ES-401 **PWR Examination Outline** **Form ES-401-2**

Facility: DCPP **Date of Exam: 11/07**

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	K	A	A 2	G *	Total
1. Emergency & Abnormal Plant Evolutions	1	1	2	6	N/A			6	1	N/A		2	18			3	3	6
	2	1	2	0				2	2			2	9			4	0	4
	Tier Totals	2	4	6				8	3			4	27			7	3	10
2. Plant Systems	1	3	3	4	2	0	1	3	3	3	4	2	28			2	3	5
	2	1	1	0	2	2	2	0	1	0	0	1	10			3	0	3
	Tier Totals	4	4	4	4	2	3	3	4	3	4	3	38			5	3	8
3. Generic Knowledge and Abilities Categories		1			2			3			4		10	1	2	3	4	
		3			3			2			2			2	1	2	2	7

Note:

1. Ensure that at least two topics from every K/A category are sampled within each tier of the RO and SRO only outlines (i.e., except for one category in Tier 3 of the SRO only outline, the "Tier Totals" in each K/A category shall not be less than two).
2. The point 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.
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 the elimination of inappropriate K/A systems.
4. Select topics from many systems as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
5. Absent a plant-specific priority, only those K/As having an importance rating (IR) or 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
6. Select SRO topics for Tiers 1 and 2 from the shaded systems and the K/A catalog.
7. The generic (G) K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system.
8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IR) 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 the 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 (Note 1 does not apply). Use duplicate pages for RO and SRO-only exams.
9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#)on the Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

PWR Examination Outline
Emergency and Abnormal Plant Evolutions – Tier 1/Group 1 (RO/SRO)

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic	IR	#	
000007 Reactor Trip – Stabilization – Recovery / 1			R				Knowledge of the reasons for the following responses as they apply to a Reactor Trip: Actions contained in the EOP for Rx Trip.	4.0	EK3.01	1
000007 Reactor Trip – Stabilization – Recovery / 1					S		Ability to determine or interpret the following as they apply to a reactor trip: Reactor Trip first-out indication.	3.9	EA2.05	S-1
000008 Pressurizer Vapor Space Accident / 3			R				Knowledge of the reasons for the following responses as they apply to the PZR vapor space accident: Why PORV or code safety exit temperature is below RCS or PZR temperature.	3.6	AK3.02	2
000009 Small Break LOCA / 3	R						Knowledge of the operational implications of the following concepts as they apply to the small break LOCA: Natural circ. and cooling including reflux boiling.	4.2	EK1.01	3
000009 Small Break LOCA / 3						S	Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.	4.0	2.4.22	S-2
000011 Large Break LOCA / 3										
000015/17 RCP Malfunctions / 4			R				Knowledge of the reasons for the following responses as they apply to the RCP malfunctions (loss of RC flow): SOE for manually tripping the reactor and RCP as a result of RCP malfunction.	3.7	AK3.03	4
000022 Loss of Rx Coolant Makeup / 2				R			Ability to operate and/or monitor the following as they apply to the Loss of RC~~A~~ Makeup: Speed demand controller and running indicators (positive displacement pump)	3.3	AA1.04	5
000025 Loss of RHR System / 4		R					Knowledge of the interrelations between the loss of the RHRS and the following: LPI or Decay Heat Removal/RHR pumps.	3.2	AK2.02	6
000026 Loss of Component Cooling Water / 8			R				Knowledge of the reasons for the following responses as they apply to the Loss of CCW: The automatic actions (alignments) within the CCWS resulting from the actuation of the ESFAS.	3.6	AK3.02	7
000026 Loss of Component Cooling Water / 8					S		Ability to determine or interpret the following as they apply to loss of Component Cooling Water System: The length of time after the loss of CCW flow to a component before that component may be damaged.	3.1	AA2.06	S-3
000027 Pressurizer Pressure Control System Malfunction / 3										
000029 ATWS / 1					R		Ability to determine or interpret the following as they apply to an ATWS: Main Turbine trip switch position indication.	3.8	EA2.06	8

000029 ATWS / 1						S	Knowledge of the parameters and logic used to assess the status of safety functions including: 1. Reactivity Control, 2. Core cooling and heat removal, 3. RCS Integrity, 4. Containment conditions, & 5. radioactivity release control.	4.3	2.4.21	S4
000038 Steam Gen. Tube Rupture / 3						R	Ability to control radiation releases.	2.7	2.3.11	9
000040 W/E12, Steam Line Rupture /4				R			Ability to operate and/or monitor the following as they apply to the Steam Line Rupture: AFW System	4.1	AA1.10	10
000055 Station Blackout / 6				R			Ability to operate and/or monitor the following as they apply to a station blackout: Manual EDG start.	4.3	EA1.02	11
000056 Loss of Off-site Power / 6				R			Ability to operate and/or monitor the following as they apply to the Loss of Offsite power: Auxiliary/emergency feedwater pump (motor driven)	4.3	AA1.10	12
000056 Loss of Off-site Power / 6						S	Knowledge of EOP implementation hierarchy and coordination with other support procedures.	4.0	2.4.16	S-5
000057 Loss of Vital AC Inst. Bus / 6				R			Ability to operate and/or monitor the following as they apply to the Loss of Vital AC Instrument Bus: Manual control of PZR level.	3.8	AA1.02	13
000058 Loss of DC Power / 6					S		Ability to determine or interpret the following as they apply to the loss of DC power: 125V dc bus voltage, low/critical low, alarm.	3.6	AA2.02	S-6
000062 Loss of Nuclear Svc Water / 4			R				Knowledge of the reasons for the following responses as they apply to the Loss of Nuclear Service Water: Guidance action contained in the EOP for loss of nuclear service water.	4.0	AK3.03	14
000065 Loss of Instrument Air / 8				R			Ability to operate and/or monitor the following as they apply to Loss of Instrument Air: Emergency Air compressor.	3.5	AA1.04	15
W/E04 LOCA Outside Containment / 3		R					Knowledge of the interrelations between the LOCA Outside CTMT and the following: Components and functions of control and safety systems including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.5	EK2.1	16
W/E11 Loss of Emergency Coolant Recirculation / 4						R	Generic, Emergency Procedures/Plan: Ability to verify that the alarms are consistent with the plant conditions.	3.5	2.4.46	17
W/E05 Loss of Secondary Heat Sink /4			R				Knowledge of the reasons for the following responses as they apply to the Loss of Secondary Heat Sink: Normal, abnormal, and emergency operating procedures associated with Loss of Sec. Heat Sink.	3.7	EK3.2	18
K/A Category Totals:	1	2	6	6	1 / 3	2 / 3	Group Point Total:		18/6	

PWR Examination Outline 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	IR	#	
000001 Continuous Rod Withdrawal / 1					R		Ability to determine and interpret the following as they apply to continuous rod withdrawal: uncontrolled rod withdrawal from available indications.	4.4	AA2.05	19
000003 Dropped Control Rod / 1										
000005 Inoperable/Stuck Control Rod / 1					S		Ability to determine and interpret the following as they apply to the inoperable / stuck control rod: Required actions if more than one rod is stuck or inoperable.	4.4	AA2.03	5-7
000024 Emergency Boration / 1										
000028 Pressurizer Level Malfunction / 2										
000032 Loss of Source Range NI / 7		R					Knowledge of the interrelations between the loss of source range nuclear instrumentation and the following: power supplies including proper switch positions.	2.7	AK2.01	20
000033 Loss of Intermediate Range NI / 7										
000036 (BW/A08) Fuel Handling Accident / 8										
000037 Steam Generator Tube Leak / 3										
000051 Loss of Condenser Vacuum / 4				R			Ability to operate and/or monitor the following as they apply to the loss of condenser vacuum: rod position.	2.5	AA1.04	21
000059 Accidental Liquid Rad Waste Release / 9						R	Ability to control radiation releases.	2.7	2.3.11	22
000060 Accidental Gaseous Rad Waste Release / 9										
000061 ARM System Alarms / 7										
000067 Plant Fire On-site / 8					R		Ability to determine and interpret the following as they apply to the plant fire on site: vital equipment and control systems to be maintained and operated during a fire.	3.3	AA2.16	23

000068 (BW/A06) Control Room Evac. / 8									
000069 (W/E14) Loss of CTMT Integrity / 5									
000074 (W/E06&E07) Inad. Core Cooling / 4									
000076 High Reactor Coolant Activity / 9						R	Knowledge of limiting conditions for operations and safety limits.	3.4	2.2.22
W/E01 & E02 Rediagnosis & SI Termination / 3									
W/E13 Steam Generator Over-pressure / 4					S		Ability to determine and interpret the following as they apply to the (Steam Generator Overpressuure): Adherence to the appropriate procedures and operation within the limitations in the facility's license and amendments. Rev. 2	3.4 Rev. 2	EA2.1 Rev. 2
W/E15 Containment Flooding / 5					S		Ability to determine and interpret the following as they apply to the (Containment flooding): Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	3.2	EA2.1
W/E16 High Containment Radiation / 9	R						Knowledge of the operational implications of the following concepts as they apply to the (high containment radiation): annunciators and conditions indicating signals, and remedial actions associated with the (high containment radiation).	3.0	EK1.3
W/E03 LOCA Cooldown – Depress. / 4		R					Knowledge of the interrelations between the (LOCA cool down and depressurization) 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.	3.7	EK2.2
W/E09&E10 Natural Circ. / 4				R			Ability to operate and/or monitor the following as they apply to the (natural circulation with steam void in vessel with/without RVLIS): components and functions of control and safety systems including instrumentation, signals, interlocks, failure modes, and automatic and manual features.	3.8	EA1.1
W/E08 RCS Overcooling – PTS / 4					S		Ability to operate and/or monitor the following as they apply to the (Pressurized Thermal Shock). Adherence to appropriate procedures and operation within the limitations in facility's license and amendments. Rev. 2	4.1 Rev. 2	EA2.2 Rev. 2
K/A Category Point Totals:	1	2	0	2	2 / 4	2	Group Point Total:		9/4

PWR Examination Outline
Plant Systems – Tier 2/Group 1 (RO/SRO)

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#	
003 Reactor Coolant Pump	R											Knowledge of the physical connections and/or cause-effect relationships between the RCPS and the following: RCS.	3.0	K1.10	28
003 Reactor Coolant Pump								S				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 fluctuation of VCT pressure on RCP seal leakoff flows.	2.8	A2.04	5-1
004 Chemical and Volume Control			R									Knowledge of the effect that a loss or mal-function of the CVCS will have on the following: RCPS.	3.7	K3.04	29
004 Chemical and Volume Control						R						Knowledge of the effect of a loss or malfunction on the following CVCS components: Letdown pressure control to prevent RCS coolant from flashing to steam in letdown piping.	2.9	K6.36	30
005 Residual Heat Removal							R					Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RHRS controls including: Heatup/cooldown rates	3.5	A1.01	31
006 Emergency Core Cooling									R			Ability to monitor automatic operation of the ECCS, including: Pumps.	4.1	A3.02	32
007 Pressurizer Relief/Quench Tank								S				Ability to (a) predict the impacts of the following malfunctions or operations on the PRTS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Abnormal pressure in the PRT.	3.2	A2.02	5-1
007 Pressurizer Relief / Quench Tank											R	Ability to interpret control room indications to verify the status and operation of the system, and understand how operator actions and directives affect plant and system conditions.	3.5	2.4.48	33
008 Component Cooling Water							R					Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the CCWS controls including: CCW flow rate.	2.8	A1.01	34
010 Pressurizer Pressure Control		R										Knowledge of the bus power supplies to the following: Controller for PZR spray valve.	2.5	K2.02	35
010 Pressurizer Pressure Control									R			Ability to monitor automatic operation of the PZR PCS, including: PRT temperature and pressure during PORV testing.	3.0	A3.01	36

012 Reactor Protection							R					Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the RPS controls including: Trip setpoint adjustment.	2.9	A1.01	37
012 Reactor Protection											S	Ability to apply Technical Specifications for a system.	4.0	2.1.12	5-13
013 Engineered Safety Features Actuation		R										Knowledge of the bus power supplies to the following: ESFAS/safeguards equipment control.	3.6	K2.01	38
013 Engineered Safety Features Actuation			R									Knowledge of the effect that a loss or malfunction of the ESFAS will have on the following: RCS	4.3	K3.02	39
022 Containment Cooling								R				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: Loss of service water.	2.9	A2.04	40
026 Containment Spray			R									Knowledge of the effect that a loss or malfunction of the CSS will have on the following: CCS	3.9	K3.01	41
039 Main and Reheat Steam										R		Ability to manually operate and/or monitor in the control room: MFW pump turbines	2.8	A4.03	42
059 Main Feedwater			R									Knowledge of the effect that a loss or malfunction of the MFW will have on the following: AFW system.	3.6	K3.02	43
059 Main Feedwater										R		Ability to manually operate and/or monitor in the control room: MFW turbine trip indication.	3.1	A4.01	44
061 Auxiliary/Emergency Feedwater	R											Knowledge of the physical connections and/or cause-effect relationships between the AFW and the following systems: Main steam system.	3.5	K1.03	45
061 Auxiliary/Emergency Feedwater				R								Knowledge of the AFW design feature(s) and/or interlock(s) which provide for the following: AFW recirculation.	2.7	K4.08	46
062 AC Electrical Distribution								R				Ability to (a) predict the impacts of the following malfunctions or operations on the AC distribution system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Consequences of improper sequencing when transferring to or from an inverter.	2.9	A2.03	47
062 AC Electrical Distribution											R	Ability to manipulate the console controls as required to operate the facility between shutdown and designated power levels.	4.0	2.2.2	48
063 DC Electrical Distribution										R		Ability to manually operate and/or monitor in the control room: battery discharge rate.	3.0	A4.03	49

063 DC Electrical Distribution											S	Knowledge of the process for making changes in the facility as described in the safety analysis report.	2.7	2.2.5	S-1
064 Emergency Diesel Generator											S	Knowledge of the bases in Technical Specifications for limiting conditions for operations and safety limits.	3.7	2.2.25	S-1
064 Emergency Diesel Generator				R								Knowledge of ED/G system design feature(s) and / or interlock(s) which provide for the following: Automatic load sequencer: blackout.	3.5	K4.10	S[illegible]
073 Process Radiation Monitoring	R											Knowledge of the physical connections and/or cause-effect relationships between the PRM system and the following systems: Those systems served by PRMs.	3.6	K1.01	S1
073 Process Radiation Monitoring										R		Ability to manually operate and/or monitor in the control room: Check source for operability demonstration.	3.1	A4.03	S2
076 Service Water								R				Ability to (a) predict the impacts of the following malfunctions or operations on the SWS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Service water header pressure.	~~3.5~~ 2.7	A2.02	S3
078 Instrument Air		R										Knowledge of the bus power supplies to the following: Instrument air compressor.	2.7	K2.01	S4
103 Containment									R			Ability to monitor automatic operation of the containment system: including containment isolation.	3.9	A3.01	S5
K/A Category Point Totals:	3	3	4	2	0	1	3	3	3	4 / 2	2 / 3	Group Point Total:		28/5	

PWR Examination Outline Plant Systems – 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															
002 Reactor Coolant															
011 Pressurizer Level Control				R								Knowledge of PZR LCS design feature(s) and/or interlock(s) which provide for the following: letdown isolation.	3.3	K4.06	S6

014 Rod Position Indication								S				Ability to (a) predict the impacts of the following malfunctions or operations on the RPIS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Misaligned Rod	3.9	A2.04	S-1
015 Nuclear Instrumentation															
016 Non-nuclear Instrumentation					R							Knowledge of the operational implication of the following concepts as they apply to the NNIS: separation of control and protection circuits.	2.7	K5.01	57
017 In-core Temperature Monitor															
027 containment Iodine Removal															
028 Hydrogen Recombiner and Purge Control						R						Knowledge of the effect of a loss or malfunction on the following will have on the HRPS: hydrogen recombiners.	2.6	K6.01	58
029 Containment Purge															
033 Spent Fuel Pool Cooling															
034 Fuel Handling Equipment						R						Knowledge of the effect of a loss or malfunction on the following will have on the fuel handling system: radiation monitoring systems.	2.6	K6.02	59
035 Steam Generator											R	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.0	2.4.49	60
041 Steam Dump/Turbine Bypass Control					R							Knowledge of the operational implications of the following concepts as they apply to the SDS: use of steam tables for saturation temperature and pressure.	2.5	K5.02	61
045 Main Turbine Generator															
055 Condenser Air Removal															
056 Condensate								R				Ability to (a) predict the impacts of the following malfunctions or operations on the condensate system: and (b) based on those predictions use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: loss of condensate pumps.	2.6	A2.04	62
056 Condensate								S				Ability to (a) predict the impacts of the following malfunctions or operations on the condensate system: and (b) based on those predictions use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Condenser tube leakage.	2.5	A2.05	S-17
068 Liquid Radwaste															

071 Waste Gas Disposal								S				Ability to (a) predict the impacts of the following malfunctions or operations on the Waste Gas Disposal System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Use of waste gas release monitor, radiation, gas flow rate and totalizer.	3.6	A2.02	STR
072 Area Radiation Monitoring															
075 Circulating Water		R										Knowledge of bus power supplies to the following: emergency/essential SWS pumps.	2.6	K2.03	63
079 Station Air	R											Knowledge of the physical connections and/or cause-effect relationships between the SAS and the following systems: IAS.	3.0	K1.01	64
086 Fire Protection				R								Knowledge of the design feature(s) and/or interlock(s) which provide for the following: personnel safety.	3.1	K4.04	6
K/A Category Point Totals:	1	1	0	2	2	2	0	1 / 3	0	0	1	Group Point Total:		10/3	

ES-401 Generic knowledge and Abilities Outline (Tier 3) Form ES-401-3

Facility: DCPP **Date of Exam: 11/07**

Category	K/A #	Topic	RO IR.	RO #	SRO-Only IR	SRO-Only #	
1. Conduct of Operations	2.1.6	Ability to supervise and assume a management role during plant transients and upset conditions.			4.3	X	S-19
	2.1.11	Knowledge of less than one hour technical specification action statements for systems.	3.0	X	3.8		66
	2.1.17	Ability to make accurate, clear and concise verbal reports.	3.5	X	3.6		67
	2.1.33	Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	3.4	X	4.0		68
	2.1.34	Ability to maintain primary and secondary plant chemistry within allowable limits.			2.9	X	S-20
	Subtotal			3		2	
2. Equipment Control	2.2.3	(multi-unit) Knowledge of the design, procedural and operational differences between units	3.1	X	3.3		69
	2.2.12	Knowledge of surveillance procedures	3.0	X	3.4		70
	2.2.29	Knowledge of SRO fuel handling responsibilities.			3.8	X	S-2
	2.2.30	Knowledge of RO duties in the control room during fuel handling such as alarms from fuel handling area, communication with fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.	3.5	X	3.3		71
	Subtotal			3		1	
3. Radiation Control	2.3.2	Knowledge of facility ALARA program.			2.9	X	S-22
	2.3.3	Knowledge of SRO responsibilities for auxiliary systems that are outside the control room (e.g., waste disposal and handling systems).			2.9	X	S-23
	2.3.9	Knowledge of the process for performing a containment purge.	2.5	X	3.4		72
	2.3.11	Ability to control radiation releases.	2.7	X	3.2		73
	Subtotal			2		2	
4. Emergency Procedures / Plan	2.4.5	Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.			3.6	X	S-24
	2.4.34	Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications.	3.8	X	3.6		75
	2.4.35	Knowledge of local auxiliary operator tasks during emergency operations including system geography and system implications.	3.3	X	3.5		74
	2.4.48	Ability to interpret control room indications to verify the status and operation of system, and understand how operator actions and directives affect plant and system conditions.			3.8	X	S-25
	Subtotal			2		2	
Tier 3 Point Total				10		7	