

2003 CNS NRC Exam Outline Changes Since Initial Submittal

I. Written Examination Outline

See ES-401-10 for respective examination.

II. Administrative Outline

Added exam material document numbers to outline.

III. JPM outline

Added exam material document numbers to outline.

IV. Scenario Outline

- A. Renumbered Scenario 2 as Scenario 4 and Scenario 4 as Scenario 2. Initial Scenario 2 originally had similarities to Scenario 1 (6 candidates would see both scenarios) and Scenario 4 turned out to be a very good exercise.
- B. Scenario #1
 - 1. Change out SJAE PCV failure for Circulating Water Pump motor failure. The SJAE PCV failure was not able to be adjusted to give operators adequate time to respond and either required no action or resulted in a scram.
 - 2. SRV "E" was changed to SRV "C" to match simulator setup. No change to actions required or effect.
- C. Scenario #2 (previous #4)
 - 1. Changed the reason to swap bus duct cooling fans.
 - 2. Replaced HPCI temperature element failure with "B" Core Spray line break as the temperature elements we can fail in the simulator are not Technical Specification instruments.
 - 3. Changed event order to shift bus duct cooling fans before the instrument and

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component failures.

D. Scenario #3

Event numbers changed. No change to dynamic events or sequence.

E. Scenario #4 (previous #2)

The level transmitter failure was replaced with a Scram Discharge Volume drain valve failure due to overlap with the Audit examination. This also reduced the similarity to an event in Scenario #1 (different instrument and controls to manipulate, but same procedure and attachment).

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
	RO ONLY
	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 14570					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 13573					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 14027	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 14000						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 14051	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 14048			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 15485	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 14001		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 1744						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 17001				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 8930				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 15472		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 5333			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

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
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 1068				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 14426	X						AK1.04 Knowledge of the operational implications of the following concepts as they apply to LOSS OF MAIN CONDENSER VACUUM: Increased offgas flow (CFR: 41.8 to 41.10)	3.0/3.3	1
295003 Partial or Complete Loss of AC Pwr / 6 1066					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 14406				X			AA1.01 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 (CFR: 41.7 / 45.6)	3.3/3.4	1
295008 High Reactor Water Level / 2 10051						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 5268					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 14047					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 14014			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 16483						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 2521		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 2931		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 14003					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 3066		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

<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
295026 High Suppression Pool Water Temp. / 5									0
295027 High Containment Temperature / 5									0
295028 High Drywell Temperature / 5 14023			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 5332						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 14045	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									0
295034 Sec. Cont. Ventilation High Rad. / 9 19124	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 14019			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 3724				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

<div>ES-401</div> <div>BWR RO Examination Outline</div> <div>Emergency and Abnormal Plant Evolutions - Tier 1/Group 3</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
295021 Loss of Shutdown Cooling / 4 15755					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 5092				X			AA1.02 Ability to operate and/or monitor the following as they apply to REFUELING ACCIDENTS: Fuel pool cooling and cleanup system (CFR: 41.7 / 45.6)	2.9/3.1	1
295032 High Secondary Containment Area Temperature / 5									0
295035 Secondary Containment High Differential Pressure / 5 19123	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 14021			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 5155 Direct						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 14024 NEW										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 RCIS														0
202002 Recirculation Flow Control 19095 last exam										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 14028								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 19100										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 14032										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 14040									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 14025	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 5070					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

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
212000 RPS 1208								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
215003 IRM 19080									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 5348			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 3085								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 3285	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 14028			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 14451					X							K5.02 Knowledge of the operational implications of the following concepts as they apply to REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) : Flow Indication (CFR: 41.5/45.3)	3.1/3.1	1
218000 ADS 5608		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 14044						X						K6.04 Knowledge of the effect that a loss or malfunction of the following will have on the PRIMARY CONTAINMENT SYSTEM AND AUXILIARIES: Combustible gas mixing: Plant-Specific(CFR: 41.7 / 45.7)	2.8/2.8	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
223001 Primary CTMT and Auxiliaries 3302									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 10081											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
239002 SRVs 5425						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 15513				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 18311				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 14004							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 14033							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 5754											X	2.2.12 Knowledge of surveillance procedures.(CFR: 41.10 / 45.13)	3.0/3.4	1
264000 EDGs 1507					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 14034	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

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
K/A Category Point Totals:	3	1	2	2	3	3	2	3	3	4	2			28

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	A 1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points
201003 Control Rod and Drive Mechanism 14038						X						K6.01 Knowledge of the effect that a loss or malfunction of the following will have on the CONTROL ROD AND DRIVEMECHANISM :Control rod drive hydraulic system (CFR: 41.7 / 45.7)	3.3/3.3	1
201004 RSCS														0
201006 RWM														0
202001 Recirculation 13406								X				A2.04 Ability to (a) predict the impacts of the following on the RECIRCULATION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations:Multiple recirculation pump trip (CFR: 41.5 / 45.6)	3.7/3.8	1
204000 RWCU														0
205000 Shutdown Cooling 2816						X						K6.08 Knowledge of the effect that a loss or malfunction of the following will have on the SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE) : RHR service water: Plant-Specific(CFR: 41.7 / 45.7)	3.5/3.7	1
214000 RPIS 1238								X				A2.02 Ability to (a) predict the impacts of the following on the ROD POSITION INFORMATION SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Reactor SCRAM (CFR: 41.5 / 45.6)	3.6/3.7	1
215002 RBM 5401		X										K2.01 Knowledge of electrical power supplies to the following: RBM channels: BWR-3,4,5 (CFR: 41.7)	2.5/2.8	1
219000 RHR/LPCI: Torus/Pool Cooling Mode														0
226001 RHR/LPCI: CTMT Spray Mode 19034							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

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	A 1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points											
230000 RHR/LPCI: Torus/Pool Spray Mode 4028		X										K2.02 Knowledge of electrical power supplies to the following: Pumps (CFR: 41.7)	2.8/2.9	1											
239001 Main and Reheat Steam														0											
245000 Main Turbine Gen. and Auxiliaries 14035										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 3973				X								K4.10 Knowledge of REACTOR CONDENSATE SYSTEM design feature(s) and/or interlocks which provide for the following: Non-condensible gas removal (CFR: 41.7)	2.7/2.7	1											
262001 AC Electrical Distribution 1111 direct										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) 14036 Alt1553	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 14050				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 14041											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 14045					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 2167					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											

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	A 1	A2	A3	A4	G	K/A Topic(s)	Imp.	Points					
290001 Secondary CTMT 5730											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 14043	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 14053			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 14039						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					

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 10084										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 1290							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 14042			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 8970					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) 5127	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) 5084	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) 14679	3.0/3.0	1	
	2.1.28	Knowledge of the purpose and function of major system components and controls. (CFR: 41.7) 2127	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) 16466	3.7/3.6	1	
	2.2.27	2.2.27 Knowledge of the refueling process. (CFR: 43.6 / 45.13) 16441	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) 13407	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) 12215	2.6/3.0	1	
	2.3.2	Knowledge of facility ALARA program. (CFR: 41.12 / 43.4 / 45.9 / 45.10) 12222	2.5/2.9	1	
	2.3.11	Ability to control radiation releases. (CFR: 45.9 / 45.10) 19068	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) 5247	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) 4214	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) 12209	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 5468					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 14052						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 24	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 28					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

<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 9015					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
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 / 8 768	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 16569				X			EA1.01 Ability to operate and/or monitor the following as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: Suppression pool cooling (CFR: 41.7 / 45.6)	4.1/4.1	1
295027 High Containment Temperature / 5									0
295030 Low Suppression Pool Water Level / 5 30				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

ES-401		BWR SRO Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1						Form ES-401-1 (R8, S1)	
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	Imp.	Points
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	X						AK1.04 Knowledge of the operational implications of the following concepts as they apply to LOSS OF MAIN CONDENSER VACUUM: Increased offgas flow (CFR: 41.8 to 41.10)	3.0/3.3	1
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 32			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

<div>ES-401</div> <div>BWR SRO Examination Outline 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
295032 High Secondary Containment Area Temperature / 5 34					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									0
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 36			X				EK3.01 Knowledge 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 5668						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

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
201005 RCIS														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 4002											X	2.1.12 Ability to apply technical specifications for a system.(CFR: 43.2 / 43.5 / 45.3)	2.9/4.0	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
216000 Nuclear Boiler Instrumentation 38						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							K5.02 Knowledge of the operational implications of the following concepts as they apply to REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) : Flow Indication (CFR: 41.5 / 45.3)	3.1/3.1	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

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					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				
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 40					X							K5.04 Knowledge of the operational implications of the following concepts as they apply to EMERGENCY GENERATORS (DIESEL/JET): Governor Control (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				

[illegible]

ES-401

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
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
259001 Reactor Feedwater														0
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 46						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 48											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	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) 5760	2.3/3.3	1	
	2.2.33	Knowledge of control rod programming.(CFR: 43.6) 114	2.5/2.9	1	
	2.2.27	Knowledge of the refueling process. (CFR 43.6/45.13) 5101	2.6/3.5	1	
	2.2.21	Knowledge of pre and post maintenance operability requirements.(CFR: 43.2) 16415	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) 47	2.5/3.4	1	
	2.3.4	Knowledge of radiation exposure limits and contamination control / including permissible levels in excess of those authorized. 12218	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) 9684	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

Reactor Operator Outline		
Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	295024 G 2.4.25	2.4.25 Knowledge of fire protection procedures is not applicable to 295024 High Drywell Pressure.
1/1	295025 EA1.06	N/A to Cooper, Cooper does not have an Isolation Condenser
1/1	295031 EA1.04	N/A to Cooper, Cooper does not have HPCS
1/1	500000 EK3.03	N/A to Cooper, Cooper does not have H2O2 Recombiner
2/1	216000 K1.11	N/A to Cooper, Cooper does not have MSIV leakage control
2/1	223001 K6.05	N/A to Cooper, Cooper does not have H2 Recombiner
2/1	202002 K2.02	N/A to Cooper, Cooper does not have hydraulic power units (Knowledge of electrical power supplies to the following: Hydraulic power unit: (CFR: 41.7)) (identified after all K/As selected. No 202002 K2 \geq 2.5 applicable to CNS. Random selection resulted in insufficient K2's in Tier 2. This required random de-selection of another Tier 2 K/A to make room for another randomly selected K2. See 218000 K5.01 below.
2/1	218000 K5.01	Randomly de-selected to make room for enough K2's to complete outline. (Knowledge of the operational implications of the following concepts as they apply to AUTOMATIC DEPRESSURIZATION SYSTEM: ADS logic operation (CFR: 41.5 / 45.3)
2/2	271000 G 2.1.3	2.1.3 Knowledge of shift turnover practices is not applicable to topic 271000 Off Gas
2/2	271000 G 2.1.17	2.1.17 Ability to make accurate / clear and concise verbal reports, is not applicable to topic 271000 Offgas

Note: All K&As randomly selected that had an importance of less than 2.5 were rejected and were not included in this log.

Reactor Operator Outline		
Tier / Group	Randomly Selected K/A	Reason for Rejection
2/2	271000 G2.1.22	2.1.22 Ability to determine Mode of Operation, is not applicable to topic 271000.
2/2	271000 G2.1.13	2.1.13 Knowledge of facility requirements for controlling vital / controlled access., is not applicable to topic area 271000.
2/2	290003 K1.02	N/A for Cooper, Cooper does not have chlorine/ammonia detectors
2/2	300000 K3.03	N/A for Cooper, Cooper is a single unit facility.
2/2	256000 K4.01	N/A for Cooper, CNS does not have auto start on Condensate or Condensate Booster pumps. (Knowledge of REACTOR CONDENSATE SYSTEM design feature(s) and/or interlocks which provide for the following: Condensate and/or booster pump auto start: Plant-Specific (CFR: 41.7))
1/2 (RO) 1/1 (SRO)	295026 EA1.02	N/A for Cooper, CNS does not take any action for suppression pool spray related to suppression pool temperature. (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)) Replaced with 295026 EA1.01 on SRO outline as required to use 295026 (now an SRO-only K/A). Replaced with 295004 AA1.01 on RO outline to reduce oversampling of secondary containment.

Note: All K&As randomly selected that had an importance of less than 2.5 were rejected and were not included in this log.

Reactor Operator Outline		
Tier / Group	Randomly Selected K/A	Reason for Rejection
1/2	295033 EK1.02	Removed due to oversampling secondary containment. (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)) Replaced with 295002 EK1.04.
1/3	295032 EA1.03	Removed due to oversampling secondary containment. (Ability to operate and/or monitor the following as they apply to HIGH SECONDARY CONTAINMENT AREA TEMPERATURE: (CFR: 41.7 / 45.6)) Replaced with 295023 EA1.02
2/1	217000 K5.04	Removed due to being not applicable to CNS. CNS previously disabling testable check valves. Replaced with 217000 K5.02 Knowledge of the operational implications of the following concepts as they apply to REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) : Flow Indication (CFR: 41.5 / 45.3)
2/1	203000 A2.06	Removed due to double jeopardy with Dynamic scenario, K/A 23000 K2.02 and K/A 264000 K5.06. Replaced with 203000 A2.02 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: Pump Trips
2/1	223001 K6.09	Removed due to double jeopardy with questions 2931 and 5249. No other concept to evaluate that is not already on the exam. Replaced with 223001 K6.04 Knowledge of the effect that a loss or malfunction of the following will have on the PRIMARY CONTAINMENT SYSTEM AND AUXILIARIES: Combustible gas mixing

Note: All K&As randomly selected that had an importance of less than 2.5 were rejected and were not included in this log.

Note: All K&As randomly selected that had an importance of less than 2.5 were rejected and were not included in this log.

Senior Reactor Operator Outline		
Tier / Group	Randomly Selected K/A	Reason for Rejection
1/2	295034 EK1.01	Double Jeopardy with 295033 EK1.02
2/1	215004 K3.03	N/A for Cooper, no RCIS
1/1	295030 EA1.04	N/A for Cooper no MKIII Containment
3	2.2.4	N/A for Cooper, Cooper is a single unit facility.
3	2.2.13	SRO question needed with limited or no applicability to CFR 43
3	2.3.5	SRO question needed with limited or no applicability to CFR 43
3	2.4.24	SRO question needed with limited or no applicability to CFR 43
3	2.4.31	SRO question needed with limited or no applicability to CFR 43
2/1	264000 K5.05	Unable to write SRO-only question on “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)” Replaced with 264000 K5.04, Knowledge of the operational implications of the following concepts as they apply to EMERGENCY GENERATORS (DIESEL/JET): Governor Control (CFR: 41.5 / 45.3)

Note: All K&As randomly selected that had an importance of less than 2.5 were rejected and were not included in this log.

Facility: <u>Cooper Nuclear Station</u> Examination Level (circle one) <u>RO</u>		Date of Examination: _____ 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

Facility: <u>Cooper Nuclear Station</u>		Date of Examination: _____
Examination Level (circle one): <u>SRO</u>		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: <u>Cooper Nuclear Station</u>		Date of Examination: _____	
Exam Level (circle one): RO / SRO(U) / SRO(I)		Operating Test No.: _____	
B.1 Control Room Systems *Similar colors indicate JPMs can be performed simultaneously.			
	System / JPM Title	Type Code*	Safety Function
1-1	Respond To A Control Rod Drifting Out (SKL034-21-54) ALTERNATE PATH: Control rod continues to move out after notched in. 201002 A2.02 (CFR: 41.5 / 45.6) Imp. 3.2/3.3	A, S, N	1
1-2	Transfer Governor Valve Control from Manual to Auto with DEH in Mode IV (SKL034-21-55) 241000 A4.08 (CFR: 41.7 / 45.5 to 45.8) Imp. 3.5/3.4	S, N	3
1-3	Respond to a trip of a Reactor Recirc pump. (SKL034-21-56) ALTERNATE PATH: Flow subtraction network fails. 202001 A2.03 (CFR: 41.5 / 45.6) Imp. 3.6/3.7	A, S, N	4
1-4	Vent primary containment per 2.4PC. (SKL034-21-57) 223001 A2.07 (CFR: 41.5 / 45.6) Imp. 4.2/4.3	S, N	5
1-5	Perform a Quick Restart of RFPT. (SKL034-21-50) ALTERNATE PATH: Trip reset requires the use of overspeed trip block. SRO UPGRADE 259001 A4.02 (CFR: 41.7 / 45.5 to 45.8) Imp. 3.9/3.7	A, L, S, D	2
1-6	Transfer the 4160 G from the Diesel Generator to the Emergency Transformer. (SKL034-21-31) SRO UPGRADE 262001 A4.04 (CFR: 41.7 / 45.5 to 45.8) Imp. 3.6/3.7	S, D	6

System / JPM Title	Type Code*	Safety Function
1-7 Install EOP PTM 97-100 (Defeat automatic opening of Outboard LPCI Injection Valve on low Reactor Pressure during ATWS). (SKL034-11-01). SRO UPGRADE 216000 A1.02 (CFR: 41.5 / 45.5) Imp. 2.9*/3.1* 295037 2.1.30 (CFR: 41.7 / 45.7) Imp. 3.9/3.4	C, N	7
B.2 Facility Walk-Through		
2-1 Locally Start the Diesel Fire Pump (SKL034-10-94). ALTERNATE PATH: Starting requires the use of the alternate battery. SRO UPGRADE 286000 A2.06 (CFR: 41.5 / 45.6) Imp. 3.1/3.2	A, D	8
2-2 Conduct Manual Draining of the SDV (SKL034-10-02) SRO UPGRADE 295037 EA1.05 (CFR: 41.7 / 45.6) Imp. 3.9/4.0 295037 2.1.30 (CFR: 41.7 / 45.7) Imp. 3.9/3.4	R, D	1
2-3 Refill FPC Skimmer Surge Tank (SKL034-11-02). 233000 A2.03 (CFR: 41.5 / 45.6) Imp. 2.8/3.0	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		

Cooper Nuclear Station

2003 NRC Exam

Scenario Outlines

Cooper Nuclear Station June 2003 NRC Exam	Start "C" CBP, Loss of ESST, Steam Flow Inst Fails, Circ Water Pump Fails, 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.</p> <p>A station operator will call the control room to report smoke and sparks coming out of the connection box on "B" Circulating Water Pump motor. The crew will rapidly remove the Circ Water Pump from service. There will be no fire or need for the fire brigade.</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 Reactor Mode Switch, ARI or 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 C 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		Start "C" CBP, Loss of ESST, Steam Flow Inst Fails, Circ Water Pump Fails, 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	None	C (BOP)	"B" Circ Water Pump motor sparking leads
6	PC08	M	Suppression Pool Leak
7	Various	C (RO)	Electrical ATWS
8	Override	C (BOP)	SRV Fails to Open on Emergency Depressurization
<p>Critical Tasks:</p> <ol style="list-style-type: none"> 1. Scram prior to depressurization below 785 psig. 2. Initiate emergency depressurization before primary containment water level goes below 9.6 ft. <p>Critical Tasks are underlined in <i>bold italics</i> in the scenario.</p>			

Cooper Nuclear Station June 2003 NRC Exam	Shift Bus Duct Fans, Core Spray Line Break, Air Compressor Trip, Loss of Vacuum, 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 as the running fan was making loud noises last shift.</p> <p>After the crew completes the swap of the bus duct fans, "B" Core Spray line breaks inside the RPV. The crew will respond per annunciator procedures and Technical Specifications.</p> <p>After Technical Specifications have been assessed, 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		Shift Bus Duct Fans, Core Spray Line Break, Air Compressor Trip, Loss of Vacuum, LOOP & LOCA	
Event No.	Malf. No.	Type	Event Description
N/A	ED20	N/A	Grid Instabilities
1	N/A	N	Shift the Bus Duct Cooling Fans
2	CS03B	I (RO)	"B" Core Spray Line Break
3	IA04C	C (BOP)	Air Compressor Trip
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: <ol style="list-style-type: none"> 1. Start the Diesel Generators prior to reactor water level reaching TAF and prior to exceeding PSP. 2. Initiate Drywell sprays prior to exceeding PSP. 3. Maintain RPV water level above -25" (corrected Fuel Zone). 			

Cooper Nuclear Station June 2003 NRC Exam	Shift CRD Pumps, SW Pump Trip, Vessel Flange Leak, Loss of FW Heating, HPCI Leak, Fuel Failure, 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. The BOP operator must be the person who swaps the CRD pumps.</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 amount of fuel 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		Shift CRD Pumps, SW Pump Trip, Vessel Flange Leak, Loss of FW Heating, HPCI Leak, Fuel Failure, MSOT 2 Areas	
Event No.	Malf. No.	Type	Event Description
1	N/A	N (BOP)	Shift CRD pumps
2	SW01C	C (BOP)	SW Pump Trip
3	RR21	I (RO)	Vessel Head Inner Seal Leakage
4	various	C (RO/BOP)	Loss of Feedwater Heating
5	N/A	R	Reduce Power Due to Loss of Feedwater Heating
6	HP06	M	HPCI Steam Leak
7	CR01	C (BOP)	Fuel Failure
8	RP05	C (BOP)	Group 6 isolation failure
<p style="text-align: center;">Critical Tasks:</p> <ol style="list-style-type: none"> Scram prior to emergency depressurization. Emergency Depressurize within 10 minutes of Exceeding Maximum Safe Operating Temperature in two areas. Manually isolate reactor building release prior to reactor building vent radiation monitor exceeding 49 mrem. 			

Cooper Nuclear Station June 2003 NRC Exam	Manual Scram Test, Single Rod Scram, SDV Drain Valve Failure, TEC Pump Trip, High Main Turbine Vibration, Stop and Prevent ATWS
<p data-bbox="147 443 326 478"><u>Description:</u></p> <p data-bbox="147 520 1390 594">The plant is operating at 90% power with SLC pump 1A is out of service for corrective maintenance.</p> <p data-bbox="147 638 1463 835">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 reduce reactor power to 70% to recover the control rod.</p> <p data-bbox="147 879 1409 953">After the crew has addressed the Technical Specifications for the control rod, one of the drain valves for the South SDV fails.</p> <p data-bbox="147 997 1461 1071">After the crew responds to drain valve failure, an operating TEC pump trips requiring the crew to start the standby pump.</p> <p data-bbox="147 1115 1461 1230">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 data-bbox="147 1274 1471 1472">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 data-bbox="147 1516 1346 1589">RPV pressure control is established with SRVs and control rods are inserted using Alternate Rod Insertion methods IAW ESP 5.8.3.</p> <p data-bbox="147 1633 911 1669">The scenario ends when all control rods are inserted.</p>	

Cooper Nuclear Station June 2003 NRC Exam		Manual Scram Test, Single Rod Scram, SDV Drain Valve Failure, TEC Pump Trip, High Main Turbine Vibration, Stop and Prevent ATWS	
Event No.	Malf. No.	Type	Event Description
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	RD01A	C (RO)	South Scram Discharge Volume Drain Valve Failure
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	C (BOP)	Steam Leak
9	RP04	I (RO)	Group 1 Isolation Failure
<p>Critical Tasks:</p> <ol style="list-style-type: none"> 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. 4. Stop and prevent injection except for CRD, RCIC and boron injection prior to HCTL. <p>Critical Tasks are underlined in <i>bold italics</i> in the scenario.</p>			

Reactor Operator Outline		
Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	295024 G 2.4.25	2.4.25 Knowledge of fire protection procedures is not applicable to 295024 High Drywell Pressure.
1/1	295025 EA1.06	N/A to Cooper, Cooper does not have an Isolation Condenser
1/1	295031 EA1.04	N/A to Cooper, Cooper does not have HPCS
1/1	500000 EK3.03	N/A to Cooper, Cooper does not have H2O2 Recombiner
2/1	216000 K1.11	N/A to Cooper, Cooper does not have MSIV leakage control
2/1	223001 K6.05	N/A to Cooper, Cooper does not have H2 Recombiner
2/1	202002 K2.02	N/A to Cooper, Cooper does not have hydraulic power units (Knowledge of electrical power supplies to the following: Hydraulic power unit: (CFR: 41.7)) (identified after all K/As selected. No 202002 K2 \geq 2.5 applicable to CNS. Random selection resulted in insufficient K2's in Tier 2. This required random de-selection of another Tier 2 K/A to make room for another randomly selected K2. See 218000 K5.01 below.
2/1	218000 K5.01	Randomly de-selected to make room for enough K2's to complete outline. (Knowledge of the operational implications of the following concepts as they apply to AUTOMATIC DEPRESSURIZATION SYSTEM : ADS logic operation (CFR: 41.5 / 45.3)
2/2	271000 G 2.1.3	2.1.3 Knowledge of shift turnover practices is not applicable to topic 271000 Off Gas
2/2	271000 G 2.1.17	2.1.17 Ability to make accurate / clear and concise verbal reports, is not applicable to topic 271000 Offgas
2/2	271000 G2.1.22	2.1.22 Ability to determine Mode of Operation, is not applicable to topic 271000.

Note: All K&As randomly selected that had an importance of less than 2.5 were rejected and were not included in this log.

Reactor Operator Outline		
Tier / Group	Randomly Selected K/A	Reason for Rejection
2/2	271000 G2.1.13	2.1.13 Knowledge of facility requirements for controlling vital / controlled access., is not applicable to topic area 271000.
2/2	290003 K1.02	N/A for Cooper, Cooper does not have chlorine/ammonia detectors
2/2	300000 K3.03	N/A for Cooper, Cooper is a single unit facility.
2/2	256000 K4.01	N/A for Cooper, CNS does not have auto start on Condensate or Condensate Booster pumps. (Knowledge of REACTOR CONDENSATE SYSTEM design feature(s) and/or interlocks which provide for the following: Condensate and/or booster pump auto start: Plant-Specific (CFR: 41.7))
1/2 (RO) 1/1 (SRO)	295026 EA1.02	N/A for Cooper, CNS does not take any action for suppression pool spray related to suppression pool temperature. (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)) Replaced with 295026 EA1.01 on SRO outline as required to use 295026 (now an SRO-only K/A). Replaced with 295004 AA1.01 on RO outline to reduce oversampling of secondary containment.
1/2	295033 EK1.02	Removed due to oversampling secondary containment. (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)) Replaced with 295002 EK1.04.

Note: All K&As randomly selected that had an importance of less than 2.5 were rejected and were not included in this log.

Reactor Operator Outline		
Tier / Group	Randomly Selected K/A	Reason for Rejection
1/3	295032 EA1.03	Removed due to oversampling secondary containment. (Ability to operate and/or monitor the following as they apply to HIGH SECONDARY CONTAINMENT AREA TEMPERATURE: (CFR: 41.7 / 45.6)) Replaced with 295023 EA1.02

Note: All K&As randomly selected that had an importance of less than 2.5 were rejected and were not included in this log.

Senior Reactor Operator Outline		
Tier / Group	Randomly Selected K/A	Reason for Rejection
1/2	295034 EK1.01	Double Jeopardy with 295033 EK1.02
2/1	215004 K3.03	N/A for Cooper, no RCIS
1/1	295030 EA1.04	N/A for Cooper no MKIII Containment
3	2.2.4	N/A for Cooper, Cooper is a single unit facility.
3	2.2.13	SRO question needed with limited or no applicability to CFR 43
3	2.3.5	SRO question needed with limited or no applicability to CFR 43
3	2.4.24	SRO question needed with limited or no applicability to CFR 43
3	2.4.31	SRO question needed with limited or no applicability to CFR 43

Note: All K&As randomly selected that had an importance of less than 2.5 were rejected and were not included in this log.

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 SKL034-21-52 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
	Equipment Control	Open Reference When is a coupling check of control rods required? SKL034-50-21 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. SKL034-20-04 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). SKL034-50-22 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 SKL034-50-23 2.4.39 Knowledge of the RO's responsibilities in emergency plan implementation.(CFR: 45.11) Imp 3.3/3.1