

Facility:		Date of Exam:																
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	4	2	4	N/A			4	2	N/A			2	18	5	1	6	
	2	2	2	2	N/A			0	2	N/A			1	9	3	1	4	
	Tier Totals	6	4	6	N/A			4	4	N/A			3	27	8	2	10	
2. Plant Systems	1	2	2	3	3	2	2	2	3	3	3	3	3	28	2	3	5	
	2	1	1	1	1	0	1	1	1	1	1	1	1	10	2	1	3	
	Tier Totals	3	3	4	4	2	3	3	4	4	4	4	4	38	4	4	8	
3. Generic Knowledge and Abilities <u>Categories</u>				1		2		3		4		10		1	2	3	4	7
				3		3		1		3				2	2	1	2	
<p>Note: 1. Ensure that at least two topics from every <u>applicable</u> K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., <u>except for one category in Tier 3 of the SRO-only outline</u>, the "Tier Totals" in each K/A category shall not be less than two).</p> <p>2. The point total for each group and tier in the proposed outline must match that specified in the table. The final point total for each group and tier may deviate by ± 1 from that specified in the table based on NRC revisions. The final <u>RO exam must total 75 points and the SRO-only exam must total 25 points</u>.</p> <p>3. Systems/evolutions within each group are identified on the associated outline; <u>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.</u></p> <p>4. Select topics from <u>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.</u></p> <p>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.</p> <p>6. <u>Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.</u></p> <p>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.</p> <p>8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IR) for the <u>applicable</u> license level, and the point totals (#) for each system and category. Enter the <u>group and tier totals</u> for each category in the table above. <u>Use duplicate pages for RO and SRO-only exams.</u></p> <p>9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, importance ratings, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.</p>																		

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO / SRO)						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	#
000007 (BW/E02&E10; CE/E02) Reactor Trip - Stabilization - Recovery / 1									0
000008 PZR Vapor Space Accident / 3				R			AA1.04: Ability to operate and/or monitor the following as they apply to the Pressurizer Vapor Space Accident: Feedwater pumps	2. 8	1
000009 Small Break LOCA / 3					R		EA2.15: Ability to determine or interpret the following as they apply to a small break LOCA: RCS parameters	3. 3	1
000011 Large Break LOCA / 3					S		EA2.05: Ability to determine or interpret the following as they apply to a Large Break LOCA: Significance of CCP operation	3. 7	1
000015/17 RCP Malfunctions / 4	R						AK1.01: Knowledge of the operational implications of the following concepts as they apply to Reactor Coolant Pump Malfunctions (Loss of RC Flow): Natural circulation in a nuclear reactor power plant	4. 4	1
000022 Loss of Rx Coolant Makeup / 2	R						AK1.03: Knowledge of the operational implications of the following concepts as they apply to Loss of Reactor Coolant Pump Makeup: Relationship between charging flow and PZR level	3. 0	1
000025 Loss of RHR System / 4			R				AK3.01: Knowledge of the reasons for the following responses as they apply to the Loss of Residual Heat Removal System: Shift to alternate flowpath	3. 1	1
000026 Loss of Comp. Cooling Water / 8			R				AK3.02: Knowledge of the reasons for the following responses as they apply to the Loss of CCW System: automatic alignments of CCW resulting from ESFAS	3. 6	1
000027 Pressurizer Pressure Control System Malfunction / 3	R				S		AK1.02: Knowledge of the operational implications of the following concepts as they apply to Pressurizer Pressure Control Malfunctions: Expansion of liquids as temperature increases AA2.16: Ability to determine and interpret the following as they apply to the Pressurizer Pressure Control Malfunctions: Actions to be taken if PZR pressure instrument fails low	2. 8 3. 9	1/1
000029 ATWS / 1			R		S		EK3.11: Knowledge of the reasons for the following responses as they apply to the ATWS: Initiating emergency boron. EA2.01: Ability to determine or interpret the following as they apply to a ATWS: Reactor nuclear instrumentation	4. 2 4. 7	1/1
000038 Steam Gen. Tube Rupture / 3	R						EK1.02: Knowledge of the operational implications of the following concepts as they apply to SGTR: Leak rate vs Pressure Drop	3. 2	1
000040 (BW/E05; CE/E05; W/E12) Steam Line Rupture - Excessive Heat Transfer / 4		R					AK2.02: Knowledge of the interrelations between the Steam Line Rupture and the following: Sensors and detectors	2. 6	1
000054 (CE/E06) Loss of Main Feedwtr / 4				R			AA1.02: Ability to operate and/or monitor the following as they apply to the Loss of Main Feedwater (MFW): Manual startup of electric and steam-driven AFW pumps	4. 4	1
000055 Station Blackout / 6						R	G.2.1.24 :Ability to obtain and interpret station electrical and mechanical drawings	2. 8	1
000056 Loss of Off-site Power / 6				R			AA1.30: Ability to operate and/or monitor the following as they apply to the Loss of Offsite Power: AFW flow control valve operating switches	3. 5	1
000057 Loss of Vital AC Inst. Bus / 6			R			S	AK3.01: Knowledge of the reasons for the following responses as they apply to Loss of vital AC Inst bus: Actions contained in EOP for loss of vital inst bus G 2.2.29 : Knowledge of SRO fuel handling	4. 1	1/1

							responsibilities	3. 8	
000058 Loss of DC Power / 6		R			S		AK1.01: : Knowledge of the operational implications of the following concepts as they apply to Loss of Dc pwr: Battery charger equipment and instrumentation AA2.03 : Ability to determine and interpret the following as they apply to the Loss of DC Power: DC loads lost; impact on ability to operate and monitor plant systems	2. 8 3. 9	1/1
000062 Loss of Nuclear Svc Water / 4						R	G 2.1.8 : Ability to coordinate personnel activities outside the control room	3. 8	1
000065 Loss of Instrument Air / 8					S		A2.06 Ability to determine and interpret the following as they apply to Loss of Inst Air: When to trip reactor if instrument air pressure is decreasing	4. 2	1
W/E04 LOCA Outside Containment / 3					R		EA2.1: Ability to determine and interpret the following as they apply to the (LOCA Outside Containment) Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	3. 4	1
W/E11 Loss of Emergency Coolant Recirc. / 4									0
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4				R			EA1.3 : Ability to operate and/or monitor the following as they apply to the (Inadequate Heat Transfer): Desired operating results during abnormal and emergency situations.	3. 8	1
K/A Category Totals:	SRO RO	4	2	4	4	5 2	1 2	Group Point Total:	<u>6</u> 18

ES-401 2		PWR Examination Outline							Form ES-401-	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO / SRO)										
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#	
000001 Continuous Rod Withdrawal / 1	R						AK1.18: Knowledge of the operational implications of the following concepts as they apply to Continuous Rod Withdrawal: Fuel temperature coefficient	3. 4	1	
000003 Dropped Control Rod / 1									0	
000005 Inoperable/Stuck Control Rod / 1									0	
000024 Emergency Boration / 1		R					AK2.03: Knowledge of the interrelations between the Emergency Boration and the following: Controllers and positioners	2. 6	1	
000028 Pressurizer Level Malfunction / 2						S	G 2.1.12 : Ability to apply technical specifications for a system	4. 0	0/1	
000032 Loss of Source Range NI / 7			R				AK3.01: Knowledge of the reasons for the following responses as they apply to the Loss of Source Range Nuclear Instrumentation: Startup termination on source-range loss	3. 2	1	
000033 Loss of Intermediate Range NI / 7			R		S		AK3.02: Knowledge of the reasons for the following responses as they apply to the Loss of Intermediate Range Nuclear Instrumentation: Guidance contained in EOP for loss of intermediate-range instrumentation AA2.08: Ability to determine and interpret the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: intermediate-range channel operability	3. 6 3. 4	1/1	
000036 (BW/A08) Fuel Handling Accident / 8	R						AK1.03: Knowledge of the operational implications of the following concepts as they apply to Fuel Handling Incidents : Indications of approaching criticality	4. 0	1	
000037 Steam Generator Tube Leak / 3									0	
000051 Loss of Condenser Vacuum / 4									0	
000059 Accidental Liquid RadWaste Rel. / 9									0	
000060 Accidental Gaseous Radwaste Rel. / 9									0	
000061 ARM System Alarms / 7									0	
000067 Plant Fire On-site / 8					S		AA2.16: Ability to determine and interpret the following as they apply to Plant fire onsite: Vital equipment and controls to be maintained and operated during the fire.	4. 0	0/1	
000068 (BW/A06) Control Room Evac. / 8									0	
000069 (W/E14) Loss of CTMT Integrity / 5		R					AK2.03: Knowledge of the interrelations between the Loss of Containment Integrity and the following: Personnel access hatch and emergency access hatch	2. 9	1	
000074 (W/E06&E07) Inad. Core Cooling / 4									0	
000076 High Reactor Coolant Activity / 9					R		AA2.04: Ability to determine and interpret the following as they apply to the High Reactor Coolant Activity: Process effluent radiation chart recorder	2. 6	1	
W/E01 & E02 Rediagnosis & SI Termination / 3					S		EA2.1: Ability to determine and interpret the following as they apply to the SI	4.	0/1	

							Termination: Facility conditions and selection of appropriate procedures during abnormal and emergency	2	
W/E13 Steam Generator Over-pressure / 4									0
W/E15 Containment Flooding / 5					R		EA2.2: Ability to determine and interpret the following as they apply to the (containment Flooding): Adherence to appropriate procedures and operation within the limitations in the facility s license and amendments.	2.9	1
W/E16 High Containment Radiation / 9									0
BW/A01 Plant Runback / 1									0
BW/A02&A03 Loss of NNI-X/Y / 7									0
BW/A04 Turbine Trip / 4									0
BW/A05 Emergency Diesel Actuation / 6									0
BW/A07 Flooding / 8									0
BW/E03 Inadequate Subcooling Margin / 4									0
BW/E08; W/E03 LOCA Cooldown - Depress. / 4									0
BW/E09; CE/A13; W/E09&E10 Natural Circ. / 4									0
BW/E13&E14 EOP Rules and Enclosures									0
CE/A11; W/E08 RCS Overcooling - PTS / 4						R	G 2.1.32: Ability to explain and apply all system limits and precautions	3.4	1
CE/A16 Excess RCS Leakage / 2									0
CE/E09 Functional Recovery									0
K/A Category Point Totals: : SRO	2	2	2	0	3	1	Group Point Total:		4
RO					2	1			9

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 2/Group 1 (RO / SRO)										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								R				A2.05: 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: Effects of VCT pressure on RCP seal injection flow A2.02: 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: Conditions which exist for an abnormal shutdown of an RCP in comparison to a normal shutdown of an RCP	2. 5 3. 9	1/1
004 Chemical and Volume Control						R			R			A3.16: Ability to monitor automatic operation of the CVCS, including: Interpretation of emergency borate valve position indicating lights K6.20: Knowledge of the effect of a loss or malfunction on following CVCS components: function of the demineralizer	3. 8 2. 5	2
005 Residual Heat Removal		R										K2.03: Knowledge of bus power supplies to the following: RCS Pressure Boundary valves	2. 7	1
006 Emergency Core Cooling								R			S	A2.03: Ability to (a) predict the impacts of the following malfunctions or operations on the ECCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: System leakage G2.4.16: Knowledge of EOP implementation hierarchy and coordination with other support procedures	3. 3 4. 0	1/1
007 Pressurizer Relief/Quench Tank									R			A3.01: Ability to monitor automatic operation of the PRTS, including: Components which discharge to the PRT	2. 7	1
008 Component Cooling Water	R											K1.02: Knowledge of the physical connections and/or cause-effect relationships between the CCWS and the following systems: Loads cooled by CCWS	3. 3	1
010 Pressurizer Pressure Control									R		R	A3.02: Ability to monitor automatic operation of the PZR PCS, including: PZR Pressure G2.1.7: Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	3. 6 3. 7	2
012 Reactor Protection							R					A1.01: Ability to predict and/or monitor Changes in parameters (to prevent	2.	2

								R				exceeding design limits) associated with operating the RPS controls including: Trip setpoint adjustment A2.01: Ability to (a) predict the impacts of the following malfunctions or operations on the RPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Faulty bistable operation	9 3. 1	
013 Engineered Safety Features Actuation					R					R		K5.02: Knowledge of operational implications of following concepts as they apply to ESFAS: Safety system logic and reliability. A4.02: Ability to manually operate and/or monitor in the control room: Reset of ESFAS channels	2. 9 4. 3	2
022 Containment Cooling			R									K3.02: Knowledge of effect that loss or malfunction of CCS will have on following: Containment instrument readings	3. 0	1
025 Ice Condenser														0
026 Containment Spray										R		G2.4.17: Knowledge of EOP terms and definitions	3. 1	1
039 Main and Reheat Steam	R										S	K1.04: Knowledge of the physical connections and/or cause-effect relationships between the MRSS and the following systems: RCS temperature monitoring and control G 2.1.12: Ability to apply Technical Specifications for a system	3. 1 4. 0	1/1
059 Main Feedwater			R							R		K3.04: Knowledge of the effect that a loss or malfunction of the MFW will have on the following: RCS A4.01: Ability to manually operate and monitor in the control room: MFW turbine trip indication	3. 6 3. 1	2
061 Auxiliary/Emergency Feedwater				R		R						K3.01: Knowledge of the effect that a loss or malfunction of the AFW will have on the following: RCS K5.02: Knowledge of operational implications of following concepts as they apply to AFW: Decay heat sources and magnitude.	4. 4 3. 2	2
062 AC Electrical Distribution					R					R		K4.03: Knowledge of AC dist. system design features/interlocks which provide for the following: Interlocks between automatic bus transfers and breakers A4.01: Ability to manually operate and/or monitor in the control room: All breakers including switchyard	2. 8 3. 3	2
063 DC Electrical Distribution					R						S	K4.04: Knowledge of DC electrical system design feature(s) and/or interlock(s) which provide for the following: Trips G2.4.20 Knowledge of operational implications of EOP warnings, cautions, and notes.	2. 6 4. 0	1/1
064 Emergency Diesel Generator					R							K4.04: Knowledge of EDG system design features and/or interlocks which provide for the following: Overload ratings K6.07: Knowledge of loss or malfunction of the following will have on EDG	3. 1 2. 7	2

															system: Air receivers		
073 Process Radiation Monitoring								R							A1.01: Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the PRM system controls including: Radiation levels	3.2	1
076 Service Water		R													K2.01: Knowledge of bus power supplies to the following: Service water	2.7	1
078 Instrument Air									S						A2.01: Ability to (a) predict the impacts of the following mal-functions or operations on the IAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Air dryer and filter malfunctions	2.9	0/1
103 Containment													R		G2.3.10 Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure	2.9	1
K/A Category Point Totals: SRO	2	2	3	3	2	2	2	2	3	3	3	3	3		Group Point Total:		5 28
RO																	

PWR Examination Outline															Form ES-401-2		
Emergency and Abnormal Plant Evolutions - Tier 2/Group 2 (RO / SRO)																	
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		R										K2.02 Knowledge of bus power supplies to the following: One line diagram of power supply to trip breakers			3.6	1	
002 Reactor Coolant									R			A3.01: Ability to monitor automatic operation of the RCS, including: Reactor coolant leak detection system			3.7	1	
011 Pressurizer Level Control							R					A1.02: Ability to predict and/or monitor changes in parameters(to prevent exceeding design limits) associated with operating the PZR LCS controls including: Charging and letdown flows			3.3	1	
014 Rod Position Indication																0	
015 Nuclear Instrumentation						R						K6.02: Knowledge of the effect of a loss or malfunction on the following will have on NIS: Discriminator/compensation circuits			2.6	1	
016 Non-nuclear Instrumentation																0	
017 In-core Temperature Monitor								S				A2.02: Ability to (a) predict the impacts of the following malfunctions or operations on the ITM system; and(b) based on those predictions, use procedures to correct, control or mitigate the consequences of those malfunctions or operations: Core damage			4.1	0/1	
027 Containment Iodine Removal																0	
028 Hydrogen Recombiner and Purge Control																0	
029 Containment Purge																0	
033 Spent Fuel Pool Cooling																0	

[illegible]

ES-401 <u>3</u>		Generic Knowledge and Abilities Outline (Tier 3)			Form ES-401- 	
Facility:		Date of Exam:				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
<u>1.</u> Conduct of Operations	2.1.2	Knowledge of Operator responsibilities during all modes	3.0	1		0
	2.1.3	Knowledge of shift turn-over practices	3.0	1		0
	2.1.32	Ability to explain/apply system limits/precaut.	3.4	1	3.8	1
	2.1.7	Ability to evaluate plant performance and make judgments		0	4.4	1
	Subtotal		3		2	
<u>2.</u> Equipment Control	2.2.3	Knowledge of design/procedure differences between units	3.1	1	3.3	1
	2.2.22	Knowledge of LCO's and Safety Limits		0	4.1	1
	2.2.12	Knowledge of surveillance procedures	3.0	1		0
	2.2.13	Knowledge of tagging/clearance procedures	3.6	1		0
	2.2.					
	Subtotal		3		2	
	2.3.1	Knowledge of 10CFR20	2.6	1		0
	2.3.4	Knowledge of radiation exposure limits/containment control		0	3.1	1

3.	Radiation Control	Subtotal		1		1	
4.	Emergency Procedures / Plan	2.4.1	Knowledge of EOP entry conditions	4.3	1		0
		2.4.3	Ability to identify post-accident instruments	3.5	1		0
		2.4.49	Ability to perform w/o reference immediate actions	4.0	1		0
		2.4.6	Knowledge of symptom based EOP strategies		0	4.0	1
		2.4.44	Knowledge of E-plan PAR's		0	4.0	1
		Subtotal		3		2	
Tier 3 Point Total				10	10	7	7

Tier / Group	Randomly Selected K/A	Reason for Rejection
1/1	026.K2	No K2 K/A's exist, random select of K3.02 as replacement
1/1	E38.K2	No K2 K/A's exist > 2.5, replaced with K1.02
1/1	A57.K1	No K1 K/A's exist > 2.5, replaced with K3.01
1/1	A58.K2	No K2 K/A's exist > 2.5, replaced with K1.01
1/2	BW/A07.A2	CPSES is Westinghouse, selected W/E15 A2 (RO)
1/2	BW/E13.A2	CPSES is Westinghouse, selected W/E02 A2 (sRO)
2/1	022.K5	No K2 K/A's exist > 2.5, replaced with K3.02
2/1	025.K5	No Ice condenser exits at CPSES, replaced with 061.K5
2/1	039.K3	Too many K3's, removed from outline to balance tiers
2/1	064.K5	No K5 K/A's exist > 2.5, replaced with K3
2/1	076.K6	No K6 K/A's exist > 2.5, replaced with 064.K6
2/2	079.k3	No K3 K/A's exist > 2.5, replaced with 001.K2
2/2	034.K2	No K2 K/A's exist > 2.5, replaced with K1
2/2	072.K1	Shifted to K3 to balance tiers
1/1	011.A2.12	N/A for CPSES, replaced with A2.05
1/1	029.EK3.04	N/A for CPSES, replaced with EK3.11
1/1	062.AA2.01	No SRO knowledge, replaced with 065.A2.06
1/2	001.AK1.13	IR was too low at 2.4, replaced with AK1.18
1/2	0033.AA2.02	No SRO knowledge, replaced with AA2.08
1/2	0061.AA2.01	No SRO knowledge, replaced with 0067.AA2.16
2/1	0003.AA2.04	Point value too low for RO, replaced with A2.05
2/1	00010.A3.01	PORV testing no impact-block vlv used, replaced with A3.02
2/1	00078.K6.01	No value > 2.2, select 0004.K6.20 for replacement
2/1	00062.A4.02	N/A for CPSES, select 0062.A4.01 for replacement
2/2	00045.A2.11	K/A <2.5, select A2.17 for replacement
2/2	00055.K4.02	All CARS <2.5, select 0068.K4.01 for replacement
2/2	00073.K1.03	N/A for CPSES, select K1.01 for replacement
2/2	0034.A2.02	No value for CPSES, selected A2.01

There were no draft outline comments for the written or operating exam outlines for the CPSES initial exam in March of 2005. The exam report did not document this fact because there is no mention of this in NUREG-1021 for cases where there are no comments or issues with the outline. It is documented here for improved package clarity for auditing purposes.

Kelly Clayton, Chief Examiner. Jan 11, 2007