

Facility: Columbia Generating Station		Date of examination:
Examination level: <b>SRO</b>		Operating test number:
Administrative Topic/Subject Description		Describe the method of evaluation: 1. ONE admin JPM, OR 2. TWO Administrative questions
A.1	Security	1. 2.1.27 2.8/2.9 – Effect of the loss of IN-4 on Security. 2. 2.1.13 2.1/2.9 – Reportability of unauthorized access to the protected area
	2 questions Plant Parameter Verification JPM	1. JPM – 2.1.7 3.7/4.4 – Given OSP-RRC-D701, use the procedure and panel indications to do a manual determination of operability of the A Loop Jet Pumps.
A.2	Use of EWDs  JPM	1. JPM – 2.1.24 2.8/3.1 – Use EWDs to explain the start and trip circuits for ROA-FN-1A.
A.3	Radiation Exposure Limits  JPM	1. JPM – 2.3.4 2.5/3.1 – Complete all required paperwork for an Increased Exposure Request.
A.4	Emergency Action Levels and Classifications  JPM	1. JPM – 2.4.41 2.3/4.1 – Given conditions, make correct classification and complete the CNF Form.

**BWR RO EXAM OUTLINE ES-401-2****COUNT MATRIX**

Summarizing Counts by K/A Group  
for  
BWR - Reactor Operator

	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	SG	Total
E/APE # - T1 Gp 1	3	2	3				3	2			0	13
E/APE # - T1 Gp 2	3	3	4				4	3			2	19
E/APE # - T1 Gp 3	1	1	2				0	0			0	4
Tier Totals	7	6	9				7	5			2	36
Plant Systems / T2 Gp 1	3	2	3	2	3	3	3	3	2	2	2	28
Plant Systems / T2 Gp 2	2	2	2	2	2	2	2	1	2	2	0	19
Plant Systems / T2 Gp 3	0	0	1	1	0	1	1	0	0	0	0	4
Tier Totals	5	4	6	6	5	5	6	4	4	4	2	51
Generic K/As / T3	CAT 1 - 4		CAT 2 - 3		CAT 3 - 3		CAT 4 - 3					13
Model Total												100

**BWR RO EXAM OUTLINE ES-401-2****EMERGENCY & ABNORMAL PLANT EVOLUTIONS - TIER 1 GROUP I**

BWR - Reactor Operator Target: 13% Actual: 13%

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
1	<b>295005 / Main Turbine Generator Trip / 3</b>							X					AA1.01 – Recirculation System: Plant Specific <b>COLUMBIA-IPE</b>	3.1/3.3	1
2	<b>295006 / Scram / 1</b>							X					AA1.04 – Recirculation System	3.1/3.2	1
3	<b>295007 / High Reactor Pressure / 3</b>		X										AK2.05 – Shutdown Cooling: Plant Specific	2.9/3.1	1
4	295007 / High Reactor Pressure / 3		X										AK2.01 – Reactor/turbine pressure regulating system	3.5/3.7	1
5	<b>295014 / Inadvertent Reactivity Addition / 1</b>	X											AK1.05 – Fuel Thermal Limits	3.7/4.2	1
6	<b>295015 / Incomplete Scram / 1</b>								X				AA2.01 – Reactor Power <b>COLUMBIA-IPE</b>	4.1/4.3	1
7	<b>295015 / Incomplete Scram / 1</b>	X											AK1.02 – Cooldown effects on reactor power <b>COLUMBIA-IPE</b>	3.9/4.1	1
8	<b>295024 / High Drywell Pressure / 5</b>							X					EA1.16 – Containment/drywell vacuum breakers	3.4/3.4	1
9	<b>295025 / High Reactor Pressure / 3</b>	X											EK1.06 – Pressure effects on reactor water level	3.5/3.6	1
10	<b>295025 / High Reactor Pressure / 3</b>			X									Ek3.01 – Safety/relief valve opening <b>COLUMBIA-IPE</b>	4.2/4.3	1

**BWR RO EXAM OUTLINE ES-401-2**

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POIN
11	<b>295031 / Reactor Low Water Level / 2</b>			X									Ek3.01 – Automatic Depressurization System actuation <b>COLUMBIA-IPE</b>	3.9/4.2	1
12	<b>500000 / High Containment Hydrogen Concentration / 5</b>			X									EK3.04 – Emergency Depressurization	3.1/3.9	1
13	<b>500000 / High Containment Hydrogen Concentration / 5</b>								X				EA2.04 – Combustible limits for wetwell	3.3/3.3	1
Category Point Totals:		3	2	3				3	2			0	Group Point Totals: 13		13

**BWR RO EXAM OUTLINE ES-401-2****EMERGENCY & ABNORMAL PLANT EVOLUTIONS - TIER 1 GROUP II**

BWR - Reactor Operator Target: 19% Actual: 19%

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
1	<b>295003 / Partial or Complete Loss of AC Power / 6</b>							X					AA1.02 – Emergency Generators <b>COLUMBIA-IPE</b>	4.2/4.3	1
2	<b>295003 / Partial or Complete Loss of AC Power / 6</b>			X									AK3.03 – Load shedding <b>COLUMBIA-IPE</b>	3.5/3.6	1
3	<b>295004 / Partial or complete loss of DC power / 6</b>	X											AK1.04 – Effect of battery discharge rate on capacity <b>COLUMBIA-IPE</b>	2.8/2.9	1
4	295008 / High Reactor Water Level / 2												AA2.02 – Steam flow /Feed flow mismatch	3.4/3.4	1
5	295008 / High Reactor Water Level / 2											X	2.1.8 – Ability to coordinate personnel activities outside the control room	3.8/3.6	1
6	<b>295012 / High Drywell Temperature / 5</b>		X										AK2.02 – Drywell cooling	3.6/3.7	1
7	<b>295013 / High Suppression Pool Temperature / 5</b>	X											AK1.04 – Complete Condensation	2.9/3.2	1
8	<b>295013 / High Suppression Pool Temperature / 5</b>		X										AK2.01 – Suppression Pool Cooling	3.6/3.7	1

**BWR RO EXAM OUTLINE ES-401-2**

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POIN
9	<b>295016 / Control Room Abandonment / 7</b>			X									AK3.01 – Reactor Scram	4.1/4.2	1
10	<b>295016 / Control Room Abandonment / 7</b>							X					AA1.06 – Reactor Water Level	4.0/4.1	1
11	<b>295018 / Partial or complete loss of Component Cooling Water / 8</b>	X											AK1.01 – Effects on component/systems operations	3.5/3.6	1
12	<b>295018 / Partial or complete loss of Component Cooling Water / 8</b>							X					AA1.02 – System loads	3.3/3.4	1
13	<b>295022 / Loss of CRD Pumps / 1</b>							X					AA1.04 – Reactor Waster Cleanup System: Plant Specific	2.5/2.6	1
14	295022 / Loss of CRD Pumps / 1								X				AA2.01 – Accumulator pressure	3.5/3.6	1
15	<b>295028 / High Drywell Temperature / 5</b>			X									EK3.04 – Increase Drywell Cooling	3.6/3.8	1
16	295029 / High Suppression Pool Water Level / 5											X	2.1.12 – Knowledge of operator responsibilities during all modes of plant operation	3.0/4.0	1
17	<b>295030 / Low Suppression Pool Water Level / 5</b>		X										EK2.05 – HPCS: Plant Specific	3.8/3.9	1
18	295030 / Low Suppression Pool Water Level / 5								X				EA2.04 – Drywell/Suppression Chamber differential pressure: Mark- I&II	3.5/3.7	1

Facility: Columbia Generating Station

**Knowledge and Ability Record Form** Date: February 2001

ref: NUREG - 1021 rev 8

**BWR RO EXAM OUTLINE ES-401-2**

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
19	2985034 / Secondary Containment Ventilation High Radiation			X									EK3.02 – Starting SBTG/FRVS: Plant Specific	4.1/4.1	1
Category Point Totals:		3	3	4				4	3			2	Group point totals: 19		19

**BWR RO EXAM OUTLINE ES-401-2****PLANT SYSTEMS - TIER 1 GROUP III**

BWR - Reactor Operator Target: 4% Actual: 4%

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POIN
1	<b>295021 / Loss of Shutdown Cooling / 4</b>			X									AK3.03 – Increasing drywell cooling	2.9/2.9	1
2	295023 / Refueling Accidents / 8		X										AK2.03 – Radiation monitoring equipment	3.4/3.6	1
3	<b>295035 / Sec Cont High Differential Press / 5</b>	X											EK1.02 – Radiation release	3.7/4.2	1
4	<b>295036 / Sec Cont High Sump/Area Water Level / 5</b>			X									EK3.03 – Isolating affected systems <b>COLUMBIA-IPE</b>	3.5/3.6	1
Category Point Totals:		1	1	2				0	0			0	Group Point Totals:		4

**BWR RO EXAM OUTLINE ES-401-2****PLANT SYSTEMS - TIER 2 GROUP I**

BWR - Reactor Operator Target: 28% Actual: 28%

	SYSTEM #/ NAME	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POI
1	203000 / RHR/LPCI: Injection Mode (Plant specific) / 2				X								K4.02 – Prevention of piping overpressurization	3.2/3.4	1
2	203000 / RHR/LPCI: Injection Mode (Plant specific) / 2						X						K6.08 – ECCS room cooling	2.9/3.1	1
3	<b>209001 / Low Pressure Core Spray</b>	X											K1.12 – Eccs room coolers	2.9/3.1	1
4	<b>209001 / Low Pressure Core Spray</b>					X							K5.04 – Heat removal (transfer) mechanisms	2.8/2.9	1
5	<b>211000 / Standby Liquid Control</b>	X											K1.09 – Core spray system: Plant specific	3.2/3.4	1
6	<b>212000 / Reactor Protection System</b>		X										K2.02 – Analog trip system logic cabinets	2.7/2.9	1
7	212000 / Reactor Protection System		X										K2.01 – RPS motor generator sets	3.2/3.3	1
8	<b>215003 / Intermediate Range Monitor</b>							X					A1.05 – SCRAM and rod block setpoints	3.9/3.9	1
9	215003 / Intermediate Range Monitor										X		A4.03 – IRM range switches	3.6/3.4	1
10	215004 / Source Range Monitor (SRM) System / 7			X									K3.04 – Reactor power and indication	3.7/3.7	1
	SYSTEM #/	K	K	K	K	K	K	A	A	A	A	G	K/A TOPICS	IMP	POI

**BWR RO EXAM OUTLINE ES-401-2**

	NAME/SAFETY FUNCTION	1	2	3	4	5	6	1	2	3	4				
11	215004 / Source Range Monitor (SRM) System / 7									X			A3.03 – RPS status	3.6/3.5	1
12	<b>215005 / Average Power Range Monitor/Local Power Range Monitor / 7</b>				X								K4.06 – Effects of detector aging on LPRM/APRM readings	2.6/2.8	1
13	215005 / Average Power Range Monitor/Local Power Range Monitor / 7										X		A4.06 – Verification of proper function/operability	3.6/3.8	1
14	<b>216000 / Nuclear Boiler Instrumentation / 7</b>			X									K3.11 – MSIV Leakage control system: Plant Specific	2.8/2.8	1
15	216000 / Nuclear Boiler Instrumentation / 7					X							K5.08 – Steam flow effect on reactor water level	3.1/3.2	1
16	<b>217000 / Reactor Core Isolation Cooling</b>						X						K6.01 – Electrical power	3.4/3.5	1
17	<b>218000 / Automatic Depressurization Sys.</b>					X							K5.01 – ADS logic operation	3.8/3.8	1
18	223001 / Primary Containment System and Auxiliaries / 5								X				A2.10 – High Drywell temperature	3.6/3.8	1
19	<b>223002 / Pri Cont Isolation Sys/ Nuclear Steam Supply Shutoff</b>			x									K3.10 – Reactor water cleanup	2.9/3.1	1
20	<b>239002 / Relief/Safety Valves</b>								X				A2.04 – ADS actuation	4.1/4.2	1

**BWR RO EXAM OUTLINE ES-401-2**

	SYSTEM #/ NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POI
21	239002 / Relief/Safety Valves						X						K6.03 – AC power: Plant Specific	2.7/2.9	1
22	241000 / Reactor/Turbine Pressure Regulating System / 3	X											K1.19 – Turbine acceleration	2.6/2.6	1
23	259001 / Reactor Feedwater System / 2											X	2.4.12 – Knowledge of general operating crew responsibilities during emergency operations.	3.4/3.9	1
24	259002 / Reactor Water Level Control System / 2											X	2.2.11 – Knowledge of the process for controlling temporary changes	2.5/3.4	1
25	<b>261000 / Standby Gas Treatment</b>							X					A1.03 – Offsite release levels	3.2/3.8	1
26	<b>261000 / Standby Gas Treatment</b>									X			A3.02 – Fan start	3.2/3.1	1
27	<b>264000 / Emergency generators (Diesel/Jet)</b>							X					A1.04 0 Crank case temperature and pressure	2.6/2.7	1
28	264000 / Emergency generators (Diesel/Jet)								X				A2.10 - LOCA	3.9/4.2	1
Category Point Totals:		3	2	3	2	3	3	3	3	2	2	2	Group Point Total: 28		2

**BWR RO EXAM OUTLINE ES-401-2****PLANT SYSTEMS - TIER 2 GROUP II**

BWR - Reactor Operator Target: 19% Actual: 19%

	SYSTEM #/ NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
1	201004 / Rod Sequence Control System (Plant Specific)					X							K5.02 – Sequence and groups: BWR-4, 5	3.1/3.3	1
2	201003 / Control Rod and Drive Mechanism										A		A4.02 – CRD mechanism position: Plant Specific	3.5/3.5	1
3	<b>215002 / Rod Block Monitor</b>		X										K2.01 – RBM channels: BWR 3, 4, and 5	2.5/2.8	1
4	<b>219000 / RHR/LPCI: Torus/Suppression Pool Cooling Mode</b>	X											K1.01 – Suppression Pool	3.8/3.9	1
5	<b>219000 / RHR/LPCI: Torus/Suppression Pool Cooling Mode</b>							X					A1.01 – Suppression Pool Temperature	4.0/4.0	1
6	226001 / RHR/LPCI: Containment Spray System Mode		X										K2.02 – Pumps	2.9/2.9	1
7	226001 / RHR/LPCI: Containment Spray System Mode			X									K3.03 – Containment/Drywell/Suppression Chamber components, continued operation with elevated pressure and/or temperature and/or level	2.9/3.2	1
8	<b>230000 / RHR/LPCI: Torus/Suppression Pool Spray Mode</b>				X								K4.03 – Unintentional reduction in vessel injection flow during accident conditions	3.5/3.6	1

**BWR RO EXAM OUTLINE ES-401-2**

	SYSTEM #/ NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
9	<b>239001 / Main and Reheat Steam</b>						X						K6.02 – Plant air systems	3.2/3.2	1
10	262001 / AC Electrical Distribution										X		A4.01 – All breakers and disconnects (including available switch yard): Plant specific	3.4/3.4	1
11	<b>262002 / Uninterruptable Power Supply (AC/DC)</b>			x									K3.15 – Main turbine operation: Plant specific	2.6/2.7	1
12	262002 / Uninterruptable Power Supply (AC/DC)									X			A3.01 – Transfer from preferred to alternate source	2.8/3.1	1
13	<b>263000 / DC Electrical Distribution</b>									X			A3.01 – Meters, dials, recorders, alarms, and indicating lights	3.2/3.3	1
14	263000 / DC Electrical Distribution				X								K4.02 – Breaker interlocks, permissives, bypasses and cross ties: Plant Specific	3.1/3.5	1
15	272000 / Radiation Monitoring System						X						K6.01 – Reactor protection system	3.0/3.2	1
16	290003 / Control Room HVAC							X					A1.04 – Control room pressure	2.5/2.8	1
17	<b>300000 / Instrument Air System</b>	X											K1.05 – Main Steam isolation valve air	3.1/3.2	1
18	<b>300000 / Instrument Air System</b>					X							K5.01 – Air Compressors	2.5/2.5	1
19	<b>400000 / Component Cooling Water System</b>								X				A2.03 – High/Low CCW temperature	2.9/3.0	1
Category Point Totals:		2	2	2	2	2	2	2	2	2	1	0	Group point totals: 19		19

**BWR RO EXAM OUTLINE ES-401-2**

**PLANT SYSTEMS - TIER 2 GROUP III**

BWR - Reactor Operator Target: 4% Actual: 4%

	SYSTEM #/ NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
1	<b>233000 / Fuel Pool Cooling and Cleanup</b>							X					A1.01 – Surge tank level	2.6/2.9	1
2	<b>234000 / Fuel Handling Equipment</b>						X						K6.04 – Refueling platform air system: Plant specific	2.9/3.7	1
3	<b>288000 / Plant Ventilation</b>				X								K4.02 – Secondary containment isolation	3.7/3.8	1
4	290002 / Reactor Vessel Internals			X									K3.07 – Nuclear boiler instrumentation	3.1/3.1	1
	Category Point Totals:	0	0	1	1	0	1	1	0	0	0	0	Group point totals:		4

**BWR RO EXAM OUTLINE ES-401-2****PLANT-WIDE GENERIC RESPONSIBILITIES TIER 3**

BWR - Reactor Operator Target: 13% Actual: 13%

	Category	K/A	TOPICS	IMP	POINT
1	Conduct of Operations	<b>2.1.11</b>	Knowledge of less than one hour technical specification action statements for systems	3.0/3.8	1
2		<b>2.1.3</b>	Knowledge of shift turnover practices	3.0/3.4	1
3		2.1.18	Ability to make accurate, clear and concise logs, records, status boards, and reports	2.9/3.0	1
4		2.1.10	Knowledge of conditions and limitations in the facility license	2.7/3.9	1
5	Equipment Control	<b>2.2.22</b>	Knowledge of limiting conditions for operations and safety limits	3.4/4.1	1
6		2.2.34	Knowledge of the process for determining the internal and external effects on core reactivity	2.8/3.2	1
7		2.2.26	Knowledge of refueling administrative requirements	2.5/3.7	1
8	Radiation Control	2.3.11	Ability to control radiation releases	2.7/3.2	1
9		<b>2.3.1</b>	Knowledge of 10CFR20 and related facility radiation control requirements	2.6/3.0	1
10		2.3.2	Knowledge of the facility ALARA Program	2.5/2.9	1
11	Emergency Proc. Plan	<b>2.4.17</b>	Knowledge of EOP terms and conditions	3.5/3.6	1
12		<b>2.4.24</b>	Knowledge of loss of cooling water procedures	3.3/3.7	1
13		<b>2.4.11</b>	Knowledge of abnormal condition procedures	3.4/3.6	1
			Group point totals: 13		13

**Knowledge and Ability Requirements** Effective Date: Feb. 22, 2001  
 ref: NUREG - 1021 rev 8  
**BWR SRO EXAM OUTLINE ES-401-1**

**COUNT MATRIX**

Summarizing Counts by K/A Group  
 for  
 BWR - Senior Reactor Operator

	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	Total
E/APE # - T1 Gp 1	4	3	5				4	7			3	26
E/APE # - T1 Gp 2	3	1	3				3	6			1	17
Tier Totals	7	4	8				7	13			4	43
Plant Systems / T2 Gp 1	2	1	2	3	2	1	2	2	1	2	5	23
Plant Systems / T2 Gp 2	2	1	1	1	1	1	2	1	1	0	2	13
Plant Systems / T2 Gp 3	0	0	0	1	0	1	1	0	0	0	1	4
Tier Totals	4	2	3	5	3	3	5	3	2	2	8	40
Generic K/As / T3	CAT 1 - 7    CAT 2 - 3    CAT 3 - 3    CAT 4 - 4											17
Model Total												100

**BWR SRO EXAM OUTLINE ES-401-1****EMERGENCY & ABNORMAL PLANT EVOLUTIONS - TIER 1 GROUP I**

BWR - Senior Reactor Operator Target: 26% Actual: 26%

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP RO/SRO	POINT
1	<b>295003 / Partial or Complete Loss of AC Power / 6</b>			X									AK3.03 – Load shedding <b>COLUMBIA-IPE</b>	3.5/3.6	1
2	<b>295003 / Partial or Complete Loss of AC Power / 6</b>							X					AA1.02 – Emergency Generators <b>COLUMBIA-IPE</b>	4.2/4.3	1
3	<b>295006 / Scram / 1</b>							X					AA1.04 – Recirculation System	3.1/3.2	1
4	295006 / Scram / 1								X				AA2.02 – Control Rod Position <b>10CFR55.43.5</b>	4.3/4.4	1
5	<b>295007 / High Reactor Pressure / 3</b>		X										AK2.05 – Shutdown Cooling: Plant Specific	2.9/3.1	1
6	295007 / High Reactor Pressure / 3											X	2.4.1 – Knowledge of EOP Entry Conditions and immediate action steps. <b>10CFR55.43.5 COLUMBIA-IPE</b>	4.3/4.6	1
7	295010 / High Drywell Pressure / 5											X	2.4.10 – Knowledge of Annunciator Response Procedures <b>10CFR55.43.5</b>	3.0/3.1	1
8	<b>295013 / High Suppression Pool Temperature / 5</b>	X											AK1.04 – Complete Condensation	2.9/3.2	1
9	<b>295013 / High Suppression Pool Temperature / 5</b>		X										AK2.01 – Suppression Pool Cooling	3.6/3.7	1

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

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POIN
10	295014 / Inadvertent Reactivity Addition / 1								X				AA2.02 – Reactor Period <b>10CFR55.43.5</b>	3.9/3.9	1
11	<b>295014 / Inadvertent Reactivity Addition / 1</b>	X											AK1.05 – Fuel Thermal Limits <b>COLUMBIA-IPE</b>	3.7/4.2	1
12	<b>295015 / Incomplete Scram / 1</b>								X				AA2.01 – Reactor Power	4.1/4.3	1
13	<b>295015 / Incomplete Scram / 1</b>	X											AK1.02 – Cooldown effects on reactor power <b>COLUMBIA-IPE</b>	3.9/4.1	1
14	<b>295016 / Control Room Abandonment / 7</b>			X									AK3.01 – Reactor Scram	4.1/4.2	1
15	<b>295016 / Control Room Abandonment / 7</b>							X					AA1.06 – Reactor Water Level	4.0/4.1	1
16	295023 / Refueling Accidents / 8											X	2.1.11 – Knowledge of less than 1 hour Tech Spec action statements for systems <b>10CFR55.43.2</b>	3.0/3.8	1
17	<b>295024 / High Drywell Pressure / 5</b>							X					EA1.16 – Containment/drywell vacuum breakers	3.4/3.4	1
18	<b>295025 / High Reactor Pressure / 3</b>	X											EK1.06 – Pressure effects on reactor water level	3.5/3.6	1
19	<b>295025 / High Reactor Pressure / 3</b>			X									Ek3.01 – Safety/relief valve opening <b>COLUMBIA-IPE</b>	4.2/4.3	1
20	<b>295030 / Low Suppression Pool Water Level / 5</b>		X										EK2.05 – HPCS: Plant Specific	3.8/3.9	1

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

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
21	<b>295031 / Reactor Low Water Level / 2</b>			X									Ek3.01 – Automatic Depressurization System actuation <b>COLUMBIA-IPE</b>	3.9/4.2	1
22	295031 / Reactor Low Water Level / 2								X				EA2.01 – Reactor Water Level <b>10CFR55.43.5</b>	4.6/4.6	1
23	295037 / SCRAM Condition present and reactor power above APRM downscale or unknown / 1								X				EA2.06 – Reactor Pressure <b>10CFR55.43.5 COLUMBIA-IPE</b>	4.0/4.1	1
24	295038 / High Offsite Release Rate / 9								X				EA2.04 – Source of offsite release <b>10CFR55.43.5</b>	4.1/4.5	1
25	<b>500000 / High Containment Hydrogen Concentration / 5</b>			X									EK3.04 – Emergency Depressurization	3.1/3.9	1
26	<b>500000 / High Containment Hydrogen Concentration / 5</b>								X				EA2.04 – Combustible limits for wetwell	3.3/3.3	1
Category Point Totals:		4	3	5				4	7			3	Group Point Totals: 26		26

**BWR SRO EXAM OUTLINE ES-401-1****EMERGENCY & ABNORMAL PLANT EVOLUTIONS - TIER 1 GROUP II**

BWR - Senior Reactor Operator Target: 17% Actual: 17%

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
1	<b>295004 / Partial or complete loss of DC power / 6</b>	X											AK1.04 – Effect of battery discharge rate on capacity <b>COLUMBIA-IPE</b>	2.8/2.9	1
2	295005 / Main Turbine Generator Trip / 3								X				AA2.01 – Turbine Speed <b>10CFR55.43.5</b>	2.6/2.7	1
3	<b>295005 / Main Turbine Generator Trip / 3</b>							X					AA1.01 – Recirculation System: Plant Specific <b>COLUMBIA-IPE</b>	3.1/3.3	1
4	295002 / Loss of Main Condenser Vacuum / 3								X				AA2.04 – Offgas System flow – <b>10CFR55.43.5</b>	2.8/2.9	
5	295012 / High Drywell Temperature / 5											X	2.1.12 – Ability to apply Tech Specs for a system <b>10CFR55.43.2/43.5</b>	2.9/4.0	1
6	<b>295012 / High Drywell Temperature / 5</b>		X										AK2.02 – Drywell cooling	3.6/3.7	1
7	<b>295018 / Partial or complete loss of Component Cooling Water / 8</b>	X											AK1.01 – Effects on component/systems operations	3.5/3.6	1
8	<b>295018 / Partial or complete loss of Component Cooling Water / 8</b>							X					AA1.02 – System loads	3.3/3.4	1

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

	E/APE # - NAME/SAFETY FUNCTION	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
9	<b>295021 / Loss of Shutdown Cooling / 4</b>			X									AK3.03 – Increasing drywell cooling	2.9/2.9	1
10	<b>295022 / Loss of CRD Pumps / 1</b>							X					AA1.04 – Reactor Waster Cleanup System: Plant Specific	2.5/2.6	1
11	<b>295028 / High Drywell Temperature / 5</b>			X									EK3.04 – Increase Drywell Cooling	3.6/3.8	1
12	295032 / High Sec Cont Area Temp / 5								X				EA2.01 – Area temperature <b>10CFR55.43.5</b>	3.8/3.8	1
13	295033 / High Sec Cont Area Rad Levels / 9								X				EA2.02 – Equipment operability <b>10CFR55.43.5</b>	3.1/3.2	1
14	295034 / Sec Cont Ventilation High Rad / 9								X				EA2.01 – Ventilation radiation levels <b>10CFR55.43.5</b>	3.8/4.2	1
15	<b>295035 / Sec Cont High Differential Press / 5</b>	X											EK1.02 – Radiation release	3.7/4.2	1
16	<b>295036 / Sec Cont High Sump/Area Water Level / 5</b>			X									EK3.03 – Isolating affected systems <b>COLUMBIA-IPE</b>	3.5/3.6	1
17	295036 / Sec Cont High Sump/Area Water Level / 5								X				EA2.03 – Cause of the high water level <b>10CFR55.43.5</b>	3.4/3.8	1
Category Point Totals:		3	1	3				3	6			1	Group point totals: 17		17

**BWR SRO EXAM OUTLINE ES-401-1****PLANT SYSTEMS - TIER 2 GROUP I**

BWR - Senior Reactor Operator Target: 23% Actual: 23%

	SYSTEM #/NAME	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POI
1	<b>209001 / Low Pressure Core Spray</b>	X											K1.12 – Eccs room coolers	2.9/3.1	1
2	<b>209001 / Low Pressure Core Spray</b>					X							K5.04 – Heat removal (transfer) mechanisms	2.8/2.9	1
3	209002 / High Pressure Core Spray										X		A4.01 – HPCS pump: BWR 5 and 6	3.7/3.7	1
4	218000 / Automatic Depressurization Sys											X	2.4.1 – Knowledge of EOP entry conditions and immediate action steps <b>10CFR55.43.5</b>	4.3/4.6	1
5	<b>211000 / Standby Liquid Control</b>	X											K1.09 – Core spray system: Plant specific	3.2/3.4	1
6	<b>212000 / Reactor Protection System</b>		X										K2.02 – Analog trip system logic cabinets	2.7/2.9	1
7	<b>215005 / Average Power Range Monitor/Local Power Range Monitor / 7</b>				X								K4.06 – Effects of detector aging on LPRM/APRM readings	2.6/2.8	1
8	<b>216000 / Nuclear Boiler Instrumentation / 7</b>			X									K3.11 – MSIV Leakage control system: Plant Specific	2.8/2.8	1
9	216000 / Nuclear Boiler Instrumentation / 7											X	2.4.38 – Ability to take actions called for in the Emergency Plan including supporting or acting as the Emergency Director	2.2/4.0	1

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

	SYSTEM #/NAME	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POI
10	<b>217000 / Reactor Core Isolation Cooling</b>						X						K6.01 – Electrical power	3.4/3.5	:
11	<b>218000 / Automatic Depressurization Sys.</b>					X							K5.01 – ADS logic operation	3.8/3.8	:
12	<b>223002 / Pri Cont Isolation Sys/ Nuclear Steam Supply Shutoff</b>			x									K3.10 – Reactor water cleanup	2.9/3.1	:
13	223002 / Pri Cont Isolation Sys/ Nuclear Steam Supply Shutoff											X	2.2.22 – Knowledge of limiting condition for operations and safety limits <b>10CFR55.43.2</b>	2.3/3.5	:
14	226001 / RHR/LPCI: Containment Spray Mode								X				A2.17 – High containment/drywell temperature	3.2/3.2	:
15	262001 / AC Electrical Distribution											X	2.4.35 – Knowledge of local operator actions during emergency operations including geography and system implications <b>10CFR55.43.5</b>	3.3/3.5	:
16	<b>239002 / Relief/Safety Valves</b>								X				A2.04 – ADS actuation	4.1/4.2	:
17	241000 / Reactor/Turbine Pressure Regulating Sys				X								K4.19 – Steam Bypass valve control	3.6/3.7	:
18	259002 / Reactor Water Level Control										X		A4.07 – All individual component controllers when transferring from automatic to manual mode	3.8/3.6	:
19	<b>261000 / Standby Gas Treatment</b>							X					A1.03 – Offsite release levels	3.2/3.8	:
20	<b>261000 / Standby Gas Treatment</b>									X			A3.02 – Fan start	3.2/3.1	:

	SYSTEM #/NAME	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POI
21	262001 / AC Electrical Distribution				X								K4.01 – Bus lockouts	3.0/3.4	1
22	<b>264000 / Emergency generators (Diesel/Jet)</b>							X					A1.04 0 Crank case temperature and pressure	2.6/2.7	1
23	290001 / Secondary Containment											X	2.4.11 – Knowledge of abnormal condition procedures <b>10CFR55.43.5 COLUMBIA-IPE</b>	3.4/3.6	1
Category Point Totals:		2	1	2	3	2	1	2	2	1	2	5	Group Point Total:		2

**BWR SRO EXAM OUTLINE ES-401-1****PLANT SYSTEMS - TIER 2 GROUP II**

BWR - Senior Reactor Operator Target: 13% Actual: 13%

	SYSTEM #/NAME	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
1	<b>215002 / Rod Block Monitor</b>		X										K2.01 – RBM channels: BWR 3, 4, and 5	2.5/2.8	1
2	<b>215003 / Intermediate Range Monitor</b>							X					A1.05 – SCRAM and rod block setpoints	3.9/3.9	1
3	<b>219000 / RHR/LPCI: Torus/Suppression Pool Cooling Mode</b>	X											K1.01 – Suppression Pool	3.8/3.9	1
4	<b>219000 / RHR/LPCI: Torus/Suppression Pool Cooling Mode</b>							X					A1.01 – Suppression Pool Temperature	4.0/4.0	1
5	<b>230000 / RHR/LPCI: Torus/Suppression Pool Spray Mode</b>				X								K4.03 – Unintentional reduction in vessel injection flow during accident conditions	3.5/3.6	1
6	234000 / Fuel Handling Equipment											X	2.4.46 – Ability to verify that the alarms are consistent with the plant conditions <b>10CFR55.43.5</b>	3.5/3.6	1
7	<b>234000 / Fuel Handling Equipment</b>						x						K6.04 – Refueling platform air system: Plant specific	2.9/3.7	1
8	239003 / MSIV Leakage Control											X	2.4.33 – Knowledge of the process to track inoperable alarms <b>10CFR55.43.5</b>	2.4/2.8	1
9	<b>262002 / Uninterruptable Power Supply (AC/DC)</b>			x									K3.15 – Main turbine operation: Plant specific	2.6/2.7	1

	SYSTEM #/NAME	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POINT
10	<b>263000 / DC Electrical Distribution</b>									X			A3.01 – Meters, dials, recorders, alarms, and indicating lights	3.2/3.3	1
11	<b>300000 / Instrument Air System</b>	X											K1.05 – Main Steam isolation valve air	3.1/3.2	1
12	<b>300000 / Instrument Air System</b>					X							K5.01 – Air Compressors	2.5/2.5	1
13	<b>400000 / Component Cooling Water System</b>								X				A2.03 – High/Low CCW temperature	2.9/3.0	1
Category Point Totals:		2	1	1	1	1	1	2	1	1	0	2	Group point totals: 13		13

**Knowledge and Ability Record Form** Date: Feb. 22, 2001  
 ref: NUREG - 1021 rev 8  
**BWR SRO EXAM OUTLINE ES-401-1**

**PLANT SYSTEMS - TIER 2 GROUP III**

BWR - Senior Reactor Operator Target: 4% Actual: 4%

	SYSTEM #/NAME	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A TOPICS	IMP	POIN
1	<b>233000 / Fuel Pool Cooling and Cleanup</b>							X					A1.01 – Surge tank level	2.6/2.9	1
2	<b>239001 / Main and Reheat Steam</b>						X						K6.02 – Plant air systems	3.2/3.2	1
3	268000 / Radwaste											X	2.1.20 – Ability to execute procedure steps <b>10CFR55.43.5</b>	4.3/4.2	1
4	<b>288000 / Plant Ventilation</b>				X								K4.02 – Secondary containment isolation	3.7/3.8	1
	Category Point Totals:	0	0	0	1	0	1	1	0	0	0	1	Group Point Total: 4		4

**BWR SRO EXAM OUTLINE ES-401-1****PLANT-WIDE GENERIC RESPONSIBILITIES TIER 3**

BWR - Senior Reactor Operator Target: 17% Actual: 17%

	Category	K/A	TOPICS	IMP	POINT
1	Conduct of Operations	2.1.7	Ability to evaluate plant performance and make operational judgements based on operating characteristics, reactor behavior, and instrument interpretation <b>10CFR55.43.5</b>	3.7/4.4	1
2		2.1.6	Ability to supervise and assume a management role during plant transients and upset conditions <b>10CFR55.43.5</b>	2.1/4.3	1
3		<b>2.1.11</b>	Knowledge of less than one hour technical specification action statements for systems	3.0/3.8	1
4		<b>2.1.3</b>	Knowledge of shift turnover practices	3.0/3.4	1
5		2.1.14	Knowledge of system status criteria which require the notification of plant personnel <b>10CFR55.43.5</b>	2.5/3.3	1
6		2.1.32	Ability to explain and apply system limits and precautions <b>10CFR55.43.2</b>	3.4/3.8	1
7		2.1.12	Ability to apply technical specifications for a system <b>10CFR55.43.2/43.5</b>	2.9/4.0	1
8	Equipment Control	2.2.14	Knowledge of the process for making configuration changes <b>10CFR55.43.3</b>	2.1/3.0	1
9		2.2.20	Knowledge of the process for managing troubleshooting activities <b>10CFR55.43.5</b>	2.2/3.3	1
10		<b>2.2.22</b>	Knowledge of limiting conditions for operations and safety limits	3.4/4.1	1
11	Radiation Control	2.3.6	Knowledge of the requirements for reviewing and approving release permits <b>10CFR55.43.4</b>	2.1/3.1	1
12		2.3.4	Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized <b>10CFR55.43.4</b>	2.5/3.1	1
13		<b>2.3.1</b>	Knowledge of 10CFR20 and related facility radiation control requirements	2.6/3.0	1

**Knowledge and Ability Requirements**  
 ref: NUREG - 1021 rev 8  
**BWR SRO EXAM OUTLINE ES-401-1**

Effective Date: Feb. 22, 2001

	Category	K/A	TOPICS	IMP	POIN
14	Emergency	<b>2.4.17</b>	Knowledge of EOP terms and conditions	3.5/3.6	1
15	Procedures	<b>2.4.24</b>	Knowledge of loss of cooling water procedures	3.3/3.7	1
16	Plan	<b>2.4.11</b>	Knowledge of abnormal condition procedures	3.4/3.6	1
17		2.4.47	Ability to diagnose and recognize trends in an accurate and timely manner utilizing the appropriate control room reference material <b>10CFR55.43.5</b>	3.4/3.7	1
			Group point totals: 17		17