

# **Final Submittal**

(Blue Paper)

**CRYSTAL RIVER OCTOBER 2005 EXAM**

**05000302/2005301**

**SEPTEMBER 12 - 16, 2005**  
**SEPTEMBER 19, 2005 (WRITTEN)**

**FINAL SAMPLE PLANS / OUTLINES**

Facility:		Crystal River Unit #3											Date of Exam:		September 9, 2005			
Tier	Group	RO K/A Category Points											SRO-Only Points					
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	TOTAL	A2	G*	TOTAL		
1. Emergency & Abnormal Plant Evolution	1	1	3	2	N/A			5	4	N/A			3	18			6	
	2	2	3	2				0	2				0	9			4	
	Tier Totals	3	6	4				5	6				3	27			10	
2. Plant Systems	1	2	2	2	4	3	1	2	2	2	4	4	28			5		
	2	2	0	1	3	1	1	1	0	1	0	0	10			3		
	Tier Totals	4	2	3	7	4	2	3	2	3	4	4	38			8		
3. Generic Knowledge and Abilities Categories					1		2		3		4		10	1	2	3	4	7
					2		3		2		3							

**Note:**

- Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
- The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by 1 from that specified in the table based on NRC revisions. The final RO exam must total 75 points and the SRO-only exam must total 25 points.
- Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems 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.
- Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
- Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
- Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- \* The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system.
- On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in other than Category A2 or G\* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2. Use duplicate pages for RO and SRO-only exams.
- For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

The random sampling guidance provided in ES-401, Attachments 1 & 2, was used to generate this outline.

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions – Tier 1 / Group 1									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
007 (BW/E02 & E10) Reactor Trip – Stabilization – Recovery - 1	X						BW/E10EK1.2 - Knowledge of the operational implications of the following concepts as they apply to the (Post-Trip Stabilization): Normal, abnormal and emergency operating procedures associated with (Post-Trip Stabilization).	3.5	1
008 Pressurizer Vapor Space Accident / 3					X		008AA2.19 - Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: PZR spray valve failure, using plant parameters	3.4	1
009 Small Break LOCA / 3				X			009EA1.11 - Ability to operate and monitor the following as they apply to a small break LOCA: EFW / MFW	4.1	1
011 Large Break LOCA / 3					X		011EA2.09 - Ability to determine or interpret the existence of adequate natural circulation as applicable to a Large Break LOCA.	4.2	1
015/17 RCP Malfunctions /4				X			015/017AA1.22 - Ability to operate and / or monitor the following as they apply to the Reactor Coolant Pump Malfunctions: RCP seal failure/malfunction	4.0	1
022 Loss of Rx Coolant Makeup / 2						X	022G2.4.45 - Ability to prioritize and interpret the significance of each annunciator or alarm.	3.3	1
025 Loss of RHR System / 4				X			025AA1.09 - Ability to operate and / or monitor the following as they apply to the Loss of Decay Heat Removal System: LPI pump switches, ammeter, discharge pressure gauge, flow meter, and indicators	3.2	1
026 Loss of Component Cooling Water / 8					X		026AA2.01 - Ability to determine and interpret the following as they apply to the Loss of Nuclear Services / Decay Heat Closed Cycle Cooling: Location of a leak in the SWS / DCS	2.9	1

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Emergency and Abnormal Plant Evolutions – Tier 1 / Group 1									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
027 PZR Pressure Control System Malfunction / 3									
029 ATWS / 1		X					029EK2.06 - Knowledge of the interrelations between the and the following an ATWS: Breakers, relays, and disconnects	2.9	1
038 Steam Generator Tube Rupture / 3					X		038EA2.08 - Ability to determine or interpret the following as they apply to a SGTR: Viable alternatives for placing plant in safe condition when condenser is not available	3.8	1
040 (BW/E05) Steam Line Rupture – Excessive Heat Transfer / 4		X					BW/E05EK2.2 - Knowledge of the interrelations between the (Excessive Heat Transfer) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	4.2	1
054 Loss of Main Feedwater / 4						X	054G2.4.49 - Ability to perform without reference to procedures those actions that require immediate operation of system components and controls	4.0	1
055 Station Blackout / 6				X			055EA1.07 - Ability to operate and monitor the following as they apply to a Station Blackout: Restoration of power from offsite	4.3	1
056 Loss of Offsite Power / 6				X			056AA1.06 - Ability to operate and / or monitor the following as they apply to the Loss of Offsite Power: Safety injection pump	3.6	1
057 Loss of Vital AC Instrument Bus / 6						X	057G2.1.28 - Knowledge of the purpose and function of major system components and controls.	3.2	1

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Emergency and Abnormal Plant Evolutions – Tier 1 / Group 1									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
058 Loss of DC Power / 6			X				058AK3.01 - Knowledge of the reasons for the following responses as they apply to the Loss of DC Power: Use of dc control power by D/Gs	3.4	1
062 Loss of Nuclear Services Water / 4			X				062AK3.03 - Knowledge of the reasons for the following responses as they apply to the Loss of Raw Water: Guidance actions contained in EOP for Loss of RWS	4.0	1
065 Loss of Instrument Air / 8									
W/E04 LOCA Outside Containment / 3							N/A		
W/E11 Loss of Emergency Coolant Recirc / 4							N/A		
BW/E04 Inadequate Heat Transfer – Loss of Secondary Heat Sink / 4		X					BW/E04EK2.2 - Knowledge of the interrelations between the (Inadequate Heat Transfer) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	4.2	1
K/A Category Totals	1	3	2	5	4	3	Group Point Total		18/6

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
001 Continuous Rod Withdrawal / 1									
003 Dropped Control Rod / 1									
005 Inoperable/Stuck Rod / 1			X				005AK3.01 - Knowledge of the reasons for the following responses as they apply to the Inoperable / Stuck Control Rod: Boration and emergency boration in the event of a stuck rod during trip or normal evolutions	4.0	1
024 Emergency Boration / 1									
028 Pressurizer Level Malfunction / 2		X					028AK2.02 - Knowledge of the interrelations between the Pressurizer Level Control Malfunctions and the following: Sensors and detectors	2.6	1
032 Loss of Source Range NI / 7									
033 Loss of Intermediate Range NI / 7									
036 (BW/A08) Fuel Handling Accident / 8									
037 Steam Generator Tube Leak / 3									
051 Loss of Condenser Vacuum / 4					X		051AA2.02 - Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: Conditions requiring reactor and/or turbine trip	3.9	1

ES-401

## PWR Examination Outline

Form ES-401-2

## Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
059 Accidental Liquid RadWaste Rel. / 9	X						059AK1.01 - Knowledge of the operational implications of the following concepts as they apply to Accidental Liquid Radwaste Release: Types of radiation, their units of intensity and the location of the sources of radiation in a nuclear power plant	2.7	1
060 Accidental Gaseous Radwaste Rel. / 9									
061 ARM System Alarms / 7		X					061AK2.01 - Knowledge of the interrelations between the Area Radiation Monitoring (ARM) System Alarms and the following: Detectors at each ARM system location	2.5	1
067 Plant Fire On-site / 8									
068 (BW/A06) Control Room Evac. / 8									
069 Loss of CTMT Integrity / 5									
074 Inad. Core Cooling / 4									
076 High Reactor Coolant Activity / 9									
W/E01 & E02 Rediagnosis & SI Termination / 3							N/A		
W/E13 Steam Generator Over-pressure / 4							N/A		
W/E15 Containment Flooding / 5							N/A		
W/E16 High Containment Radiation / 9							N/A		

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## PWR Examination Outline

Form ES-401-2

## Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
BW/A01 Plant Runback / 1									
BW/A02&A03 Loss of NNI-X/Y / 7									
BW/A04 Turbine Trip / 4					X		BW/A04AA2.1 - Ability to determine and interpret the following as they apply to the (Turbine Trip): Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	3.3	1
BW/A05 Emergency Diesel Actuation / 6		X					BW/A05AK2.1 - Knowledge of the interrelations between the (Emergency Diesel Actuation) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	4.0	1
BW/A07 Flooding / 8	X						BW/A07AK1.2 - Knowledge of the operational implications of the following concepts as they apply to the (Flooding): Normal, abnormal and emergency operating procedures associated with (Flooding).	3.3	1
BW/E03 Inadequate Subcooling Margin / 4									
BW/E08 LOCA Cooldown - Depress. / 4			X				BW/E08EK3.3 - Knowledge of the reasons for the following responses as they apply to the (LOCA Cooldown): Manipulation of controls required to obtain desired operating results during abnormal and emergency situations.	4.0	1
BW/E09 Natural Circ. / 4									
BW/E13&E14 EOP Rules and Enclosures									



ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
CE/A11; W/E08 RCS Overcooling – PTS / 4							N/A		
CE/A16 Excess RCS Leakage / 2							N/A		
CE/E09 Functional Recovery							N/A		
K/A Category Totals	2	3	2	0	2	0	Group Point Total		9/4

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 1										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
003 Reactor Coolant Pump / 4		X										003K2.01 - Knowledge of bus power supplies to the RCPs.	3.1	1
004 Chemical and Volume Control / 1 & 2								X				004A2.26 - Ability to (a) predict the impacts of a low MUT pressure on the MUPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of this malfunction.	2.8	1
005 Residual Heat Removal / 4							X					005A1.03 - Ability to predict and/or monitor changes in closed cooling water flow rate and temperature (to prevent exceeding design limits) associated with operating the Decay Heat System controls.	2.5	1
006 Emergency Core Cooling / 2 & 3							X					006A1.13 - Ability to predict and/or monitor changes in Core Flood Tank pressure, level, and boron concentration (to prevent exceeding design limits) associated with operating the ECCS controls.	3.5	1
007 Pressurizer Relief/Quench Tank / 5									X			007A3.01 - Ability to monitor automatic operation of the RCDT, including: Components which discharge to the RCDT	2.7	1
008 Component Cooling Water / 8				X								008K4.02 - Knowledge of CCWS design feature(s) and/or interlock(s) which provide for operation of the surge tank, including the associated valves and controls.	2.9	2
											X	008G2.4.4 - Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.	4.0	

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 1										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
010 Pressurizer Pressure Control / 3					X							010K5.02 - Knowledge of the operational implications of the following concepts as the apply to the PZR PCS: Constant enthalpy expansion through a valve	2.6	2
										X		010A4.02 - Ability to manually operate and/or monitor in the control room: PZR heaters	3.6	
012 Reactor Protection / 7				X								012K4.02 - Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following: Automatic reactor trip when RPS setpoints are exceeded for each RPS function; basis for each	3.9	1
013 Engineered Safety Features Actuation / 2						X						013K6.01 - Knowledge of the effect of a loss or malfunction of ESFAS related sensors and detectors.	2.7	2
										X		013A4.03 - Ability to manually operate and/or monitor in the control room: ESFAS initiation	4.5	
022 Containment Cooling / 5								X				022A2.05 - Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Major leak in CCS	3.1	1
<del>025 Ice Condenser</del>												N/A		
026 Containment Spray / 5											X	026G2.1.32 - Ability to explain and apply all system limits and precautions.	3.4	2
									X			026A3.01 - Ability to monitor automatic operation of the BSS, including: Pump starts and correct MOV positioning	4.3	

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**PWR Examination Outline**  
**Plant Systems – Tier 2 / Group 1**

Form ES-401-2

System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
039 Main and Reheat Steam / 4				X								039K4.05 - Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: Automatic isolation of steam line	3.7	2
					X							039K5.08 - Knowledge of the operational implications of the following concepts as they apply to the MRSS: Effect of steam removal on reactivity	3.4	
059 Main Feedwater / 4			X									059K3.02 - Knowledge of the effect that a loss or malfunction of the MFW will have on the following: EFW system	3.6	1
061 Auxiliary / Emergency Feedwater / 4					X							061K5.01 - Knowledge of the operational implications of the following concepts as they apply to the EFW: Relationship between EFW flow and RCS heat transfer	3.6	1
062 AC Electrical Distribution / 6	X											062K1.02 - Knowledge of the physical connections and/or cause-effect relationships between the AC distribution system and the following systems: ED/G	4.1	1
063 DC Electrical Distribution / 6		X										063K2.01 - Knowledge of bus power supplies to the following: Major dc loads	2.9	1
064 Emergency Diesel Generator / 6											X	064A4.06 - Ability to manually operate and/or monitor in the control room: Manual start, loading, and stopping of the ED/G	3.9	2
											X	064G2.1.32 – Ability to explain and apply all system limits and precautions.	3.4	
073 Process Radiation Monitoring / 7											X	073G2.3.11 - Ability to control radiation releases.	2.7	1

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 1										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
076 Service Water / 4											X	076A4.01 - Ability to manually operate and/or monitor in the control room: RWS pumps	2.9	1
078 Instrument Air / 8	X											078K1.05 - Knowledge of the physical connections and/or cause-effect relationships between the IAS and the following systems: MSIV air	3.4	2
			X									078K3.02 - Knowledge of the effect that a loss or malfunction of the IAS will have on the following: Systems having pneumatic valves and controls	3.4	
103 Containment / 5				X								103K4.06 - Knowledge of reactor building system design feature(s) and/or interlock(s) which provide for the following: Reactor Building isolation system	3.1	1
K/A Category Totals	2	2	2	4	3	1	2	2	2	4	4	Group Point Total		28/5

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 2										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive / 1	X											001K1.05 - Knowledge of the physical connections and/or cause-effect relationships between the CRDS, the Nuclear Instrumentation System, and the Reactor Protection System.	4.5	1
002 Reactor Coolant / 2 & 4	X											002K1.09 - Knowledge of the physical connections and/or cause-effect relationships between the RCS and the Pressurizer (Pzr).	4.1	1
011 Pressurizer Level Control / 2														
014 Rod Position Indication / 1				X								014K4.06 - Knowledge of RPIS design feature(s) and/or interlock(s) which provide for individual and group misalignment.	3.4	1
015 Nuclear Instrumentation / 7						X						015K6.02 - Knowledge of the operational implications of the following concepts as they apply to the NIS: Discriminator / compensation operation	2.6	1
016 Non-nuclear Instrumentation / 7														
017 In-core Temperature Monitor / 7					X							017K5.03 - Knowledge of the operational implications of the following concepts as they apply to the ITM system: Indication of superheating	3.7	1
027 Containment Iodine Removal / 5														
028 Hydrogen Recombiner and Purge Control / 5														
029 Containment Purge / 8														
033 Spent Fuel Pool Cooling / 8														

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 2										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
034 Fuel Handling Equipment / 8														
035 Steam Generator / 4														
041 Steam Dump/Turbine Bypass Control / 4							X					041A1.02 - Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the Turbine Bypass Valve controls including: Steam pressure	3.1	1
045 Main Turbine Generator / 4				X								045K4.13 - Knowledge of MT/G system design feature(s) and/or interlock(s) which provide for overspeed protection.	2.6	1
055 Condenser Air Removal / 4			X									055K3.01 - Knowledge of the effect that a loss or malfunction of the CARS will have on the following: Main condenser	2.5	1
056 Condensate / 4														
068 Liquid Radwaste / 9														
071 Waste Gas Disposal / 9									X			071A3.03 - Ability to monitor automatic operation of the Waste Gas Disposal System including: Radiation monitoring system alarm and actuating signals	3.6	1
072 Area Radiation Monitoring / 7														
075 Circulating Water / 8														
079 Station Air / 8														
086 Fire Protection / 8				X								086K4.06 - Knowledge of design feature(s) and/or interlock(s) which provide for the following: CO2	3.0	1
K/A Category Totals	2	0	1	3	1	1	1	0	1	0	0	Group Point Total		10/3

Facility:		Crystal River Unit #3												Date of Exam:		September 9, 2005			
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					2		3		2		3								

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008 Pressurizer Vapor Space Accident / 3					X		008AA2.19 - Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident: PZR spray valve failure, using plant parameters	3.4	1
009 Small Break LOCA / 3				X			009EA1.11 - Ability to operate and monitor the following as they apply to a small break LOCA: EFW / MFW	4.1	1
011 Large Break LOCA / 3					X		011EA2.09 - Ability to determine or interpret the existence of adequate natural circulation as applicable to a Large Break LOCA.	4.2	1
015/17 RCP Malfunctions / 4				X			015/017AA1.22 - Ability to operate and / or monitor the following as they apply to the Reactor Coolant Pump Malfunctions: RCP seal failure/malfunction	4.0	1
022 Loss of Rx Coolant Makeup / 2						X	022G2.4.45 - Ability to prioritize and interpret the significance of each annunciator or alarm.	3.3	1
025 Loss of RHR System / 4				X			025AA1.09 - Ability to operate and / or monitor the following as they apply to the Loss of Decay Heat Removal System: LPI pump switches, ammeter, discharge pressure gauge, flow meter, and indicators	3.2	1
026 Loss of Component Cooling Water / 8					X		026AA2.01 - Ability to determine and interpret the following as they apply to the Loss of Nuclear Services / Decay Heat Closed Cycle Cooling: Location of a leak in the SWS / DCS	2.9	1

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		Emergency and Abnormal Plant Evolutions – Tier 1 / Group 1							
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
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029 ATWS / 1		X					029EK2.06 - Knowledge of the interrelations between the and the following an ATWS: Breakers, relays, and disconnects	2.9	1
038 Steam Generator Tube Rupture / 3					X		038EA2.08 - Ability to determine or interpret the following as they apply to a SGTR: Viable alternatives for placing plant in safe condition when condenser is not available	3.8	1
040 (BW/E05) Steam Line Rupture – Excessive Heat Transfer / 4		X					BW/E05EK2.2 - Knowledge of the interrelations between the (Excessive Heat Transfer) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	4.2	1
054 Loss of Main Feedwater / 4						X	054G2.4.49 - Ability to perform without reference to procedures those actions that require immediate operation of system components and controls	4.0	1
055 Station Blackout / 6				X			055EA1.07 - Ability to operate and monitor the following as they apply to a Station Blackout: Restoration of power from offsite	4.3	1
056 Loss of Offsite Power / 6				X			056AA1.06 - Ability to operate and / or monitor the following as they apply to the Loss of Offsite Power: Safety injection pump	3.6	1
057 Loss of Vital AC Instrument Bus / 6						X	057G2.1.28 - Knowledge of the purpose and function of major system components and controls.	3.2	1

ES-401		PWR Examination Outline						Form ES-401-2	
		Emergency and Abnormal Plant Evolutions – Tier 1 / Group 1							
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
058 Loss of DC Power / 6			X				058AK3.01 - Knowledge of the reasons for the following responses as they apply to the Loss of DC Power: Use of dc control power by D/Gs	3.4	1
062 Loss of Nuclear Services Water / 4			X				062AK3.03 - Knowledge of the reasons for the following responses as they apply to the Loss of Raw Water: Guidance actions contained in EOP for Loss of RWS	4.0	1
065 Loss of Instrument Air / 8									
W/E04 LOCA Outside Containment / 3							N/A		
W/E11 Loss of Emergency Coolant Recirc / 4							N/A		
BW/E04 Inadequate Heat Transfer – Loss of Secondary Heat Sink / 4		X					BW/E04EK2.2 - Knowledge of the interrelations between the (Inadequate Heat Transfer) and the following: Facility's heat removal systems, including primary coolant, emergency coolant, the decay heat removal systems, and relations between the proper operation of these systems to the operation of the facility.	4.2	1
K/A Category Totals	1	3	2	5	4	3	Group Point Total		18/6

<b>ES-401 PWR Examination Outline Form ES-401-2</b> <b>Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2</b>									
<b>E/APE # / Name / Safety Function</b>	<b>K 1</b>	<b>K 2</b>	<b>K 3</b>	<b>A 1</b>	<b>A 2</b>	<b>G</b>	<b>K/A Topic(s)</b>	<b>IR</b>	<b>#</b>
001 Continuous Rod Withdrawal / 1									
003 Dropped Control Rod / 1									
005 Inoperable/Stuck Rod / 1			X				005AK3.01 - Knowledge of the reasons for the following responses as they apply to the Inoperable / Stuck Control Rod: Boration and emergency boration in the event of a stuck rod during trip or normal evolutions	4.0	1
024 Emergency Boration / 1									
028 Pressurizer Level Malfunction / 2		X					028AK2.02 - Knowledge of the interrelations between the Pressurizer Level Control Malfunctions and the following: Sensors and detectors	2.6	1
032 Loss of Source Range NI / 7									
033 Loss of Intermediate Range NI / 7									
036 (BW/A08) Fuel Handling Accident / 8									
037 Steam Generator Tube Leak / 3									
051 Loss of Condenser Vacuum / 4					X		051AA2.02 - Ability to determine and interpret the following as they apply to the Loss of Condenser Vacuum: Conditions requiring reactor and/or turbine trip	3.9	1



ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
059 Accidental Liquid RadWaste Rel. / 9	X						059AK1.01 - Knowledge of the operational implications of the following concepts as they apply to Accidental Liquid Radwaste Release: Types of radiation, their units of intensity and the location of the sources of radiation in a nuclear power plant	2.7	1
060 Accidental Gaseous Radwaste Rel. / 9									
061 ARM System Alarms / 7		X					061AK2.01 - Knowledge of the interrelations between the Area Radiation Monitoring (ARM) System Alarms and the following: Detectors at each ARM system location	2.5	1
067 Plant Fire On-site / 8									
068 (BW/A06) Control Room Evac. / 8									
069 Loss of CTMT Integrity / 5									
074 Inad. Core Cooling / 4									
076 High Reactor Coolant Activity / 9									
W/E01 & E02 Rediagnosis & SI Termination / 3							N/A		
W/E13 Steam Generator Over pressure / 4							N/A		
W/E15 Containment Flooding / 5							N/A		
W/E16 High Containment Radiation / 9							N/A		

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
BW/A01 Plant Runback / 1									
BW/A02&A03 Loss of NNI-X/Y / 7									
BW/A04 Turbine Trip / 4					X		BW/A04AA2.1 - Ability to determine and interpret the following as they apply to the (Turbine Trip): Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	3.3	1
BW/A05 Emergency Diesel Actuation / 6		X					BW/A05AK2.1 - Knowledge of the interrelations between the (Emergency Diesel Actuation) and the following: Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	4.0	1
BW/A07 Flooding / 8	X						BW/A07AK1.2 - Knowledge of the operational implications of the following concepts as they apply to the (Flooding): Normal, abnormal and emergency operating procedures associated with (Flooding).	3.3	1
BW/E03 Inadequate Subcooling Margin / 4									
BW/E08 LOCA Cooldown - Depress. / 4			X				BW/E08EK3.3 - Knowledge of the reasons for the following responses as they apply to the (LOCA Cooldown): Manipulation of controls required to obtain desired operating results during abnormal and emergency situations.	4.0	1
BW/E09 Natural Circ. / 4									
BW/E13&E14 EOP Rules and Enclosures									

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
CE/A11; W/E08 RCS Overcooling - PTS / 4							N/A		
CE/A16 Excess RCS Leakage / 2							N/A		
CE/E09 Functional Recovery							N/A		
K/A Category Totals	2	3	2	0	2	0	Group Point Total		9/4



ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 1										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
003 Reactor Coolant Pump / 4		X										003K2.01 - Knowledge of bus power supplies to the RCPs.	3.1	1
004 Chemical and Volume Control / 1 & 2								X				004A2.26 - Ability to (a) predict the impacts of a low MUT pressure on the MUPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of this malfunction.	2.8	1
005 Residual Heat Removal / 4							X					005A1.03 - Ability to predict and/or monitor changes in closed cooling water flow rate and temperature (to prevent exceeding design limits) associated with operating the Decay Heat System controls.	2.5	1
006 Emergency Core Cooling / 2 & 3							X					006A1.13 - Ability to predict and/or monitor changes in Core Flood Tank pressure, level, and boron concentration (to prevent exceeding design limits) associated with operating the ECCS controls.	3.5	1
007 Pressurizer Relief/Quench Tank / 5									X			007A3.01 - Ability to monitor automatic operation of the RCDT, including: Components which discharge to the RCDT	2.7	1
008 Component Cooling Water / 8				X								008K4.02 - Knowledge of CCWS design feature(s) and/or interlock(s) which provide for operation of the surge tank, including the associated valves and controls.	2.9	2
											X	008G2.4.4 - Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.	4.0	

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 1										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
010 Pressurizer Pressure Control / 3					X							010K5.02 - Knowledge of the operational implications of the following concepts as the apply to the PZR PCS: Constant enthalpy expansion through a valve	2.6	2
										X		010A4.02 - Ability to manually operate and/or monitor in the control room: PZR heaters	3.6	
012 Reactor Protection / 7				X								012K4.02 - Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following: Automatic reactor trip when RPS setpoints are exceeded for each RPS function; basis for each	3.9	1
013 Engineered Safety Features Actuation / 2						X						013K6.01 - Knowledge of the effect of a loss or malfunction of ESFAS related sensors and detectors.	2.7	2
										X		013A4.03 - Ability to manually operate and/or monitor in the control room: ESFAS initiation	4.5	
022 Containment Cooling / 5								X				022A2.05 - Ability to (a) predict the impacts of the following malfunctions or operations on the CCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Major leak in CCS	3.1	1
025 Ice Condenser												N/A		
026 Containment Spray / 5											X	026G2.1.32 - Ability to explain and apply all system limits and precautions.	3.4	2
									X			026A3.01 - Ability to monitor automatic operation of the BSS, including: Pump starts and correct MOV positioning	4.3	

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 1										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
039 Main and Reheat Steam / 4				X								039K4.05 - Knowledge of MRSS design feature(s) and/or interlock(s) which provide for the following: Automatic isolation of steam line	3.7	2
					X							039K5.08 - Knowledge of the operational implications of the following concepts as the apply to the MRSS: Effect of steam removal on reactivity	3.4	
059 Main Feedwater / 4			X									059K3.02 - Knowledge of the effect that a loss or malfunction of the MFW will have on the following: EFW system	3.6	1
061 Auxiliary / Emergency Feedwater / 4					X							061K5.01 - Knowledge of the operational implications of the following concepts as the apply to the EFW: Relationship between EFW flow and RCS heat transfer	3.6	1
062 AC Electrical Distribution / 6	X											062K1.02 - Knowledge of the physical connections and/or cause-effect relationships between the AC distribution system and the following systems: ED/G	4.1	1
063 DC Electrical Distribution / 6		X										063K2.01 - Knowledge of bus power supplies to the following: Major dc loads	2.9	1
064 Emergency Diesel Generator / 6											X	064A4.06 - Ability to manually operate and/or monitor in the control room: Manual start, loading, and stopping of the ED/G	3.9	2
											X	064G2.1.32 – Ability to explain and apply all system limits and precautions.	3.4	
073 Process Radiation Monitoring / 7											X	073G2.3.11 - Ability to control radiation releases.	2.7	1

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 1										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
076 Service Water / 4											X	076A4.01 - Ability to manually operate and/or monitor in the control room: RWS pumps	2.9	1
078 Instrument Air / 8	X											078K1.05 - Knowledge of the physical connections and/or cause-effect relationships between the IAS and the following systems: MSIV air	3.4	2
			X									078K3.02 - Knowledge of the effect that a loss or malfunction of the IAS will have on the following: Systems having pneumatic valves and controls	3.4	
103 Containment / 5				X								103K4.06 - Knowledge of reactor building system design feature(s) and/or interlock(s) which provide for the following: Reactor Building isolation system	3.1	1
K/A Category Totals	2	2	2	4	3	1	2	2	2	4	4	Group Point Total		28/5

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 2										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive / 1	X											001K1.05 - Knowledge of the physical connections and/or cause-effect relationships between the CRDS, the Nuclear Instrumentation System, and the Reactor Protection System.	4.5	1
002 Reactor Coolant / 2 & 4	X											002K1.09 - Knowledge of the physical connections and/or cause-effect relationships between the RCS and the Pressurizer (Pzr).	4.1	1
011 Pressurizer Level Control / 2														
014 Rod Position Indication / 1				X								014K4.06 - Knowledge of RPIS design feature(s) and/or interlock(s) which provide for individual and group misalignment.	3.4	1
015 Nuclear Instrumentation / 7						X						015K6.02 - Knowledge of the operational implications of the following concepts as they apply to the NIS: Discriminator / compensation operation	2.6	1
016 Non-nuclear Instrumentation / 7														
017 In-core Temperature Monitor / 7					X							017K5.03 - Knowledge of the operational implications of the following concepts as they apply to the ITM system: Indication of superheating	3.7	1
027 Containment Iodine Removal / 5														
028 Hydrogen Recombiner and Purge Control / 5														
029 Containment Purge / 8														
033 Spent Fuel Pool Cooling / 8														

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 2										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
034 Fuel Handling Equipment / 8														
035 Steam Generator / 4														
041 Steam Dump/Turbine Bypass Control / 4							X					041A1.02 - Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the Turbine Bypass Valve controls including: Steam pressure	3.1	1
045 Main Turbine Generator / 4				X								045K4.13 - Knowledge of MT/G system design feature(s) and/or interlock(s) which provide for overspeed protection.	2.6	1
055 Condenser Air Removal / 4			X									055K3.01 - Knowledge of the effect that a loss or malfunction of the CARS will have on the following: Main condenser	2.5	1
056 Condensate / 4														
068 Liquid Radwaste / 9														
071 Waste Gas Disposal / 9									X			071A3.03 - Ability to monitor automatic operation of the Waste Gas Disposal System including: Radiation monitoring system alarm and actuating signals	3.6	1
072 Area Radiation Monitoring / 7														
075 Circulating Water / 8														
079 Station Air / 8														
086 Fire Protection / 8				X								086K4.06 - Knowledge of design feature(s) and/or interlock(s) which provide for the following: CO2	3.0	1
K/A Category Totals	2	0	1	3	1	1	1	0	1	0	0	Group Point Total		10/3

**RO**

Facility: Crystal River Unit #3		Reactor Operator	Date of Exam: September 9, 2005			
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.12	Ability to apply <b>technical</b> specifications for a system.	2.9	1		
	2.1.29	Knowledge of <b>how</b> to conduct and verify valve lineups.	3.4	1		
	Subtotal			2		
2. Equipment Control	2.2.1	Ability to perform <b>pre-startup</b> procedures for the facility, including <b>operating</b> those controls associated with plant equipment that <b>could</b> affect reactivity.	3.7	1		
	2.2.11	Knowledge of <b>the</b> process for controlling temporary changes.	2.5	1		
	2.2.28	Knowledge of <b>new</b> and spent fuel movement procedures.	2.6	1		
	Subtotal			3		
3. Radiation Control	2.3.1	Knowledge of <b>10 CFR: 20</b> and related facility radiation control requirements.	2.6	1		
	2.3.10	Ability to perform <b>procedures</b> to reduce excessive levels of radiation and <b>guard</b> against personnel exposure.	2.9	1		
	Subtotal			2		
4. Emergency Procedures / Plan	2.4.6	Knowledge <b>symptom</b> based EOP mitigation strategies.	3.1	1		
	2.4.35	Knowledge of <b>local</b> auxiliary operator tasks during emergency operations <b>including</b> system geography and system implications.	3.3	1		
	2.4.43	Knowledge of <b>emergency</b> communications systems and techniques.	2.8	1		
	Subtotal			3		
Tier 3 Point Total				10		7

Facility:		Crystal River Unit #3										Date of Exam:		September 9, 2005				
Tier	Group	RO K/A Category Points												SRO-Only Points				
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *	TOTAL	A2	G*	TOTAL		
1. Emergency & Abnormal Plant Evolutions	1												18	4	2	6		
	2												9	3	1	4		
	Tier Totals												27	7	3	10		
2. Plant Systems	1												28	2	3	5		
	2												10	3	0	3		
	Tier Totals												38	5	3	8		
3. Generic Knowledge and Abilities Categories				1		2		3		4		10		1	2	3	4	7
												2	2	1	2			
<p>Note:</p> <ol style="list-style-type: none"> <li>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).</li> <li>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 RO exam must total 75 points and the SRO-only exam must total 25 points.</li> <li>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.</li> <li>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 any system or evolution.</li> <li>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.</li> <li>6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.</li> <li>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.</li> <li>8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) for the applicable license level, and the point totals (#) for each system and category. Enter the group and tier totals for each category in the table above; if fuel handling equipment is sampled in other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2. Use duplicate pages for RO and SRO-only exams.</li> <li>9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.</li> </ol>																		

**The random sampling guidance provided in ES-401, Attachments 1 & 2, was used to generate this outline.**



ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions – Tier 1 / Group 1									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
007 (BW/E02 & E10) Reactor Trip – Stabilization – Recovery - 1					X		BW/E02EA2.1 - Ability to determine and interpret the following as they apply to the (Vital System Status Verification): Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	4.0	1
008 Pressurizer Vapor Space Accident / 3									
009 Small Break LOCA / 3					X		009EA2.34 - Ability to determine or interpret the following as they apply to a small break LOCA: Conditions for throttling or stopping HPI	4.2	1
011 Large Break LOCA / 3									
015/17 RCP Malfunctions / 4									
022 Loss of Rx Coolant Makeup / 2					X		022AA2.01 - Ability to determine and interpret the following as they apply to the Loss of Reactor Coolant Pump Makeup: Whether makeup line leak exists	3.8	1
025 Loss of RHR System / 4									
026 Loss of Component Cooling Water / 8									
027 PZR Pressure Control System Malfunction / 3									
029 ATWS / 1									
038 Steam Generator Tube Rupture / 3									
040 (BW/E05) Steam Line Rupture – Excessive Heat Transfer / 4									

ES-401		PWR Examination Outline					Form ES-401-2		
Emergency and Abnormal Plant Evolutions – Tier 1 / Group 1									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
054 Loss of Main Feedwater / 4					X		054AA2.03 - Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): Conditions and reasons for EFW pump startup	4.2	1
055 Station Blackout / 6						X	055EG2.4.6 - Knowledge of symptom based EOP mitigation strategies.	4.0	1
056 Loss of Offsite Power / 6									
057 Loss of Vital AC Instrument Bus / 6						X	057G2.4.32 - Knowledge of operator response to loss of all annunciators.	3.5	1
058 Loss of DC Power / 6									
062 Loss of Nuclear Services Water / 4									
065 Loss of Instrument Air / 8									
W/E04 LOCA Outside Containment / 3							N/A		
W/E11 Loss of Emergency Coolant Recirc / 4							N/A		
BW/E04 Inadequate Heat Transfer – Loss of Secondary Heat Sink / 4									
K/A Category Totals					4	2	Group Point Total		18/6

ES-401		PWR Examination Outline						Form ES-401-2	
		Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2							
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
001 Continuous Rod Withdrawal / 1						X	001G2.1.33 - Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	4.0	1
003 Dropped Control Rod / 1									
005 Inoperable/Stuck Rod / 1									
024 Emergency Boration / 1									
028 Pressurizer Level Malfunction / 2									
032 Loss of Source Range NI / 7									
033 Loss of Intermediate Range NI / 7									
036 (BW/A08) Fuel Handling Accident / 8					X		036AA2.02 - Ability to determine and interpret the following as they apply to the Fuel Handling Incidents: Occurrence of a fuel handling incident	4.1	1
037 Steam Generator Tube Leak / 3					X		037AA2.10 - Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: Tech-Spec limits for RCS leakage	4.1	1
051 Loss of Condenser Vacuum / 4									
059 Accidental Liquid RadWaste Rel. / 9									
060 Accidental Gaseous Radwaste Rel. / 9									
061 ARM System Alarms / 7									

ES-401

**PWR Examination Outline**  
**Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2**

Form ES-401-2

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
067 Plant Fire On-site / 8									
068 (BW/A06) Control Room Evac. / 8									
069 Loss of CTMT Integrity / 5									
074 Inad. Core Cooling / 4									
076 High Reactor Coolant Activity / 9									
<i>W/E01 &amp; E02 Rediagnosis &amp; SI Termination / 3</i>							N/A		
<i>W/E13 Steam Generator Over-pressure / 4</i>							N/A		
<i>W/E15 Containment Flooding / 5</i>							N/A		
<i>W/E16 High Containment Radiation / 9</i>							N/A		
BW/A01 Plant Runback / 1									
BW/A02&A03 Loss of NNI- X/Y / 7									
BW/A04 Turbine Trip / 4					X		BW/A04AA2.2 - Ability to determine and interpret the following as they apply to the (Turbine Trip): Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments.	3.7	1
BW/A05 Emergency Diesel Actuation / 6									

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions – Tier 1 / Group 2									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
BW/A07 Flooding / 8									
BW/E03 Inadequate Subcooling Margin / 4									
BW/E08 LOCA Cooldown - Depress. / 4									
BW/E09 Natural Circ. / 4									
BW/E13&E14 EOP Rules and Enclosures									
<i>CE/A11; W/E08 RCS Overcooling - PTS / 4</i>							N/A		
<i>CE/A16 Excess RCS Leakage / 2</i>							N/A		
<i>CE/E09 Functional Recovery</i>							N/A		
K/A Category Totals					3	1	Group Point Total		9/4

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 1										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
003 Reactor Coolant Pump / 4									X			003A2.01 - Ability to (a) predict the impacts of the following malfunctions or operations on the RCPs; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Problems with RCP seals, especially rates of seal leak-off	3.9	1
004 Chemical and Volume Control / 1 & 2														
005 Residual Heat Removal / 4											X	005G2.2.18 - Knowledge of the process for managing maintenance activities during shutdown operations.	3.6	1
006 Emergency Core Cooling / 2 & 3														
007 Pressurizer Relief/Quench Tank / 5														
008 Component Cooling Water / 8														
010 Pressurizer Pressure Control / 3														
012 Reactor Protection / 7									X			012A2.05 - Ability to (a) predict the impacts of faulty or erratic operation of detectors and function generators on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of these malfunctions.	3.2	1

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 1										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
013 Engineered Safety Features Actuation / 2														
022 Containment Cooling / 5														
025 Ice Condenser														
026 Containment Spray / 5											X	026G2.2.23 - Ability to track limiting conditions for operations.	3.8	1
039 Main and Reheat Steam / 4														
059 Main Feedwater / 4														
061 Auxiliary / Emergency Feedwater / 4											X	061G2.1.12 - Ability to apply technical specifications for a system.	4.0	1
062 AC Electrical Distribution / 6														
063 DC Electrical Distribution / 6														
064 Emergency Diesel Generator / 6														
073 Process Radiation Monitoring / 7														
076 Service Water / 4														
078 Instrument Air / 8														

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 1											Form ES-401-2	
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
103 Containment / 5														
K/A Category Totals								2			3	Group Point Total		28/5



ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 2										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive / 1														
002 Reactor Coolant / 2 & 4								X				002A2.04 - Ability to (a) predict the impacts of the following malfunctions or operations on the RCS; and (b based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of heat sinks	4.6	1
011 Pressurizer Level Control / 2														
014 Rod Position Indication / 1														
015 Nuclear Instrumentation / 7								X				015A2.01 - Ability to (a) predict the impacts of the following malfunctions or operations on the NIS; and (b based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Power supply loss or erratic operation	3.9	1
016 Non-nuclear Instrumentation / 7														
017 In-core Temperature Monitor / 7														
027 Containment Iodine Removal / 5														
028 Hydrogen Recombiner and Purge Control / 5														
029 Containment Purge / 8														
033 Spent Fuel Pool Cooling / 8														

ES-401		PWR Examination Outline Plant Systems – Tier 2 / Group 2										Form ES-401-2		
System # / Name	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
034 Fuel Handling Equipment / 8														
035 Steam Generator / 4														
041 Steam Dump/Turbine Bypass Control / 4								X				041A2.02 - Ability to (a) predict the impacts of the following malfunctions or operations on the Turbine Bypass Valves; and (b) based on those predictions or mitigate the consequences of those malfunctions or operations: Steam valve stuck open	3.9	1
045 Main Turbine Generator / 4														
055 Condenser Air Removal / 4														
056 Condensate / 4														
068 Liquid Radwaste / 9														
071 Waste Gas Disposal / 9														
072 Area Radiation Monitoring / 7														
075 Circulating Water / 8														
079 Station Air / 8														
086 Fire Protection / 8														
K/A Category Totals								3			0	Group Point Total		10/3

***SRO***

Facility: Crystal River Unit #3		Senior Reactor Operator		Date of Exam: September 9, 2005			
Category	K/A #	Topic	RO		SRO-Only		
			IR	#	IR	#	
1. Conduct of Operations	2.1.22	Ability to determine Mode of Operation.			3.3	1	
	2.1.34	Ability to maintain primary and secondary plant chemistry within allowable limits.			2.9	1	
	Subtotal					2	
2. Equipment Control	2.2.22	Knowledge of limiting conditions for operations and safety limits.			4.1	1	
	2.2.24	Ability to analyze the affect of maintenance activities on LCO status.			3.8	1	
	Subtotal					2	
3. Radiation Control	2.3.2	Knowledge of facility ALARA program.			2.9	1	
	Subtotal					1	
4. Emergency Procedures / Plan	2.4.11	Knowledge of abnormal condition procedures.			3.6	1	
	2.4.30	Knowledge of which events related to system operations/status should be reported to outside agencies.			3.6	1	
	Subtotal					2	
Tier 3 Point Total				10		7	

Facility: Crystal River Unit #3 Date of Exam: September 9 thru 16, 2005

Examination Level: **RO & SRO-I** Operating Test Number: 1

Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	N	<b>SRO Only</b> – (CO1) – Determine overtime availability. <i>K/A – G2.1.4 SRO 3.4</i> AI-100
	N	<b>RO &amp; SRO</b> – (CO2) – Calculate SDM with a dropped control rod. <i>K/A – G2.1.7 RO 3.7 SRO 4.4</i> SP-421 <b>SRO Only</b> – After completing the SDM calculation determine required TS actions, if any. <i>K/A – G2.1.12 SRO 4.0</i>
Equipment Control	N	<b>RO &amp; SRO</b> – (EC1) – Perform a QPTR calculation. <i>K/A – G2.2.12 RO 3.0 SRO 3.4</i> SP-303 <b>SRO Only</b> – After completing the QPTR calculation determine required TS actions, if any. <i>K/A – G2.1.12 SRO 4.0</i>
Radiation Control	N	<b>RO &amp; SRO</b> – (RC1) – Calculate the maximum permissible stay time with an Emergency Event in progress. <i>K/A – 2.3.4 RO 2.5 SRO 3.1</i> EM-202
Emergency Plan	D	<b>RO Only</b> – (EP1) - Perform an Offsite Dose Assessment Calculation <i>K/A – G2.4.39 RO 3.3</i> EM-204A
	N	<b>SRO Only</b> – (EP2) - Determine Emergency Action Level and Protective Action Recommendations. <i>K/A – G2.4.41 SRO 4.1</i> EM-202

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 &amp; 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

Facility: Crystal River Unit #3		Date of Exam: September 9 - 16, 2005	
Examination Level: <b>RO &amp; SRO-I</b>		Operating Test Number: 1	
<i>Control Room systems<sup>@</sup> (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)</i>			
System / JPM Title		Type Code*	Safety Function
a.	CRDS – Transfer control rod to auxiliary power supply K/A – 001A4.03 RO 4.0 SRO 3.7 (OP-502) [RO]	D, P, S	1
b.	CVCS – Respond to OTSG tube rupture at power K/A – 004A4.06 RO 3.6 SRO 3.1 (EOP-6) [RO, SRO-I]	A, D, S	3
c.	RCS – Respond to a stuck open PZR spray valve K/A – 002A4.01 RO 4.2 SRO 4.4 (AP-520) [RO, SRO-I]	A, L, N, S	2
d.	RHR – Respond to an ES A/B actuation K/A – 025AA1.10 RO 3.1 SRO 2.9 (EOP-3) [RO, SRO-I]	A, M, S	4 Primary
e.	MSS – Perform actions for a stuck open MSSV K/A – 039A2.04 RO 3.4 SRO 3.7 (EOP-2) [RO, SRO-I]	D, S	4 Secondary
f.	EDG – Synchronize off-site power and unload/shutdown EDG K/A – 064A4.09 RO 3.2 SRO 3.3 (AP-770) [RO, SRO-I]	D, S	6
g.	RPS – Restore RPS channel power K/A – 012A2.02 RO 3.6 SRO 3.9 (OP-507) [RO, SRO-I]	D, S	7
h.	WG – Respond to a Waste Gas header leak K/A – 060AA2.05 RO 3.7 SRO 4.2 (AP-250) [RO, SRO-I]	A, N, S	9
SPARE	MU – Restart a MUP following an RCS leak isolation K/A – 002A2.01 RO 4.3 SRO 4.4 (AP-520)	D, S	2
<i>In-Plant Systems<sup>@</sup> (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)</i>			
i.	CRDS – Manual Reactor trip from outside control room K/A – E02EA1.1 RO 4.0 SRO 3.6 (AP-990) [RO, SRO-I]	A, D, E, L, P	1
j.	EFW – Reset EFP-2 trip valve (ASV-50) K/A – 061A2.04 RO 3.4 SRO 3.8 (OP-450) [RO, SRO-I]	D, R	4 Secondary
k.	CCW – Appendix R Chiller lineup K/A – 008A2.01 RO 3.3 SRO 3.6 (AP-330) [RO, SRO-I]	D, E	8
SPARE	FS/OTSG – Transfer excess secondary inventory to FST K/A – 037AK3.07 RO 4.2 SRO 4.4 (EOP-14, Enc. 9)	D, E	2, 8
@	All control room (and in-plant) systems must be different and serve different safety functions; in-plant systems and 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)		$\geq 2 / \geq 2 / \geq 1$	
(P)revious 2 exams		$\leq 3 / \leq 3 / \leq 2$ (randomly selected)	
(R)CA		$\geq 1 / \geq 1 / \geq 1$	
(S)imulator			

Facility: **Crystal River #3**

Scenario No.: #1 (NRC)

Op-Test No.: 1

Examiners: \_\_\_\_\_

Operators: \_\_\_\_\_

Initial Conditions: The plant is at 100% power.Turnover: The following equipment is OOS: MUP-1B (12 hours); EFP-1 (6 hours); RWP-2A (12 hours). All required surveillances have been completed. Thunderstorms are predicted for Citrus and Levy counties.

Event No.	Malf. No.	Event Type*	Event Description
1	1	I (RO) I (SRO)	NI-7 Summing Amp slowly fails high. (OP-501, OP-504, OP-507) SRO TS determination. (TS 3.3.1)
2	2	C (BOP) C (SRO)	55 gpm RCS leak inside Reactor Building. (AP-520) SRO TS determination. (TS 3.4.12)
3	3	C (RO)	"A" loop FW demand fails as is.
4	N/A	R (RO) R (SRO)	Manual power decrease required. (AP-510)
5	4	C (RO)	Safety rod drops causing RCS leak rate to increase to 200 gpm. (AP-545)
6	5	M (ALL)	Manual Reactor Trip – MSV-9 (TBV) fails open following trip. (EOP-2, EOP-5)
7	6	C (BOP)	MSLI fails on "A" OTSG. [CT] (EOP-5)
8	7	C (RO or BOP)	EFV-11 and EFV-56 fail as is. [CT] (EOP-5, EOP-13, Rule 3)
* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor			

Facility: **Crystal River #3** Scenario No.: **#2 (NRC)** Op-Test No.: **1**

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: The plant is in Mode 2 at approximately 2% power.

Turnover: The following equipment is OOS: MUP-1B (12 hours). Maintain this power level until you are relieved. The oncoming crew will continue the plant startup. Thunderstorms are predicted for Citrus and Levy counties.

Event No.	Malf. No.	Event Type*	Event Description
1	1	I (SRO)	RC-3A-PT3 (ES Channel 1) fails low. (OP-507) SRO TS determination. (TS 3.3.5)
2	2	C (BOP)	Condenser vacuum leak – ARP-1B fail to start (OP-607)
3	3	C (BOP)	RM-A5G fails high. (AP-250)
4	4	I (RO) I (SRO)	Selected PZR level instrument fail low (OP-501) SRO TS determination. (TS 3.3.17)
5	5	C (RO)	FWV-39, “B” OTSG SUCV, fails open.
6	6	M (ALL)	OTSG tube leak occurs on the “B” OTSG which will require a reactor trip. (EOP-6)
7	7	C (RO)	Manual Rx trip pushbutton failure. (EOP-6) [CT]
8	8	C (RO or BOP)	“A” MUP bearing fails. (EOP-6, EOP-13) [CT]

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

Facility: **Crystal River #3**Scenario No.: **#3 (NRC)**Op-Test No.: **1**Examiners: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_Operators: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

**Initial Conditions:** The plant is at approximately 55% power continuing to 100% power. Down power was required for work on FWP-2B governor which is now repaired.

**Turnover:** The following equipment is OOS: MUP-1B (12 hours); FWP-7 (4 hours). Continue power increase to full power. Thunderstorms are predicted for Citrus and Levy counties.

Event No.	Malf. No.	Event Type*	Event Description
1	N/A	N (RO)	Power increase through MBVs. (OP-204)
2	1	I (SRO)	SP-26-LT ("B" EFIC Channel, "A" OTSG) fail low. (OP-450) SRO TS determination. (TS 3.3.11 & TS 3.3.17)
3	2	C (BOP) C (SRO)	OPT major alarm. (OP-703) SRO TS determination. (TS 3.8.1)
4	N/A	N (BOP)	Perform SP-321, Page 1 of Enclosure 1. (SP-321)
5	3	C (BOP)	MUV-258 spurious closure. (AI-500)
6	4	C (RO)	RCP-1A seal failure. (OP-302, AP-545)
7	5	C (RO)	"A" MBV fails to auto-close when RCP shutdown. (AI-500)
8	6	M (ALL)	Large PZR steam space leak, RPS fails to actuate, RCS leak due to Rx trip. (EOP-2, EOP-3, EOP-13 Rules 1 & 3) [CT]
9	7	C (RO or BOP)	MUV-586 (HPI cross-tie valve) fails closed, MUV-25 (normal HPI injection valve fails to open). (EOP-3) [CT]
10	8	C (RO or BOP)	DHV-110 auto-control failure. (EOP-3) [CT]

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