Range Monitor			X									K3.02 Knowledge of the effect that a loss or malfunction of the SOURCE RANGE MONITOR (SRM) SYSTEM will have on following: Reactor manual control: Plant-Specific (CFR: 41.7 / 45.4)	3.4/3.4	1
215005 APRM / LPRM											X	2.1.12 Ability to apply technical specifications for a system.(CFR: 43.2 / 43.5 / 45.3)	2.9/4.0	1

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BWR SRO Examination Outline
Plant Systems - Tier 2/Group 1

Form ES-401-1 (R8, S1)

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
216000 Nuclear Boiler Instrumentation						X						K6.01 Knowledge of the effect that a loss or malfunction of the following will have on the NUCLEAR BOILER INSTRUMENTATION: A.C. electrical distribution (CFR: 41.7 / 45.7)	3.1/3.3	1
217000 RCIC					X							K5.04 Knowledge of the operational implications of the following concepts as they apply to REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) : Testable check valve operation (CFR: 41.5 / 45.3)	2.6/2.7	1
218000 ADS		X										K2.01 Knowledge of electrical power supplies to the following: ADS logic (CFR: 41.7)	3.1/3.3	1
223001 Primary CTMT and Auxiliaries						X						K6.09 Knowledge of the effect that a loss or malfunction of the following will have on the PRIMARY CONTAINMENT SYSTEM AND AUXILIARIES: Drywell vacuum relief system (CFR: 41.7 / 45.7)	3.4/3.6	1
223002 PCIS/Nuclear Steam Supply Shutoff											X	2.1.23 Ability to perform specific system and integrated plant procedures during different modes of plant operation.(CFR: 45.2 / 45.6)	3.9/4.0	1
226001 RHR/LPCI: CTMT Spray Mode							X					A1.02 Ability to predict and/or monitor changes in parameters associated with operating the RHR/LPCI: CONTAINMENT SPRAY SYSTEM MODE controls including: Containment/drywell temperature (CFR: 41.5 / 45.5)	3.4/3.5	1
239002 SRVs						X						K6.03 Knowledge of the effect that a loss or malfunction of the following will have on the RELIEF/SAFETY VALVES : A.C. power: Plant-Specific (CFR: 41.7 / 45.7)	2.7/2.9	1
241000 Reactor/Turbine Pressure Regulator				X								K4.01 Knowledge of REACTOR/TURBINE PRESSURE REGULATING SYSTEM design feature(s) and/or interlocks which provide for the following: Reactor pressure control (CFR: 41.7)	3.8/3.8	1
259002 Reactor Water Level Control							X					A1.04 Ability to predict and/or monitor changes in parameters associated with operating the REACTOR WATER LEVEL CONTROL SYSTEM controls including: Reactor water level control controller indications (CFR: 41.5 / 45.5)	3.6/3.6	1
261000 SGTS							X					A1.01 Ability to predict and/or monitor changes in parameters associated with operating the STANDBY GAS TREATMENT SYSTEM controls including: System flow (CFR: 41.5 / 45.5)	2.9/3.1	1

ES-401		BWR SRO Examination Outline Plant Systems - Tier 2/Group 1										Form ES-401-1 (R8, S1)		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
261000 SGTS											X	2.2.12 Knowledge of surveillance procedures.(CFR: 41.10 / 45.13)	3.0/3.4	1
262001 AC Electrical Distribution										X		A4.05 Ability to manually operate and/or monitor in the control room: Voltage, current, power, and frequency on A.C. buses (CFR: 41.7 / 45.5 to 45.8)	3.3/3.3	1
264000 EDGs					X							K5.06 Knowledge of the operational implications of the following concepts as they apply to EMERGENCY GENERATORS (DIESEL/JET): Load sequencing (CFR: 41.5 / 45.3)	3.4/3.5	1
264000 EDGs					X							K5.05 Knowledge of the operational implications of the following concepts as they apply to EMERGENCY GENERATORS (DIESEL/JET): Paralleling A.C. power sources(CFR: 41.5 / 45.3)	3.4/3.4	1
290001 Secondary CTMT											X	2.3.1 Knowledge of 10 CFR: 20 and related facility radiation control requirements.(CFR: 41.12 / 43.4. 45.9 / 45.10)	2.6/3.0	1
K/A Category Point Totals:	1	1	1	1	3	3	3	2	1	3	4	Group Point Total:		23

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BWR SRO Examination Outline
Plant Systems - Tier 2/Group 2

Form ES-401-1 (R8, S1)

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
262002 UPS (AC/DC)	X											K1.06 Knowledge of the physical connections and/or cause- effect relationships between UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) and the following: Unit computer: Plant-Specific (CFR: 41.2 to 41.9 / 45.7 to 45.8)	2.6/2.7	1
263000 DC Electrical Distribution				X								K4.02 Knowledge of D.C. ELECTRICAL DISTRIBUTION design feature(s) and/or interlocks which provide for the following: Breaker interlocks, permissives, bypasses and cross ties: Plant-Specific (CFR: 41.7)	3.1/3.5	1
271000 Offgas														0
272000 Radiation Monitoring					X							K5.01 Knowledge of the operational implications of the following concepts as they apply to RADIATION MONITORING SYSTEM: Hydrogen injection operation's effect on process radiation indications: Plant-Specific(CFR: 41.7 / 45.4)	3.2/3.5	1
286000 Fire Protection						X						K6.02 Knowledge of the effect that a loss or malfunction of the following will have on the FIRE PROTECTION SYSTEM: D. C . electrical distribution (CFR: 41.7 / 45.7)	2.8/2.9	1
290003 Control Room HVAC	X											K1.05 Knowledge of the physical connections and/or cause- effect relationships between CONTROL ROOM HVAC and the following: Component cooling water systems (CFR: 41.2 to 41.9 / 45.7 to 45.8)	2.8/3.0	1
300000 Instrument Air														0
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 (CFR: 41.7 / 45.7)	2.8/2.9	1
K/A Category Point Totals:	3	1	0	1	1	3	0	1	1	2	0	Group Point Total:		13

BWR SRO Examination Outline Plant Systems - Tier 2/Group 3												Form ES-401-1 (R8, S1)		
System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
201003 Control Rod and Drive Mechanism											X	2.2.21 Knowledge of pre and post maintenance operability requirements.(CFR: 43.2)	2.3/3.5	1
215001 Traversing In-core Probe										X		A4.03 Ability to manually operate and/or monitor in the control room: Isolation valves: Mark-I&II(Not-BWR1) (CFR: 41.7 / 45.5 to 45.8)	3.0/3.1	1
233000 Fuel Pool Cooling and Cleanup														0
239001 Main and Reheat Steam														0
256000 Reactor Condensate														0
268000 Radwaste			X									K3.04 Knowledge of the effect that a loss or malfunction of the RADWASTE will have on following: Drain sumps (CFR: 41.5 / 45.3)	2.7/2.8	1
288000 Plant Ventilation														0
290002 Reactor Vessel Internals					X							K5.07 Knowledge of the operational implications of the following concepts as they apply to REACTOR VESSEL INTERNALS: †Safety limits (CFR: 41.5 / 45.3)	3.9/4.4	1
K/A Category Point Totals:	0	0	1	0	1	0	0	0	0	0	1	1	Group Point Total:	4
Plant-Specific Priorities														
System / Topic						Recommended Replacement for...						Reason		Points
Plant-Specific Priority Total (limit 10):														

Facility:		Date of Exam:		Exam Level: SRO	
Category	K/A #	Topic	Imp.	Points	
Conduct of Operations	2.1.18	Ability to make accurate / clear and concise logs / records / status boards / and reports. (CFR: 45.12 / 45.13)	2.9/3.0	1	
	2.1.31	Ability to locate control room switches / controls and indications and to determine that they are correctly reflecting the desired plant lineup.(CFR: 45.12)	4.2/3.9	1	
	2.1.19	Ability to use plant computer to obtain and evaluate parametric information on system or component status.(CFR: 45.12)	3.0/3.0	1	
	2.1.28	Knowledge of the purpose and function of major system components and controls. (CFR: 41.7)	3.2/3.3	1	
	Total			4	
Equipment Control	2.2.6	Knowledge of the process for making changes in procedures as described in the safety analysis report.(CFR: 43.3 / 45.13)	2.3/3.3	1	
	2.2.33	Knowledge of control rod programming.(CFR: 43.6)	2.5/2.9	1	
	2.2.27	Knowledge of the refueling process. (CFR 43.6/45.13)	2.6/3.5	1	
	2.2.21	Knowledge of pre and post maintenance operability requirements.(CFR: 43.2)	2.3/3.5	1	
	Total			4	
Radiation Control	2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure. (CFR: 43.4 / 45.10)	2.9/3.3	1	
	2.3.1	Knowledge of 10 CFR: 20 and related facility radiation control requirements.(CFR: 41.12 / 43.4. 45.9 / 45.10)	2.6/3.0	1	
	2.3.11	Ability to control radiation releases. (CFR: 45.9 / 45.10)	2.7/3.2	1	
	2.3.9	Knowledge of the process for performing a containment purge.(CFR: 43.4 / 45.10)	2.5/3.4	1	
	2.3.4	Knowledge of radiation exposure limits and contamination control / including permissible levels in excess of those authorized.	2.0/3.3	1	
	Total			5	
Emergency Procedures/ Plan	2.4.21	Knowledge of the parameters and logic used to assess the status of safety functions including: 1. Reactivity control 2. Core cooling and heat removal 3. Reactor coolant system integrity 4. Containment conditions 5. Radioactivity release control.(CFR: 43.5 / 45.12)	3.7/4.3	1	
	2.4.2	Knowledge of system set points / interlocks and automatic actions associated with EOP entry conditions. (CFR: 41.7 / 45.7 / 45.8)	3.9/4.1	1	
	2.4.34	Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications. (CFR: 43.5 / 45.13)	3.8/3.6	1	
	2.4.31	Knowledge of annunciators alarms and indications / and use of the response instructions. (CFR: 41.10 / 45.3)	3.3/3.4	1	
	Total			4	
Tier 3 Point Total (RO/SRO)				17	