

Facility: Columbia Generating Station Examination Level (circle one): RO / SRO		Date of examination: November 2006 Operating test number:
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	D	SRO is given a turnover sheet that states a RX S/U is in progress and then parameters that indicate the reactor is critical. He is cued to determine his next action. To successfully complete the JPM he has to realize the Reactor is Critical prior to the ECP and take actions per PPM 3.1.2 which states to: stop control rod withdrawal, the CRS should direct the CRO to drive control rods in the reverse order until all rods are fully inserted; POC approval is required to proceed with further rod withdrawal; Consider the applicability of T.S. 3.1.2. He will fill out an attachment indicating what his next action will be and the basis for that action.
Conduct of Operations	N	SRO is cued that during an inspection of the Active Fire System in the Control Room, the 18 Halon systems storage tanks were found to be 85% of full charge pressure. He is asked to determine if any compensatory measures are required and if they are, what are they. He will refer to PPM 1.3.10B and determine operability. Per PPM 1.3.10B he is to issue an FPSI permit for the inoperable system. Once this is identified he is handed a blank FPSI permit to fill out.
Equipment Control	N	The SRO is given a turnover sheet that indicates a Division 1 instrument is OOS. He is then handed a tagout for a Div 2 piece of equipment. The tagout erroneously pulls a fuse for a non-related Div 2 component that is the opposite division of the Div 1 component already OOS. If approved and this fuse is removed, a full scram would occur. He has to determine if he would sign tagout or not and explain why/why not.
Radiation Control	D, S	The SRO is given data and is required to enter the data into the QEDPS and print out the form. Then, based on the results of the QEDPS, he is to classify the event.
Emergency Plan	N, S	After Scenario #2, Classify the event and fill out a CNF. The scenario should be classified as a Site Area Emergency per EAL 2.2.S.1 (ATWS with power GT 5%).
Note: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.		
*Type Codes & Criteria (C)ontrol room (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1; randomly selected) (S)imulator		

**BWR RO/SRO EXAM OUTLINE ES-401-3 (Tier 3)**

**PLANT-WIDE GENERIC RESPONSIBILITIES TIER 3**

BWR - RO

Category	K/A	TOPICS	RO		SRO	
			IMP	#	IMP	#
1. Conduct of Operations	2.1.22	Ability to determine the Mode of Operation	2.8	1		
	2.1.7	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretations	3.7	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	4.2	1		
	Subtotal				3	

**BWR RO/SRO EXAM OUTLINE ES-401-3 (Tier 3)**

**PLANT-WIDE GENERIC RESPONSIBILITIES TIER 3**

BWR - RO

Category	K/A	TOPICS	RO		SRO	
			IMP	#	IMP	#
2. Equipment	2.2.26	Knowledge of refueling administrative requirements	2.5	1		
	2.2.28	Knowledge of new and spent fuel movement procedures	2.6	1		
Control	2.2.12	Knowledge of surveillance procedures	3.0	1		
	Subtotal			3		

**BWR RO/SRO EXAM OUTLINE ES-401-3 (Tier 3)**

**PLANT-WIDE GENERIC RESPONSIBILITIES TIER 3**

BWR - RO

Category	K/A	TOPICS	RO		SRO	
			IMP	#	IMP	#
3. Radiation  Control	2.3.4	Knowledge of the radiation exposure limits and contamination control / including permissible levels in excess of those authorized	2.5	1		
	2.3.1	Knowledge of 10 CFR 20 and related facility radiation control requirements	2.6	1		
Subtotal				2		

**BWR RO/SRO EXAM OUTLINE ES-401-3 (Tier 3)**

**PLANT-WIDE GENERIC RESPONSIBILITIES TIER 3**

BWR - RO

Category	K/A	TOPICS	RO		SRO	
			IMP	#	IMP	#
4. Emergency Procedures Plan	2.4.11	Knowledge of abnormal condition procedures	3.4	1		
	2.4.29	Knowledge of the Emergency Plan	2.6	1		
	Subtotal			2		
Group point totals: 10/7				10		

EMERGENCY & ABNORMAL PLANT EVOLUTIONS - TIER 1 GROUP I

BWR - RO

Target:

Actual:

E / APE # - NAME / SAFETY FUNCTION	K1	K2	K3	A1	A2	G	K/A TOPICS	IMP	#
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4					X		AA2.06 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Nuclear Boiler Instrumentation	3.2	1
295003 Partial or Complete Loss of AC / 6				X			AA1.03 Ability to operate and/or monitor the following as they apply to PARTIAL OR COMPLETE LOSS OF A.C. POWER: Systems necessary to assure safe plant shutdown	4.4	1
295004 Partial or Total Loss of DC PWR / 6					X		AA2.04 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF D.C. POWER: System lineups	3.2	1
295005 Main Turbine Generator Trip / 3	X						AK1.01 Knowledge of the operational implications of the following concepts as they apply to MAIN TURBINE GENERATOR TRIP: Pressure effects on reactor power	4.0	1
295005 Main Turbine Generator Trip / 3		X					AK2.03 Knowledge of the interrelations between MAIN TURBINE GENERATOR TRIP and the following: Recirculation system	3.2	1
295006 SCRAM / 1			X				AK3.04 Knowledge of the reasons for the following responses as they apply to SCRAM: Reactor water level setpoint Setdown: Plant specific	3.1	1

295016 Control Room Abandonment / 7				X			AA1.06 Ability to operate and/or monitor the following as they apply to CONTROL ROOM ABANDONMENT: Reactor water level	4.0	1
295018 Partial or Complete Loss of CCW / 8						X	2.1.28 Knowledge of the purpose and function of major system components and controls.	3.3	1
295019 Partial or Complete Loss of Inst. Air / 8					X		AA2.02 (AK2.03 RFW) Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR: Status of safety related instrument air system loads (see AK2.1– AK2-19)	3.6	1
295021 Loss of Shutdown Cooling / 4	X						AK1.03 Knowledge of the operational implications of the following concepts as they apply to LOSS OF SHUTDOWN COOLING: Adequate core cooling	3.9	1
295023 Refueling Accident / 8				X			AA1.04 Ability to operate and/or monitor the following as they apply to REFUELING ACCIDENTS: Radiation Monitoring equipment	3.4	1
295024 High Drywell Pressure / 5		X					EK2.12 Knowledge of the interrelations between HIGH DRYWELL PRESSURE and the following: Suppression pool cooling	3.5	1
295025 High Reactor Pressure / 3		X					EK2.04 Knowledge of the interrelations between HIGH REACTOR PRESSURE and the following: ARI/RPT/ATWS: Plant specific	3.9	1
295026 Suppression Pool High Water Temperature / 5			X				EK3.01 Knowledge of the reasons for the following responses as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: Emergency/normal depressurization	3.8	1
295027 High Containment Temperature / 5							N/A MARK III CONTAINMENT ONLY		

295028 High Drywell Temperature / 5		X					EK2.03 Knowledge of the interrelations between HIGH DRYWELL TEMPERATURE and the following: Reactor Water level indication	3.6	1
295030 Low Suppression Pool Water Level / 5	X						EK1.01 Knowledge of the operational implications of the following concepts as they apply to LOW SUPPRESSION POOL WATER LEVEL: Steam condensation	4.1	1
295031 Reactor Low Water Level / 2						X	2.4.24 Knowledge of loss of cooling water procedures	3.3	1
295037 SCRAM Condition Present and Power Above APRM Downscale or Unknown / 1				X			EA1.04 Ability to operate and/or monitor the following as they apply to SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN: SBLC	4.5	1
295038 High Off-site Release Rate / 9					X		EA2.04 Ability to determine and/or interpret the following as they apply to HIGH OFF-SITE RELEASE RATE: Source of off-site release	4.1	1
600000 Plant Fire On Site / 8	X						AK1.02 Knowledge of the operation applications of the following concepts as they apply to Plant Fire On Site: Fire fighting	2.9	1
Category Point Totals:	4	4	2	4	4	2	Group Point Totals:		20/7

**Knowledge and Ability Record Form**  
 ref: NUREG - 1021 rev 9  
**BWR RO/SRO EXAM OUTLINE ES-401-1**

EMERGENCY & ABNORMAL PLANT EVOLUTIONS - TIER 1 GROUP II

BWR - RO

Target:

Actual:

E / APE # - NAME / SAFETY FUNCTION	K1	K2	K3	A1	A2	G	K/A TOPICS	IMP	#
295002 Loss of Main Condenser Vacuum / 3									
295007 High Reactor Pressure / 3			X				AK3.04 Knowledge of the reasons for the following responses as they apply to HIGH REACTOR PRESSURE: Safety/relief valve operation: Plant specific	4.0	1
295008 High Reactor Water Level / 2					X		AA2.05 Ability to determine and/or interpret the following as they apply to HIGH REACTOR WATER LEVEL: Swell	2.9	1
295009 Low Reactor Water Level / 2						X	2.1.32 Ability to explain and apply system limits and precautions	3.4	1
295010 High Drywell Pressure / 5									
295011 High Containment Temperature / 5							N/A MARK III CONTAINMENT ONLY		
295012 High Drywell Temperature / 5									
295013 High Suppression Pool Temperature / 5				X			AA1.02 Ability to operate and/or monitor the following as they apply to HIGH SUPPRESSION POOL TEMPERATURE: Systems that add heat to the suppression pool	3.6	1
295014 Inadvertent Reactivity Addition / 1		X					AK2.06 Knowledge of the interrelationships between INADVERTENT REACTIVITY ADDITION and the following: Moderator Temperature	3.5	1
295015 Incomplete SCRAM / 1									
295017 High Off-site Release Rate / 9									

295020 Inadvertent Containment Isolation / 5 & 7									
295022 Loss of CRD Pumps / 1									
295029 High Suppression Pool Water Level / 5									
295032 High Secondary Containment Area Temperature / 5									
295033 High Secondary Containment Area Radiation Levels / 9									
295034 Secondary Containment Ventilation High Radiation / 9				X			EA1.02 Ability to operate and/or monitor the following as they apply to SECONDARY CONTAINMENT VENTILATION HIGH RADIATION: Process Radiation monitoring system	3.9	1
295035 Secondary Containment High Differential Pressure / 5									
295036 Secondary Containment High Sump/Area Water Level / 5					X		EA2.03 Ability to determine and/or interpret the following as they apply to SECONDARY CONTAINMENT HIGH SUMP/AREA WATER LEVEL: Cause of the high water level	3.4	1
500000 High Containment Hydrogen Concentration / 5									
Category Point Totals:	0	1	1	2	2	1	Group Point Totals:		7/3

**Knowledge and Ability Record Form**  
 ref: NUREG - 1021 rev 9  
**BWR RO/SRO EXAM OUTLINE ES-401-1**

PLANT SYSTEMS - TIER 2 GROUP I

BWR - RO/SRO

Target:

Actual:

SYSTEM #/NAME	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A TOPICS	IMP	#
203000 RHR/LPCI: Injection Mode			X									K3.03 Knowledge of the effect that a loss or malfunction of the RHR/LPCI: INJECTION MODE will have on following: Automatic depressurization logic	4.2	1
205000 Shutdown Cooling							X					A1.05 Ability to predict and/or monitor changes in parameters associated with operating the SHUTDOWN COOLING SYSTEM/MODE controls including: Reactor water level	3.4	1
206000 HPCI												N/A AT CGS		
207000 Iso (Emerg) Cond												N/A AT CGS		
209001 LPCS	X											K1.09 Knowledge of the physical connections and/or cause- effect relationships between LOW PRESSURE CORE SPRAY SYSTEM and the following: Nuclear boiler instrumentation	3.2	1

209002 HPCS							X				A2.12 Ability to (a) predict the impacts of the following on the HIGH PRESSURE CORE SPRAY SYSTEM (HPCS); and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: High suppression pool level	3.3	1
209002 HPCS						X					A1.03 Ability to predict and/or monitor changes in parameters associated with operating the HIGH PRESSURE CORE SPRAY SYSTEM (HPCS) controls including: Reactor water level	3.7	1
211000 SLC									X		A4.06 Ability to manually operate and/or monitor in the control room: RWCU system isolation	3.9	1
211000 SLC						X					A1.04 Ability to predict and/or monitor changes in parameters associated with operating the STANDBY LIQUID CONTROL SYSTEM controls including: Valve operations	3.6	1

212000 RPS								X				A2.19 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: Partial system activation (Half-SCRAM)	3.8	1
215003 IRM										X		A4.03 Ability to manually operate and/or monitor in the control room: IRM range switches	3.6	1
215004 SRM	X											K1.03 Knowledge of the physical connections and/or cause- effect relationships between SOURCE RANGE MONITOR (SRM) SYSTEM and the following: Rod control and information system: Plant specific	3.0	1
215005 APRM/LPRM		X										K2.02 Knowledge of electrical power supplies to the following: APRM channels	2.6	1
217000 RCIC				X								K4.07 Knowledge of REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) design feature(s) and/or interlocks which provide for the following: Alternate supplies of water	3.6	1

217000 RCIC									X			A3.01 Ability to monitor automatic operations of the REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) including: Valve operation	3.5	1
218000 ADS						X						K6.04 Knowledge of the effect that a loss or malfunction of the following will have on the AUTOMATIC DEPRESSURIZATION SYSTEM: Air supply to ADS valves: Plant specific	3.6	1
223002 PCIS/ Nuclear Steam Supply Shutoff									X			A2.06 Ability to (a) predict the impacts of the following on the PCIS/NSSSS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Containment instrumentation failures	3.0	1
239002 SRVs				X								K4.05 Knowledge of RELIEF/SAFETY VALVES design feature(s) and/or interlocks which provide for the following: Allows for SRV operation from more than one location: Plant specific	3.6	1

**BWR RO/SRO EXAM OUTLINE ES-401-1**

259002 Reactor Water Level Control				X							K5.03 Knowledge of the operational implications of the following concepts as they apply to REACTOR WATER LEVEL CONTROL SYSTEM: Water level measurement	3.2	1
261000 SGTS			X								K3.02 Knowledge of the effect that a loss or malfunction of the STANDBY GAS TREATMENT SYSTEM will have on following: Off-site release rate	3.6	1
261000 SGTS					X						K6.01 Knowledge of the effect that a loss or malfunction of the following will have on the STANDBY GAS TREATMENT SYSTEM: A. C. Electrical distribution	2.9	1
262001 AC Elec Dist				X							K5.02 Knowledge of the operational implications of the following concepts as they apply to A. C. ELECTRICAL DISTRIBUTION: Breaker control	2.6	1
262002 UPS (AC/DC)				X							K4.01 Knowledge of UNINTERRUPTIBLE POWER SUPPLY (A. C./D. C.) design feature(s) and/or interlocks which provide for the following: Transfer from preferred power to alternate power supplies	3.1	1

**BWR RO/SRO EXAM OUTLINE ES-401-1**

263000 DC Elec Dist							X					A1.01 Ability to predict and / or monitor changes in parameters associated with operating the D.C. ELECTRICAL DISTRIBUTION controls including: Battery charging/discharging rate	2.5	1
264000 EDGs									X			A3.06 Ability to monitor automatic operations of the EMERGENCY GENERATORS (DIESEL/JET) including: Cooling water system operation	3.1	1
264000 EDGs			X									K3.01 Knowledge of the effect that a loss or malfunction of the EMERGENCY GENERATORS (DIESEL/JET) will have on following: Emergency core cooling systems	4.2	1
300000 Instrument Air	X											K1.04 Knowledge of the connections and/or cause effect relationships between INSTRUMENT AIR SYSTEM and the following: Cooling water to compressor	2.8	1
400000 Component Cooling Water											X	2.1.24 Ability to obtain and interpret station electrical and mechanical drawings	2.8	1
Category Point Totals:	3	1	3	3	2	2	4	3	2	2	1	Group Point Total:		26/5

**Knowledge and Ability Record Form**  
 ref: NUREG - 1021 rev 9  
**BWR RO/SRO EXAM OUTLINE ES-401-1**

PLANT SYSTEMS - TIER 2 GROUP II

BWR - RO

Target:

Actual:

SYSTEM #/NAME	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A TOPICS	IMP	#
201001 CRD Hydraulic									X			A3.10 Ability to monitor automatic operations of the CONTROL ROD DRIVE HYDRAULIC SYSTEM including: Lights and Alarms	3.0	1
201002 RMCS				X								K4.04 Knowledge of REACTOR MANUAL CONTROL SYSTEM design feature(s) and/or interlocks which provide for the following: Single notch rod withdrawal and insertion	3.3	1
201003 CRD Mechanism														
201004 RSCS														
201005 RCIS												N/A AT CGS		
201006 RWM														
202001 Recirculation		X										K2.01 Knowledge of electrical power supplies to the following: Recirculation Pumps Plant specific	3.2	1

202002 Recirc Flow Control								X					A2.01 Ability to (a) predict the impacts of the following on the RECIRCULATION FLOW CONTROL SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Recirculation Pump Trip	3.4	1
204000 RWCU															
214000 RPIS															
215001 TIP															
215002 RBM															
216000 Nuclear Boiler Inst						X							K5.07 Knowledge of the operational implications of the following concepts as they apply to NUCLEAR BOILER INSTRUMENTATION: Elevated temperature effects on level indication	3.6	1
219000 RHR/LPCI: Pool Cooling Mode															
223001 Pri Containment and Aux															
226001 RHR/LPCI: CTMT Spray Mode															
230000 RHR/LPCI: Pool Spray Mode															

233000 FPC/Cleanup										X	2.1.30 Ability to locate and operate components / including local controls	3.9	1
234000 Fuel Handling Equip													
239001 Main and Reheat Steam								X			A2.08 Ability to (a) predict the impacts of the following on the MAIN AND REHEAT STEAM SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Low condenser vacuum	3.6	1
239003 MSLC													
241000 Reactor/Turbine Pressure Regulator	X										K1.28 Knowledge of the physical connections and/or cause- effect relationships between REACTOR/TURBINE PRESSURE REGULATING SYSTEM and the following: Reactor startup	3.2	1
245000 Main Turbine Generator/Aux			X								K3.03 Knowledge of the effect that a loss or malfunction of the MAIN TURBINE GENERATOR AND AUXILIARY SYSTEMS will have on following: reactor power	3.9	1
256000 Reactor Condensate													

259001 Reactor Feedwater						X						K6.06 Knowledge of the effect that a loss or malfunction of the following will have on the REACTOR FEEDWATER SYSTEM: Plant service water	2.7	1
268000 Radwaste														
271000 Offgas							X					A1.15 Ability to predict and/or monitor changes in parameters associated with operating the OFFGAS SYSTEM controls including: Steam supply pressures	2.7	1
272000 Radiation Monitoring														
286000 Fire Protection														
288000 Plant Ventilation														
290001 Secondary Containment														
290002 Reactor Vessel Int														
290003 Control Room HVAC	X											K1.03 Knowledge of the physical connections and/or cause- effect relationships between CONTROL ROOM HVAC and the following: Remote air intakes: Plant Specific	2.8	1
Category Point Totals:	2	1	1	1	1	1	1	2	1	0	1	Group Point Total:		12/3

**BWR RO/SRO EXAM OUTLINE ES-401-1**

Facility: Columbia Generating Station		Date of Exam: November 2006																
Tier	Group	RO Category Points												SRO Only Points				
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	Total	A2	G*	Total		
1. Emergency and Abnormal Plant Evolutions	1	4	4	2	N/A			4	4	N/A		2	20	5	2	7		
	2	0	1	1				2	2			1	7	2	1	3		
	Tier Totals	4	5	3				6	6			3	27	7	3	10		
2. Plant Systems	1	3	1	3	3	2	2	4	3	2	2	1	26	3	2	5		
	2	2	1	1	1	1	1	1	2	1	0	1	12	1	2	3		
	Tier Totals	5	2	4	4	3	3	5	5	3	2	2	38	4	4	8		
3. Generic Knowledge and Abilities Categories					1		2		3		4		10	1	2	3	4	7
					3		3		2		2			1	2	2	2	

1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO only outlines (i.e. except for one category in Tier 3 of the SRO only outline, the "Tier Totals" in each K/A category shall not be less than two.
2. The point 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 + or - 1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO only exam must total 25 points.
3. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems that are not included on the outline should be added. Refer to ES-401, Attachment 2 for guidance regarding the elimination of inappropriate K/A statements.
4. Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for a system or evolution.
5. Absent a plant specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO only portions, respectively.
6. Select SRO topics for Tiers 1 and 2 from the shaded system and K/A categories.
7. \*The Generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system.
8. On the following page, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above. Use duplicate pages for RO and SRO only exams.
9. For Tier 3, select topics from Section 2 of the K/A Catalog, and enter the K/A number, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

Tier/Group	Randomly Selected K/A	Reason for Rejection
<b>RO WRITTEN EXAM</b>		
1 / 1	295018; 2.1.15	KA has a value of less than a 2.5 for RO
1 / 1	295031; 2.4.28	KA has a value of less than a 2.5 for RO
1 / 2	295009; 2.1.26	KA has a value of less than a 2.5 for RO
2 / 2	259001; K2.01	CGS does not have Motor Driven RFW pumps
2 / 2	286000; A4.06	Randomly deleted this to select a K2 Category as sample had only 1 K2 question at the time. 202001 K2.01 was subsequently selected
1/1	295012 AA1.03	Could not write a discerning question. AA1.04 randomly selected in its place
1/2	295017 AK2.12	Duplicate knowledge to CGS Q#8/exam Q#59 (295038 EA2.04). 295014 AK2.06 randomly selected in its place
1/1	295018 2.1.20	KA 2.1.20 was deleted during NRC development of the question. Deleted KA documented on question template. KA 2.1.28 selected in its place
1/1	295030 EK1.03	KA EK1.03 was deleted during NRC development of the question. Deleted KA documented on question template. KA EK1.01 selected in its place
1/1	295023 AA1.03	Could not write a discerning question. AA1.04 randomly selected in its place
2/1	295002 K5.09	KA K5.09 was deleted during NRC development of the question. Deleted KA documented on question template. KA K5.03 selected in its place
<b>SRO WRITTEN EXAM</b>		
1/1	295006 AA2.06	Could not write an SRO only question. 295028 EA2.03 randomly selected in its place
1/2	295033 2.4.47	Could not write an SRO Only question. 295029 EA2.01 randomly selected in its place
2/1	215004 A2.02	Could not write an SRO only question. 212000 A2.03 randomly selected in its place

**BWR RO/SRO EXAM OUTLINE ES-401-3 (Tier 3)**

**PLANT-WIDE GENERIC RESPONSIBILITIES TIER 3**

BWR - SRO

Category	K/A	TOPICS	RO		SRO	
			IMP	#	IMP	#
1. Conduct of Operations	2.1.4	Knowledge of shift staffing requirements			3.4	1
	Subtotal					1

**BWR RO/SRO EXAM OUTLINE ES-401-3 (Tier 3)**

**PLANT-WIDE GENERIC RESPONSIBILITIES TIER 3**

BWR - SRO

Category	K/A	TOPICS	RO		SRO	
			IMP	#	IMP	#
2. Equipment Control	2.2.29	Knowledge of SRO fuel handling responsibilities			3.8	1
	2.2.11	Knowledge of the process for controlling temporary changes			3.4	1
	Subtotal					2

**BWR RO/SRO EXAM OUTLINE ES-401-3 (Tier 3)**

**PLANT-WIDE GENERIC RESPONSIBILITIES TIER 3**

BWR - SRO

Category:	K/A	TOPICS	RO		SRO	
			IMP	#	IMP	#
3. Radiation Control	2.3.2	Knowledge of facility ALARA program			2.9	1
	2.3.6	Knowledge of the requirements for reviewing and approving release permits			3.1	1
	Subtotal					2

**BWR RO/SRO EXAM OUTLINE ES-401-3 (Tier 3)**

**PLANT-WIDE GENERIC RESPONSIBILITIES TIER 3**

BWR - SRO

Category	K/A	TOPICS	RO		SRO	
			IMP	#	IMP	#
4. Emergency Procedures Plan	2.4.30	Knowledge of which events related to system operation/status should be reported to outside agencies			3.6	1
	2.4.22	Knowledge of the bases for prioritizing safety functions during abnormal/emergency conditions			4.0	1
	Subtotal					2
Group point totals: 10 / 7						7

EMERGENCY & ABNORMAL PLANT EVOLUTIONS - TIER 1 GROUP I

BWR - SRO

Target:

Actual:

E / APE # - NAME / SAFETY FUNCTION	K1	K2	K3	A1	A2	G	K/A TOPICS	IMP	#
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4					X		AA2.01 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Power/Flow map	3.8	1
295003 Partial or Complete Loss of AC / 6									
295004 Partial or Total Loss of DC PWR / 6					X		AA2.04 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF D.C. POWER: System lineups	3.3	1
295005 Main Turbine Generator Trip / 3									
295006 SCRAM / 1									
295016 Control Room Abandonment / 7									
295018 Partial or Complete Loss of CCW / 8									
295019 Partial or Complete Loss of Inst. Air / 8									
295021 Loss of Shutdown Cooling / 4					X		AA2.06 Ability to determine and/or interpret the following as they apply to LOSS OF SHUTDOWN COOLING: Reactor pressure	3.3	1
295023 Refueling Accident / 8									
295024 High Drywell Pressure / 5					X		EA2.04 Ability to determine and/or interpret the following as they apply to HIGH DRYWELL PRESSURE: Suppression Chamber pressure: Plant specific	3.9	1

295025 High Reactor Pressure / 3									
295026 Suppression Pool High Water Temperature / 5									
295027 High Containment Temperature / 5							N/A MARK III CONTAINMENT ONLY		
295028 High Drywell Temperature / 5					X		EA2.03 Ability to determine and/or interpret the following as they apply to HIGH DRYWELL TEMPERATURE: Reactor water level	3.9	1
295030 Low Suppression Pool Water Level / 5									
295031 Reactor Low Water Level / 2									
295037 SCRAM Condition Present and Power Above APRM Downscale or Unknown / 1						X	2.4.6 Knowledge of symptom based EOP mitigation strategies	4.0	1
295038 High Off-site Release Rate / 9						X	2.4.44 Knowledge of emergency plan protective action recommendations	4.0	1
600000 Plant Fire On Site / 8									
Category Point Totals:					5	2	Group Point Totals: 20 / 7		7

**BWR RO/SRO EXAM OUTLINE ES-401-1**

EMERGENCY & ABNORMAL PLANT EVOLUTIONS - TIER 1 GROUP II

BWR - SRO

Target:

Actual:

E / APE # - NAME / SAFETY FUNCTION	K1	K2	K3	A1	A2	G	K/A TOPICS	IMP	#
295002 Loss of Main Condenser Vacuum / 3									
295007 High Reactor Pressure / 3									
295008 High Reactor Water Level / 2									
295009 Low Reactor Water Level / 2									
295010 High Drywell Pressure / 5									
295011 High Containment Temperature / 5							N/A MARK III CONTAINMENT ONLY		
295012 High Drywell Temperature / 5						X	2.1.25 Ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data	3.1	1
295013 High Suppression Pool Temperature/ 5									
295014 Inadvertent Reactivity Addition / 1					X		AA2.05 Ability to determine and/or interpret the following as they apply to INADVERTENT REACTIVITY ADDITION: Violation of Safety Limits	4.6	1
295015 Incomplete SCRAM / 1									
295017 High Off-site Release Rate / 9									
295020 Inadvertent Containment Isolation/5&7									
295022 Loss of CRD Pumps / 1									

295029 High Suppression Pool Water Level / 5					X		EA2.01 Ability to determine and/or interpret the following as they apply to HIGH SUPPRESSION POOL WATER LEVEL: Suppression Pool Water Level	3.9	1
295032 High Secondary Containment Area Temperature / 5									
295033 High Secondary Containment Area Radiation Levels / 9									
295034 Secondary Containment Ventilation High Radiation / 9									
295035 Secondary Containment High Differential Pressure / 5									
295036 Secondary Containment High Sump/Area Water Level / 5									
500000 High Containment Hydrogen Concentration / 5									
Category Point Totals:					2	1	Group Point Totals: 7 / 3		3

PLANT SYSTEMS - TIER 2 GROUP I

BWR - SRO

Target:

Actual:

SYSTEM #/NAME	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A TOPICS	IMP	#
203000 RHR/LPCI: Injection Mode														
205000 Shutdown Cooling														
206000 HPCI												N/A AT CGS		
207000 Iso (Emerg) Cond												N/A AT CGS		
209001 LPCS														
209002 HPCS								X				A2.11 Ability to (a) predict the impacts of the following on the HIGH PRESSURE CORE SPRAY SYSTEM (HPCS); and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Low Suppression pool level	3.5	1
211000 SLC														

212000 RPS								X				A2.03 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: Surveillance Testing	3.5	
215003 IRM														
215004 SRM														1
215005 APRM/LPRM														
217000 RCIC											X	2.1.20 Ability to execute procedural steps	4.2	1
218000 ADS														
223002 PCIS/ Nuclear Steam Supply Shutoff														
239002 SRVs								X				A2.03 Ability to (a) predict the impacts of the following on the RELIEF/SAFETY VALVES; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Stuck open relief valve	4.2	1
259002 Reactor Water Level Control														



PLANT SYSTEMS - TIER 2 GROUP II

BWR - SRO

Target:

Actual:

SYSTEM #/NAME	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A TOPICS	IMP	#
201001 CRD Hydraulic														
201002 RMCS														
201003 CRD Mechanism														
201004 RSCS														
201005 RCIS												N/A AT CGS		
201006 RWM														
202001 Recirculation								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 trips	3.8	1
202002 Recirc Flow Control														
204000 RWCU														
214000 RPIS														
215001 TIP														
215002 RBM											X	2.1.12 Ability to apply technical specification for a system	4.0	1



286000 Fire Protection														
288000 Plant Ventilation														
290001 Secondary Containment														
290002 Reactor Vessel Int														
290003 Control Room HVAC														
Category Point Totals:							1			2	Group Point Total: 12 / 3			3

Facility: Columbia Generating Station		Date of examination: November 2006	
Exam level (circle one): RO / SRO-I / SRO-U		Operating Test No:	
Control Room Systems (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)			
JPM #	System / JPM Title	Type Code*	Safety Function
#1	Remove FW Heater 1A, 1B, and 1C From Service	N, S	2 R / SRO-I
#2	Restore Power to RPS-A From Alternate Power Supply (ESF)	N, S	7 R / SRO-I
#3	Transfer SL-21 From SL-11 to SM-2	N, S	6 R / SRO-I / SRO-U
#4	Manually Initiate Containment Isolation – TIP fails to Isolate (ESF)	A, D, L, E, S	5 R
#5	Lower Reactor Pressure using DEH	L, N, S	3 R / SRO-I / SRO-U
#6	Manually Initiate RCIC, RCIC-V-46 Fails to Auto Open	A, D, S	4 R / SRO-I
#7	RB Ventilation Fails; Start Standby Gas Treatment (ESF)	A, N, S	9 R / SRO-I
#8	Start HPCS Service Water Pump after it fails to Auto start	A, N, S	8 R / SRO-I / SRO-U
In-Plant Systems (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)			
#9	Insert Control Rods by Venting Scram Air Header	E, D, R	1 R / SRO-I / SRO-U

Facility: Columbia Generating Station		Date of examination: November 2006	
Exam level (circle one): RO / SRO-I / SRO-U		Operating Test No:	
Control Room Systems (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)			
JPM #	System / JPM Title	Type Code*	Safety Function
#10	Start DG-2 During Control Room Evacuation (ESF)	A, E, M, R	6 R / SRO-I
#11	Respond to CR HVAC High Rad Levels in One Intake – Pull Fuse (ESF)	A, E, D, R	9 R / SRO-I / SRO-U
All control room (and in-plant) systems must be different and serve different safety functions; in-plant systems and safety functions may overlap those tested in the control room.			

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

Actual Count:

Alternate Path = 6 / 4 / 2

Control Room

Direct From Bank = 4 / 3 / 2

Emergency or Abnormal In-Plant = 3 / 3 / 2

Low Power = 2 / 1 / 1

New or Modified = 6 / 6 / 3

Previous 2 exams = 0 / 0 / 0

RCA = 3 / 3 / 2

Simulator

Facility: Columbia Generating Station Examination Level (circle one): <b>RO</b> / SRO		Date of examination: November 2006 Operating test number:
Administrative Topic (see Note)	Type Code*	Describe activity to be performed
Conduct of Operations	D	The RO is given a turnover sheet that states a RX S/U is in progress and then parameters that indicate the reactor is critical. He has to realize the Reactor is Critical or will be critical prior to the ECP and take actions per PPM 3.1.2 which states to: stop control rod withdrawal and notify the CRS. He will fill out an attachment indicating what his next action will be and the basis for that action.
Conduct of Operations	M	The RO is given that a startup is in progress and plant data showing current APRM indicated Power and Bypass Valve Positions and told to complete step Q31 of PPM 3.1.2 and inform the CRS of the results. When done he will check the block on the attachment indicating APRM readings are GT power readings extrapolated from BPV position.
Equipment Control	N	The RO is given a section of OSP-INST-H101 that has 3 out of spec reading entered and not identified as out of spec readings. Candidate is told to verify readings and to submit the surveillance to the CRS for review. He should find the 3 out of spec readings and circle them.
Radiation Control	N	The RO is given a tagout that requires entry into a contaminated area of the plant to hang. His directions are to sign onto a specific RWP to perform the task. He is to determine if the tagout can be hung. The tagout has no discrepancies. When the RWP is reviewed it is discovered that the RWP does not allow entry into contaminated zones of the plant. The candidate will indicate that the task can not be performed.
Emergency Plan		
Note: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when all 5 are required.		
*Type Codes & Criteria (C)ontrol room (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1; randomly selected) (S)imulator		