ES-401 PWR Examination Outline Form ES-401 2																		
Facility: Calvert Cliffs Date of Exam: December 08, 2008																		
					F	<u> 10 K</u>		ateg	ory F	Point	s				SI	<u> 20-0</u> r	nly Poir	nts
Tier	Group	К 1	К 2	К 3	К 4	К 5	К 6	A 1	A 2	A 3	A 4	G *	Total	, 	42	(G*	Total
1.	1	3	3	3				3	3			3	18		3		3	6
Emergency & Abnormal	2	1	1	2		N/A		2	2	N	/A	1	9		2		2	4
Plant Evolutions	Tier Totals	4	4	5				5	5			4	27		5		5	10
	1	3	2	3	3	2	2	3	3	2	2	3	28		3		2	5
2. Plant	2	1	1	1	1	0	1	1	1	1	1	1	10	0	2		1	3
Systems	Tier Totals	4	3	4	4	2	3	4	4	3	3	4	38		5		3	8
3. Generic Knowledge and Abilities 1 2 3 4 10 1 2 3 4 7														7				
Categories 3 2 3 2 1 2 7																		
Note: 1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO- only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).																		
2.	The point total for for each group a must total 75 poi	or ead ind tie ints a	ch gro er ma nd th	oup a y dev e SR	nd tie /iate l O-on	er in ti by ±1 ly exa	he pro from am m	opose that ust to	ed ou speci otal 2	tline ified i 5 poii	must n the nts.	matc table	h that spe based on	cified i NRC	n the ta revision	ble. s. The	The fin final R	al point total O exam
3.	Systems/evolutio at the facility sho on the outline sh K/A statements.	ons wi buld b hould	thin e be del be ac	ach g leted lded.	and j Ref	are io ustific er to	dentifi ed; oj Secti	ied or berati on D.	n the a ionall 1.b o	assoc y imp f ES-	iated ortan 401 f	outlin it, site or gu	ne; systems e-specific s idance reg	s or eve system jarding	olutions s/evolut the elir	that do tions th ninatio	not app nat are r n of ina	oly not included ppropriate
4.	Select topics from selecting a seco	m as nd to	many pic fo	y syst r any	tems v syst	and e em o	evolu r evol	tions lution	as po	ossibl	e; sa	mple	every syst	em or	evolutio	on in th	e group	before
5.	Absent a plant-s the RO and SRC	pecifi) ratii	ic prio ngs fo	ority, o	only f RO a	those and S	K/As RO-0	s havi only p	ng ar portio	n imp ns, re	ortan spec	ce rat tively	ting (IR) of	2.5 or	higher	shall b	e selec	ted. Us∉
6.	Select SRO topic	s for	Tiers	1 an	d 2 fr	rom th	ne sh	aded	syste	ems a	nd K	/A ca	tegories.					
7.*	The generic (G) I to the applicable	K/As evol	in Tie ution	ers 1 a or sy	and 2 stem	shal . Rei	l be s fer to	elect Sect	ed fro	om Se .1.b c	ection of ES	1 2 of -401 1	the K/A C for the app	atalog licable	, but the e K/As.	e topics	s must	be relevar
8.	 The generic (G) K/As in thers 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. Refer to Section D.1.b of ES-401 for the applicable K/As. 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 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams. 																	
9.	For Tier 3, select and point totals (t topi (#) or	cs fro n Forr	om Se n ES	ectior -401-	n 2 of -3. Li	the M mit S	(/A ca RO s	atalog elect), and ions t	l ente o K/A	er the As tha	K/A numb It are linke	ers, de d to 10	escriptic) CFR 5	ons, IR: 5.43.	S,	

ES-401	ation Outline F	orm E	<u>S-401-2</u>						
ES-401 Emergency	and	Abno		PW al P	/R Ex lant E	amin Volut	ation Outline ions - Tier 1/Group 1- Reactor Operator	Form E	S-401-2
E/APE # / Name / Safety Function	К 1	к 2	к 3	A 1	A 2	G	K/A Topic(s)	IR	#
000007 (CE/E02) Reactor Trip - Stabilization - Recovery / 1		x					EK2.03 - Reactor trip status panel	3.5	
000008 Pressurizer Vapor Space Accident / 3	x						AK1.02 - Change in leak rate with change in pressure	3.1	
000009 Small Break LOCA / 3			x				EK3.26 - Maintenance of RCS subcooling	4.4	
000011 Large Break LOCA / 3						x	2.2.44 – Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.	4.2	
000015/17 RCP Malfunctions / 4		x					AK2.07 - RCP seals	2.9	
000022 Loss of Rx Coolant Makeup / 2				x			AA1.03 - PZR level trend	3.2	
000025 Loss of RHR System / 4	x						AK1.01 - Loss of RHRS during all modes of operation	3.9	
000026 Loss of Component Cooling Water / 8						x	2.2.40 - Ability to apply technical Specifications for a system.	3.4	
000029 ATWS / 1	1			x			EA1.08 – Reactor trip switch pushbutton	4.5	
000038 Steam Gen. Tube Rupture / 3	x						EK1.01 - Use of steam tables	3.1	
000040 (CE/E05) Steam Line Rupture - Excessive Heat Transfer / 4						x	2.4.45 – Ability to prioritize and interpret the significance of each annunciator or alarm.	4.1	
000054 (CE/E06) Loss of Main Feedwater / 4			x				EK3.3 – Manipulation of controls required to obtain desired operating results during abnormal and emergency situations.	3.2	
000055 Station Blackout / 6			x				EK3.02 - Actions contained in EOP for loss of offsite and onsite power	4.3	
000056 Loss of Off-site Power / 6					x		AA2.73 - PZR heater on/off	3.5	
000057 Loss of Vital AC Inst. Bus / 6				x			AA1.06 - Manual control of components for which automatic control is lost	3.5	
000058 Loss of DC Power / 6					x		AA2.01 - That a loss of dc power has occurred; verification that substitute power sources have come on line	3.7	
000065 Loss of Instrument Air / 8					x		AA2.01 - Cause and effect of low-pressure instrument air alarm	2.9	
000077 Generator Voltage and Electric Grid Disturbances / 6		x				-	AK2.06 - Reactor power	3.9	
K/A Category Totals:	3	3	3	3	3	3	Group Point Total:	18	

ES-401

PWR Examination Outline

Form ES-401-2

ES-401 PWR Examination Outline Form ES-401-2 Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 – Reactor Operator											
E/APE # / Name / Safety Function	К 1	K 2	к 3	A 1	A 2	G	K/A Topic(s)	IR	#		
000059 Accidental Liquid RadWaste Rel. / 9					x		AA2.02 The permit for liquid radioactive waste release	2.9			
000061 ARM System Alarms / 7			x				AK3.02 - Guidance contained in alarm response for ARM system	3.4			
000067 Plant Fire On-site / 8						x	2.2.42 - Ability to recognize system parameters that are entry-level conditions for Technical Specifications	3.9			
000068 (BW/A06) Control Room Evac. / 8		x					AK2.02 - Reactor trip system	3.7			
000069 (W/E14) Loss of CTMT Integrity / 5				x			AA1.03 - Fluid systems penetrating containment	2.8			
000074 (W/E06&E07) Inad. Core Cooling / 4					x		EA2.06 - Changes in PZR level due to PZR steam bubble transfer to the RCS during inadequate core cooling	4.0			
CE/A13 - Natural Circ. / 4		x					AK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.0			
CE/A16 Excess RCS Leakage / 2	x						AK1.2 - Normal, abnormal and emergency operating procedures associated with (Excess RCS Leakage)	3.0			
CE/E09 Functional Recovery				x			EA1.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	4.2			
K/A Category Point Totals:	1	2	1	2	2	1	Group Point Total:	9			

ES-401

PWR Examination Outline

Form ES-401-2

ES-401 PWR Examination Outline Form ES-401-2 Plant Systems - Tier 2/Group 1- Reactor Operator														
System # / Name K K K K K K A A A A G K/A Topic(s) 003 Reactor Coolant Pump X X X X X K6.14 – Starting Requirements								K/A Topic(s)	IR	#				
003 Reactor Coolant Pump	-					x		_				K6.14 – Starting Requirements	2.6	
003 Reactor Coolant Pump											x	2.1.31 - Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.	4.6	
004 Chemical and Volume Control					x							K5.14 - Reduction process of gas concentration in RCS: vent- accumulated non-condensable gases from PZR bubble space, depressurized during cooldown or by alternately heating and cooling (spray) within allowed pressure band (drive more gas out of solution)	2.5	
005 Residual Heat Removal					x							K5.02 - Need for adequate subcooling	3.4	
006 Emergency Core Cooling									x			A3.04 - Cooling water systems	3.8	
006 Emergency Core Cooling		x										K2.02 - Valve operators for accumulators	2.5	
007 Pressurizer Relief/Quench Tank			x									K3.01 - Containment	3.3	
008 Component Cooling Water		x										K2.02 - CCW pump, including emergency backup	3.0	
008 Component Cooling Water											x	2.4.1 - Knowledge of EOP entry condition and immediate action steps.	4.6	
010 Pressurizer Pressure Control							x					A1.06 - RCS heatup and cooldown effect on pressure	3.1	
012 Reactor Protection						x						K6.10 - Permissive circuits	3.3	
013 Engineered Safety Features Actuation	x											K1.18 - Premature reset of ESF actuation	3.7	
022 Containment Cooling				x								K4.04 - Cooling of control rod drive motors	2.8	
022 Containment Cooling			x									K3.01 – Containment equipment subject to damage by high or low temperature, humidity, and pressure	2.9	
026 Containment Spray	x											K1.01 - ECCS	4.2	
026 Containment Spray											x	2.2.37 – Ability to determine operability and/or availability of safety related equipment.	3.6	

ES-401 PWR Examination Outline Form ES-401-2														
ES-401		Plant	Sys	stem	IS -	PW Tier	/R E 2/G	ixan irou	nina p 1-	tion (Rea	Dutlin	e Operator (continued)	Form E	S-401-2
System # / Name	К 1	К 2	К 3	К 4	K 5	К 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
039 Main and Reheat Steam							x					A1.05 - RCS T-ave	3.2	
059 Main Feedwater								x				A2.05 - Rupture in MFW suction or discharge line	3.1	
061 Auxiliary/Emergency Feedwater				x								K4.14 - AFW automatic isolation	3.5	
062 AC Electrical Distribution										x		A4.01 - All breakers (including available switchyard)	3.1	
062 AC Electrical Distribution							x					A1.01 - Significance of D/G load limits	3.4	
063 DC Electrical Distribution								x				A2.01 - Grounds	2.5	
064 Emergency Diesel Generator								x				A2.18 - Consequences of premature opening of breaker under load	2.6	
073 Process Radiation Monitoring			x									K3.01 - Radioactive effluent releases	3.6	
076 Service Water										x		A4.02 - SWS valves	2.6	
076 Service Water				x								K4.06 - Service water train separation	2.8	
078 Instrument Air									x			A3.01 - Air pressure	3.1	
103 Containment	x											K1.01 - CCS	3.6	
K/A Category Point Totals:	(/A Category Point Totals: 3 2 3 2 2 3 2 2 3 Group Point Total: 28													

ES-401 PWR Examination Outline												Form ES-401-2		
ES-401			Plan	t Sysi	PW1 tems	R Exa - Tier	amina r 2/Gi	ation roup	Outli 2 - R	ne eacte	or Op	berator	Form E	S-401-2
System # / Name	К 1	К 2	К 3	K 4	K 5	К 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive								x				A2.07 - Effect of reactor trip on primary and secondary parameters and systems	4.1	
027 Containment Iodine Removal										x		A4.02 - Remote operation and handling of iodine filters	2.8	
033 Spent Fuel Pool Cooling							x					A1.01 - Spent fuel pool water level	2.7	-
035 Steam Generator						x						K6.01 - MSIVs	3.2	
041 Steam Dump/Turbine Bypass Control		x										K3.04 – Reactor Power	3.5	
055 Condenser Air Removal	x											K1.06 - PRM system	2.6	
056 Condensate											x	2.4.6 - Knowledge of EOP mitigation strategies.	3.7	
068 Liquid Radwaste									x			A3.02 – Automatic isolatio	n 3.8	
071 Waste Gas Disposal			x									K3.04 - Ventilation system	2.7	r L
086 Fire Protection				x								K4.02 - Maintenance of fire header pressure	e 3.0	
K/A Category Point Totals:	1	1	1	1	0	1	1	1	1	1	1	Group Point Total:	10	

1. A set the set of the set of

ES-401	ES-401 PWR Examination Outline Form ES-401-2														
ES-401 Emergency an	ES-401 PWR Examination Outline Form ES-401-2 Emergency and Abnormal Plant Evolutions - Tier 1/Group 1- Sr. Reactor Operator														
E/APE # / Name / Safety Function	PE # / Name / Safety Function K K K A A G K/A Topic(s)														
000015/17 RCP Malfunctions / 4						x	2.1.19 - Ability to use plant computers to evaluate system or component status.	3.8							
000027 Pressurizer Pressure Control System Malfunction / 3	Pressure Control / 3 X AA2.10 - PZR heater energize condition						AA2.10 - PZR heater energized/de-energized condition	3.6							
000040 Steam Line Rupture - Excessive Heat Transfer / 4						x	2.4.23 - Knowledge of the bases for prioritizing emergency procedure implementation during emergency operations.	4.4							
000054 Loss of Main Feedwater / 4					x		AA2.01 - Occurrence of reactor and/or turbing	e 4.4							
000062 Loss of Nuclear Svc Water / 4	AA2.01 - Location of a leak in the SWS	3.5													
CE/E02 Reactor Trip - Stabilization - Recovery / 1	4.6														
K/A Category Totals:	6														

ES-401 P	WR	Ex	an	nir	ati	on	Outline Fo	Form ES-401-2		
ES-401 Emergency and Abnorr	P nal P	WR ant	Exa Evo	amii lutio	natio	on C ∙ Ti€	Putline F Putline F Pr 1/Group 2 - Sr. Reactor Operator	orm ES-4	101-2	
E/APE # / Name / Safety Function	K/A Topic(s)	IR	#							
000001 Continuous Rod Withdrawal / 1					x		AA2.04 - Reactor power and its trend	4.3		
000003 Dropped Control Rod / 1						x	2.4.1 - Knowledge of EOP entry conditions and immediate action steps.	3.6		
000051 Loss of Condenser Vacuum					x		AA2.01 – Cause of low vacuum condition	2.7		
000033 Loss of Intermediate Range NI / 7						x	2.4.20 - Knowledge of operational implications of EOP warnings, cautions, and notes.	4.3		
K/A Category Point Totals:	0	0	0	0	2	2	Group Point Total:	4		

 $\frac{1}{2} + \frac{1}{2} + \frac{1}$

ES-401				P	W	RE	utline	Form ES-401-2						
ES-401		F	Plan	t Sy	ster	PW ns -	/R E Tie	ixan r 2/0	nina Grou	tion C ip 1-	Dutlin Sr. R	e eactor Operator	Form ES	5-401-2
System # / Name	K 1	К 2	K 3	К 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
005 Residual Heat Removal								x				A2.02 - Pressure transient protection during cold shutdown	3.7	
013 Engineered Safety Features Actuation											x	2.1.45 - Ability to identify and interpret diverse indications to validate the response of another indication.	4.3	
061 Auxiliary/Emergency Feedwater								x				A2.08 - Flow rates expected from various combinations of AFW pump discharge valves	¹ 2.9	
073 Process Radiation Monitoring											x	2.4.6 - Knowledge of EOP mitigation strategies.	4.7	
078 Instrument Air								x				A2.01 - Air dryer and filter malfunctions	2.9	- · · · · · · · · · · · · · · · · · · ·
K/A Category Point Totals:	0 0 0 0 0 0 0 3 0 0 2 Group Point Tota									Group Point Total:	5			

ES-401	PWR Examination Outline										F	Form ES-401-2		
ES-401		Pl	lant S	Syster	PWI ns - 1	R Exa Fier 2	imina /Groi	tion up 2 -	Outli - Sr.	ne Reac	tor C	Dperator	Form E	S-401-2
System # / Name	К 1	К 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
015 Nuclear Instrumentation								x				A2.04 - Effects on axial flux density of control rod alignment and sequencing, xenon production and decay, and boron vs. control rod reactivity changes	3.8	
045 Main Turbine Generator								x				A2.17 - Malfunction of electrohydraulic control	2.9	
072 Area Radiation Monitoring											x	2.2.37 – Ability to determine operability and/or availability of safety related equipment.	4.6	
K/A Category Point Totals:	0	0	0	0	0	0	0	2	0	0	1	Group Point Total:	3	

ES-401		Generic Knowledge & Abilities Outline		F	orm ES	401-3
Facility: Calvert	Cliffs	Date of Exam: December 08, 20	08			
Category	K/A #	Торіс	F	20	SRC	-Only
•			IR	#	IR	#
	2.1.3	Knowledge of shift or short-term relief turnover practices.	3.7		- 1	-
	2.1.17	Ability to make accurate, clear, and concise verbal reports	3.9		-	-
1. Conduct of Operations	2.1.44	Knowledge of RO duties in the control room during fuel handling, such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.	3.9		-	-
	2.1.20	Ability to interpret and execute procedure steps.	-	-	4.6	
	2.1.40	Knowledge of refueling administrative requirements.	-	-	3.9	
	Subtotal	3		2		
	2.2.1	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.	4.5		-	-
2. Equipment Control	2.2.17	Knowledge of the process for managing maintenance activities during power operations, such as risk assessments, work prioritization, and coordination with the transmission system operator.	2.6		-	-
	2.2.43	Knowledge of the process used to track inoperable alarms.	-	-	3.3	
	Subtotal		2		1	
	2.3.4	Knowledge of radiation exposure limits under normal or emergency conditions.	3.2		-	-
2	2.3.11	Ability to control radiation releases.	3.8		-	-
s. Radiation Control	2.3.14	Knowledge of radiation or contamination hazards that may arise during normal, abnormal, or emergency conditions or activities.	3.7		-	-
	2.3.6	Ability to approve release permits.	-	-	3.8	
	2.3.15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	-	-	3.1	
	Subtotal		3		2	
	2.4.3	Ability to identify post-accident instrumentation.	3.7		-	-
4. Emergency	2.4.5	Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions.	3.7		-	-
Plan	2.4.11	Knowledge of abnormal condition procedures.	-	-	4.2	
	2.4.45	Ability to prioritize and interpret the significance of each annunciator or alarm.	-	-	4.3	
	Subtotal		2		2	
	• · · · · · · · · · · · · · · · · · · ·		10		7	

and the state of t

ES-401		Record of Rejected K/As	Form ES-401-4
Tier / Group	Randomly Selected K/A	Reason for Rejection	on
RO - 1/1	EA1.02	Replaced 029, EA1.02 with 029, EA1.08. inappropriate match for the E/APE # select post-trip actions for an ATWS do not inclu RWST.	K/A EA1.02 is an sted. CCNPP standard ude boration from the
RO - 2/1	025	Replaced 025, K3.01 with 022, K3.01. Ca have ice condensers.	alvert Cliffs does not
RO - 2/2	K2.02	Replaced K2.02 with K3.04. Calvert Clif. Integrated Control System.	fs does not have an
RO - 2/2	A3.01	Replaced A3.01 with A3.02. Calvert Clift Waste Evaporators are retired-in-place	fs Reactor Coolant
SRO - 1/1	2.1.43	Replaced 2.1.43 with 2.1.19. Poor K/A m	atch to system
SRO - 1/2	2.4.26	Replaced K/A 2.4.26 with K/A 2.4.1. K/A inappropriate match for the E/APE # select knowledge of facility fire protection with Rod. K/A 2.4.1 pairs knowledge of EOP immediate action steps with a Dropped Co	A 2.4.26 is an ted. K/A 2.4.26 paired a Dropped Control entry conditions and pontrol Rod.
SRO - 1/2	005 AA2.01	Replaced 005 AA2.01 with 051 AA2.01 d CEA Malfunctions.	lue to over sampling of
SRO - 2/2	2.4.26	Replaced K/A 2.4.26 with 2.2.37. K/A 2. match for the E/APE # selected. K/A 2.4. of facility fire protection with Area Radiat 2.2.37 pairs the ability to determine opera availability of safety related equipment with Monitoring.	4.26 is an inappropriate 26 paired knowledge tion Monitoring. K/A bility and/or ith Area Radiation
			· · · · · · · · · · · · · · · · · · ·
			·

ES-401 PWR Examination Outline Form ES-401-2																		
Facility: Calver	Cliffs						Date	e of E	Exam	: De	cen	nber	10, 200	8		• •••		
						RO K	(/A C	ateg	ory P	oints	5				S	RO-Or	ly Poin	its
Tier	Group	К 1	К 2	К 3	К 4	К 5	К 6	A 1	A 2	A 3	A 4	G *	Total	4	42	C	5* 	Total
1.	1	3	3	3				3	3			3	18		3		3	6
Emergency & Abnormal	2	1	1	2		N/A		2	2	N,	N/A 1		9		2		2	4
Plant Evolutions	Tier Totals	4	4	5		-		5	5			4	27		5		5	10
	1	3	2	3	3	2	2	3	3	2	2	3	28		3		2	5
2. Plant	2	1	1	1	1	0	1	1	1	1	1	1	10	0	2		1	3
Systems	Tier Totals	4	3	4	4	2	3	4	4	3	3	4	38		5		3	8
3. Generic I	Knowledge and	Abili	ities			1		2		3		1	10	1	2	3	4	_
	Categories					3		2		3		2		2	1	2	2	/
3. Generic Knowledge and Abilities 1 2 3 4 10 1 2 3 4 7 Note: 1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two). 2. The point 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/evolution: that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements. 4. Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution. 5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively. 6. Select SRO topics for Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or syste								the RO tals" ble. al 25 hat do not evolutions ce r shall be topics applicable ance r. Enter ed in other Group 2 hs, IRs, r43.										

Tier 1/Group 1- Reactor Operator							
E/APE # / Name / Safety Function	K/A Topics	Imp #	Vision ID	Туре	Cognitive Level	Exarr (Q #
000007 (CE/E02) Reactor Trip - Stabilization - Recovery / 1	EK2.03	3.5	Q20174	В	3	13	
000008 Pressurizer Vapor Space Accident / 3	AK1.02	3.1	Q50851	N	2	25	
000009 Small Break LOCA / 3	EK3.26	4.4	Q26519	В	1		
000011 Large Break LOCA / 3	2.2.44	4.2	Q25313	В	2	41	
000015/17 RCP Malfunctions / 4	AK2.07	2.9	Q38715	В	1	t	
000022 Loss of Rx Coolant Makeup / 2	AA1.03	3.2	Q50992	М	2	53	
000025 Loss of RHR System / 4	AK1.01	3.9	Q20393	В	2	ļ.	
000026 Loss of Component Cooling Water / 8	2.2.40	3.4	Q50770	м	1	ę	
000029 ATWS / 1	EA1.08	4.5	Q50651	м	2	27	
000038 Steam Gen. Tube Rupture / 3	EK1.01	3.1	Q23208	В	2	22	
000040 (CE/E05) Steam Line Rupture - Excessive Heat Transfer / 4	2.4.45	4.1	Q50950	N	3	55	
000054 (CE/E06) Loss of Main Feedwater / 4	EK3.3	3.2	Q28472	В	2	12	
000055 Station Blackout / 6	EK3.02	4.3	Q40704	В	1	3	
000056 Loss of Off-site Power / 6	AA2.73	3.5	Q18107	В	2	35	;
000057 Loss of Vital AC Inst. Bus / 6	AA1.06	3.5	Q50852	N	2	25	i
000058 Loss of DC Power / 6	AA2.01	3.7	Q51132	N	2	33	}
000065 Loss of Instrument Air / 8	AA2.01	2.9	Q51150	м	2	4	
000077 Generator Voltage & Electric Grid Disturbances / 6	AK2.06	3.9	Q50730	N	1	1	

the second se

Tier 1/Group 2- Reactor Operator						
E/APE # / Name / Safety Function	K/A Topics	Imp #	Vision ID	Туре	Cognitive Level	Exara Q #
000059 Accidental Liquid RadWaste Rel. / 9	AA2.02	2.9	Q50933	N	2	53
000061 ARM System Alarms / 7	AK3.02	3.4	Q24719	В	1	<u>5</u> 9
000067 Plant Fire On-site / 8	2.2.42	3.9	Q50931	В	1	51
000068 (BW/A06) Control Room Evac. / 8	AK2.02	3.7	Q50930	м	1	49
000069 Loss of CTMT Integrity / 5	AA1.03	2.8	Q50932	N	2	52
000074 (W/E06&E07) Inad. Core Cooling / 4	EA2.06	4.0	Q40348	В	2	:4
CE/A13 - Natural Circ. / 4	AK2.1	3.0	Q14420	В	2	: 6
CE/A16 Excess RCS Leakage / 2	AK1.2	3.0	Q40701	В	2	::3
CE/E09 Functional Recovery	EA1.1	4.2	Q25068	В	2	: 5

Tier 2/G	iroup 1 - R	eactor C	Operator	· · · · · · · · · · · · · · · · · · ·		
E/APE # / Name / Safety Function	K/A Topics	Imp #	Vision ID	Туре	Cognitive Level	Exam Ç #
003 Reactor Coolant Pump	K6.14	2.6	Q14389	В	3	36
003 Reactor Coolant Pump	2.1.31	4.6	Q14376	В	1	37
004 Chemical and Volume Control	K5.14	2.5	Q50970	N	1	56
005 Residual Heat Removal	K5.02	3.4	Q37797	В	3	50
006 Emergency Core Cooling	A3.04	3.8	Q20385	В	1	10
006 Emergency Core Cooling	K2.02	2.5	Q50790	N	1	11
007 Pressurizer Relief/Quench Tank	K3.01	3.3	Q51010	N	2	60
008 Component Cooling Water	K2.02	3.0	Q20367	В	1	43
008 Component Cooling Water	2.4.1	4.6	Q20381	В	1	42
010 Pressurizer Pressure Control	A1.06	3.1	Q14353	В	2	38
012 Reactor Protection	K6.10	3.3	Q20195	В	2	39
013 Engineered Safety Features Actuation	K1.18	3.7	Q50990	N	2	57
022 Containment Cooling	K4.04	2.8	Q51131	В	1	40
022 Containment Cooling	К3.01	2.9	Q51011	N	2	61
026 Containment Spray	K1.01	4.2	Q20402	В	2	44
026 Containment Spray	2.2.37	3.6	Q17833	В	2	45
039 Main and Reheat Steam	A1.05	3.2	Q50810	N	2	17
059 Main Feedwater	A2.05	3.1	Q50993	м	2	59
061 Auxiliary/Emergency Feedwater	K4.14	3.5	Q16704	В	3	46
062 AC Electrical Distribution	A4.01	3.1	Q15852	В	2	62
062 AC Electrical Distribution	A1.01	3.4	Q20008	В	1	47
063 DC Electrical Distribution	A2.01	2.5	Q51013	N	2	64
064 Emergency Diesel Generator	A2.18	2.6	Q15971	В	2	48
073 Process Radiation Monitoring	K3.01	3.6	Q51133	В	2	75
076 Service Water	A4.02	2.6	Q51012	N	1	63
076 Service Water	K4.06	2.8	Q51031	N	2	67
078 Instrument Air	A3.01	3.1	Q25078	В	2	66
103 Containment	K1.01	3.6	Q51016	м	1	65

ŝ

Tier 2 / Group 2 - Reactor Operator						
E/APE # / Name / Safety Function	K/A ⊤opics	Imp #	Vision ID	Туре	Cognitive Level	Exan Q #
001 Control Rod Drive	A2.07	4.1	Q51032	N	3	63
027 Containment Iodine Removal	A4.02	2.8	Q51130	В	1	41
033 Spent Fuel Pool Cooling	A1.01	2.7	Q51050	N	2	72
035 Steam Generator	К6.01	3.2	Q28225	В	2	20
041 Steam Dump/Turbine Bypass Control	K5.07	3.1	Q28429	В	3	21
055 Condenser Air Removal	K1.06	2.6	Q50830	N	1	23
056 Condensate	2.4.6	3.7	Q24549	В	1	24
068 Liquid Radwaste	A3.02	3.8	Q51033	N	1	69
071 Waste Gas Disposal	K3.04	2.7	Q51051	N	2	71
086 Fire Protection	K4.02	3.0	Q34432	В	1	28

|x| = |x| = |x| = |x|

Tier 1 / Group 1 – Sr. Reactor Operator							
E/APE # / Name / Safety Function	K/A Topics	Imp #	Vision ID	Туре	Cognitive Level	Exan	Q #
000015/17 RCP Malfunctions / 4	2.1.19	3.8	Q51083	N	2	89	14)
000027 Pressurizer Pressure Control System Malfunction / 3	AA2.10	3.6	Q14490	В	2	77	(2)
000040 Steam Line Rupture - Excessive Heat Transfer / 4	2.4.23	4.4	Q51094	N	2	91	16)
000054 Loss of Main Feedwater / 4	AA2.01	4.4	Q51072	В	1	78	(3)
000062 Loss of Nuclear Svc Water / 4	AA2.01	3.5	Q51096 '	N	2	93	18)
CE/E02 Reactor Trip - Stabilization - Recovery / 1	2.4.41	4.6	Q51075	N	2	81	(6)

÷.

Tier 1 / Group 2 – Sr. Reactor Operator						
E/APE # / Name / Safety Function	K/A Topics	Imp #	Vision ID	Туре	Cognitive Level	Exam Q #
000001 Continuous Rod Withdrawal / 1	AA2.04	4.3	Q19089	В	1	82 (7)
000003 Dropped Control Rod / 1	2.4.1	3.6	Q51078	В	1	8 3 (8)
000051 Loss of Condenser Vacuum	AA2.01	2.7	Q41651	м	2	88 (13)
000033 Loss of Intermediate Range NI / 7	2.4.20	4.3	Q51082	N	2	87 (12)

Tier 2 / Group 1 – Sr. Reactor Operator						
E/APE # / Name / Safety Function	K/A Topics	Imp #	Vision ID	Туре	Cognitive Level	Exam Q #
005 Residual Heat Removal	A2.02	3.7	Q51100	N	3	99 (24)
013 Engineered Safety Features Actuation	2.1.45	4.3	Q51076	N	3	80 (5)
061 Auxiliary/Emergency Feedwater	A2.08	2.9	Q51098	N	2	97 (22)
073 Process Radiation Monitoring	2.4.6	4.7	Q51110	М	2	100 (25)
078 Instrument Air	A2.01	2.9	Q51097	м	2	96 (21)

· · · 3

Tier 2 / Group 2 – Sr. Reactor Operator							
E/APE # / Name / Safety Function	K/A Topics	Imp #	Vision ID	Туре	Cognitive Level	Exan	Q #
015 Nuclear Instrumentation	A2.04	3.8	Q51079	N	3	85	10)
045 Main Turbine Generator	A2.17	2.9	Q25257	В	2	95	20)
072 Area Radiation Monitoring	2.2.37	4.6	Q51073	N	2	79	(4)

	Generic Kno	wledge	& Abili	ities			
Category		K/A Topics	Imp #	Vision ID	Туре	Cognitive Level	Exam Q #
	RO	2.1.3	3.7	Q50870	N	1	29
	RO	2.1.17	3.9	Q26067	В	1	3
Conduct of Ops	RO	2.1.44	3.9	Q50934	N	1	54
	SRO	2.1.20	4.6	Q45189	В	1	94 (19)
	SRO	2.1.40	3.9	Q20627	В	1	76 (1)
	RO	2.2.1	4.5	Q25936	В	2	.32
Equipment Control	RO	2.2.17	2.6	Q51170	N	1	34
	SRO	2.2.43	3.3	Q51099	N	1	98 (23)
	RO	2.3.4	3.2	Q17947	В	1	70
	RO	2.3.11	3.8	Q20605	В	1	73
Radiation Control	RO	2.3.14	3.7	Q50890	м	2	31
	SRO	2.3.6	3.8	Q51080	N	1	84 (9)
	SRO	2.3.15	3.1	Q24714	В	2	86 (11)
	RO	2.4.3	3.7	Q24951	В	1	30
	RO	2.4.5	3.7	Q19570	В	2	74
Emergency procedures / Plan	SRO	2.4.11	4.2	Q51095	N	2	92 (17)
	SRO	2.4.45	4.3	Q51090	N	3	90 (15)

Parameter	Reactor Operator Test	Sr. Reactor Operator Test
Bank Questions (Maximum of 75%)	43 (57%)	8 (32%)
Modified Questions	8 (11%)	3 (12%)
New Questions (Minimum of 10 questions – 8 RO, 2 SRO)	24 (32%)	14 (56%)
Memory	30 (40%)	7 (28%)
Comprehension / Analysis (50 – 60% for RO exam)	45 (60%)	18 (72%)

Modified	Questions
Modified Question #	Original Question #
Q50992	Q14583
Q50770	Q20383
Q50651	Q19256
Q50930	Q24994
Q50993	Q50990
Q51016	Q20397
Q51110	Q28787
Q51097	Q50364
Q41651	Q41134
Q50890	Q42268
Q51150	Q20290

Key to symbols / abbreviations:

Type:

- B = Bank Question
- M = Modified Question
- N = New Question

Cognitive Level:

- 1 = Fundamental knowledge or simple memory (stpts, definitions, facts)
- 2 = Comprehension (recognition of system interactions)
- 3 = Analysis / Synthesis / Application (use of info to predict an event or outcome or to solve a problem)