

Facility: <u>Duane Arnold Energy Center</u>														Date of Exam: 4/6/15 – 4/17/15			
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	3	N/A			4	4	N/A		3	20	3	4	7	
	2	1	1	2	N/A			2	1	N/A		0	7	1	2	3	
	Tier Totals	5	3	5	N/A			6	5	N/A		3	27	4	6	10	
2. Plant Systems	1	3	2	3	3	3	2	2	2	3	2	1	26	3	2	5	
	2	1	2	2	1	0	1	1	0	1	1	2	12	0	1	3	
	Tier Totals	4	4	5	4	3	3	3	2	3	3	4	38	4	4	8	
3. Generic Knowledge and Abilities Categories				1		2		3		4		10	1	2	3	4	7
				2		3		2		3			2	2	1	2	

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/evolutions 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.
- 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. 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.
- 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.

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4					0 5		Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Jet pump operability. CFR: 41.10	3.1	1
295003 Partial or Complete Loss of AC / 6						R	2.1.25: Ability to interpret reference materials, such as graphs, curves, tables, etc. CFR: 41.10	3.9	2
295004 Partial or Total Loss of DC Pwr / 6	0 3						Knowledge of the operational implications of the following concepts as they apply to PARTIAL OR COMPLETE LOSS OF D.C. POWER: Electrical bus divisional separation. CFR: 41.8 to 41.10	2.9	3
295005 Main Turbine Generator Trip / 3		0 8					Knowledge of the interrelations between MAIN TURBINE GENERATOR TRIP and the following: A.C. electrical distribution. CFR: 41.7	3.2	4
295006 SCRAM / 1			0 6				Knowledge of the reasons for the following responses as they apply to SCRAM : Recirculation pump speed reduction. CFR: 41.5	3.2	5
295016 Control Room Abandonment / 7				0 4			Ability to operate and/or monitor the following as they apply to CONTROL ROOM ABANDONMENT : A.C. electrical distribution. CFR: 41.7	3.1	6
295018 Partial or Total Loss of CCW / 8					0 2		Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER : Cooling water temperature. CFR: 41.10	3.1	7
295019 Partial or Total Loss of Inst. Air / 8						R	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. CFR: 41.5	4.2	8
295021 Loss of Shutdown Cooling / 4	0 1						Knowledge of the operational implications of the following concepts as they apply to LOSS OF SHUTDOWN COOLING : Decay heat. CFR: 41.8 to 41.10	3.6	9
295023 Refueling Acc / 8		0 1					Knowledge of the interrelations between REFUELING ACCIDENTS and the following: Fuel handling equipment. CFR: 41.7	3.3	10
295024 High Drywell Pressure / 5			0 8				Knowledge of the reasons for the following responses as they apply to HIGH DRYWELL PRESSURE : Containment spray. CFR: 41.5	3.7	11
295025 High Reactor Pressure / 3				0 2			Ability to operate and/or monitor the following as they apply to HIGH REACTOR PRESSURE: Reactor/turbine pressure regulating system. CFR: 41.7	3.8	12
295026 Suppression Pool High Water Temp. / 5					0 3		Ability to determine and/or interpret the following as they apply to SUPPRESSION POOL HIGH WATER TEMPERATURE: Reactor pressure. CFR: 41.10	3.9	13
295027 High Containment Temperature / 5							(Not Applicable to Plant Design)		
295028 High Drywell Temperature / 5	0 1						Knowledge of the operational implications of the following concepts as they apply to HIGH DRYWELL TEMPERATURE : Reactor water level measurement. CFR: 41.8 to 41.10	3.5	14

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295030 Low Suppression Pool Wtr Lvl / 5				0 5			Ability to operate and/or monitor the following as they apply to LOW SUPPRESSION POOL WATER LEVEL: HPCI. CFR: 41.7	3.5	15
295031 Reactor Low Water Level / 2			0 1				Knowledge of the reasons for the following responses as they apply to REACTOR LOW WATER LEVEL: Automatic depressurization system actuation. CFR: 41.5	3.9	16
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1				0 4			Ability to operate and/or monitor the following as they apply to SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN : SBLC. CFR: 41.7	4.5	17
295038 High Off-site Release Rate / 9					0 1		Ability to determine and/or interpret the following as they apply to HIGH OFF-SITE RELEASE RATE : Off-site. CFR: 41.10	3.3	18
600000 Plant Fire On Site / 8						R	2.4.45: Ability to prioritize and interpret the significance of each annunciator or alarm. CFR: 41.10	4.1	19
700000 Generator Voltage and Electric Grid Disturbances / 6	0 1						Knowledge of the operational implications of the following concepts as they apply to GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES: Definition of terms: volts, watts, amps, VARs, power factor. CFR: 41.4, 41.5, 41.7, 41.10	3.3	20
<b>K/A Category Totals:</b>	<b>4</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>3</b>	<b>Group Point Total: 20</b>		<b>20 17</b>

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295002 Loss of Main Condenser Vac / 3									
295007 High Reactor Pressure / 3									
295008 High Reactor Water Level / 2				0 5			Ability to operate and/or monitor the following as they apply to HIGH REACTOR WATER LEVEL: RCIC. CFR: 41.7	3.3	21
295009 Low Reactor Water Level / 2					0 2		Ability to determine and/or interpret the following as they apply to LOW REACTOR WATER LEVEL : Steam flow/feed flow mismatch. CFR: 41.10	3.6	22
295010 High Drywell Pressure / 5									
295011 High Containment Temp / 5									
295012 High Drywell Temperature / 5									
295013 High Suppression Pool Temp. / 5									
295014 Inadvertent Reactivity Addition / 1		0 4					Knowledge of the interrelations between INADVERTENT REACTIVITY ADDITION and the following: Void concentration. CFR: 41.7	3.2	23
295015 Incomplete SCRAM / 1									
295017 High Off-site Release Rate / 9									
295020 Inadvertent Cont. Isolation / 5 & 7	0 1						Knowledge of the operational implications of the following concepts as they apply to INADVERTENT CONTAINMENT ISOLATION : Loss of normal heat sink. CFR: 41.8 to 41.10	3.7	24
295022 Loss of CRD Pumps / 1									
295029 High Suppression Pool Wtr Lvl / 5									
295032 High Secondary Containment Area Temperature / 5				0 1			Ability to operate and/or monitor the following as they apply to HIGH SECONDARY CONTAINMENT AREA TEMPERATURE : Area temperature monitoring system. CFR: 41.7	3.6	25
295033 High Secondary Containment Area Radiation Levels / 9									
295034 Secondary Containment Ventilation High Radiation / 9			0 5				Knowledge of the reasons for the following responses as they apply to SECONDARY CONTAINMENT VENTILATION HIGH RADIATION : Manual SCRAM and depressurization: Plant-Specific. CFR: 41.5	3.6	26
295035 Secondary Containment High Differential Pressure / 5									
295036 Secondary Containment High Sump/Area Water Level / 5									
500000 High CTMT Hydrogen Conc. / 5			0 1				Knowledge of the reasons for the following responses as they apply to HIGH PRIMARY CONTAINMENT HYDROGEN CONCENTRATIONS: Initiation of containment atmosphere control system. CFR: 41.5	2.9	27
K/A Category Point Totals:	1	1	2	2	1	0	Group Point Total: 7		7/3

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	#
203000 RHR/LPCI: Injection Mode		0 2		0 6								Knowledge of electrical power supplies to the following: Valves. CFR: 41.7 /	2.5	33
												Knowledge of RHR/LPCI: INJECTION MODE (PLANT SPECIFIC) design feature(s) and/or interlocks which provide for the following: Adequate pump net positive suction head (interlock suction valve open): Plant-Specific. CFR: 41.7.	3.5	28
205000 Shutdown Cooling	0 1				0 3							Knowledge of the operational implications of the following concepts as they apply to SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE) : Heat removal mechanisms. CFR: 41.5 /	2.8	29
												Knowledge of the physical connections and/or cause effect relationships between SHUTDOWN COOLING SYSTEM (RHR SHUTDOWN COOLING MODE) and the following: Reactor pressure. CFR: 41.2 to 41.9	3.6	30
206000 HPCI							1 2			0 1		Knowledge of the effect that a loss or malfunction of the following will have on the HIGH PRESSURE COOLANT INJECTION SYSTEM: Reactor water level. CFR: 41.7 /	4.2	31
												Ability to monitor automatic operations of the HIGH PRESSURE COOLANT INJECTION SYSTEM including: Turbine speed. CFR: 41.7	3.6	32
207000 Isolation (Emergency) Condenser												(System Not Applicable)		
209001 LPCS								0 8				Ability to (a) predict the impacts of the following on the LOW PRESSURE CORE SPRAY SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Valve openings. CFR: 41.5	3.1	34
209002 HPCS												(System Not Applicable)		
211000 SLC										0 1		Ability to manually operate and/or monitor in the control room: Tank level. CFR: 41.7	3.9	35
212000 RPS											R	2.4.2: Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions. CFR: 41.7	4.5	36
215003 IRM	0 4											Knowledge of the physical connections and/or cause effect relationships between INTERMEDIATE RANGE MONITOR (IRM) SYSTEM and the following: Process computer/ performance monitoring system (SPDS/ERIS/CRIDS/GDS). CFR: 41.2 to 41.9	2.5	37

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	#
215004 Source Range Monitor		0 1				0 3						Knowledge of electrical power supplies to the following: SRM channels/detectors. CFR: 41.7  /	2.6	38
												Knowledge of the operational implications of the following concepts as they apply to SOURCE RANGE MONITOR (SRM) SYSTEM: Changing detector position. CFR: 41.5	2.8	39
215005 APRM / LPRM				0 7			0 4					Knowledge of the effect that a loss or malfunction of the AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM will have on following: Rod block monitor. CFR: 41.7 /	3.2	40
												Ability to predict and/or monitor changes in parameters associated with operating the AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM controls including: SCRAM and rod block trip setpoints. CFR: 41.5	4.1	41
217000 RCIC				0 3								Knowledge of REACTOR CORE ISOLATION COOLING SYSTEM (RCIC) design feature(s) and/or interlocks which provide for the following: Prevents pump over heating. CFR: 41.7	2.9	42
218000 ADS					0 1							Knowledge of the operational implications of the following concepts as they apply to AUTOMATIC DEPRESSURIZATION SYSTEM: ADS logic operation. CFR: 41.5	3.8	43
223002 PCIS/Nuclear Steam Supply Shutoff						0 5						Knowledge of the effect that a loss or malfunction of the following will have on the PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF: Containment instrumentation. CFR: 41.7	3.0	44
239002 SRVs							0 6					Ability to predict and/or monitor changes in parameters associated with operating the RELIEF/SAFETY VALVES controls including: Reactor power. CFR: 41.5	3.7	45
259002 Reactor Water Level Control								0 2				Ability to (a) predict the impacts of the following on the REACTOR WATER LEVEL CONTROL SYSTEM ; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Loss of any number of reactor feedwater flow inputs. CFR: 41.5	3.3	46
261000 SGTS									0 3			Ability to monitor automatic operations of the STANDBY GAS TREATMENT SYSTEM including: Valve operation. CFR: 41.7	3.0	47
262001 AC Electrical Distribution										0 5		Ability to manually operate and/or monitor in the control room: Voltage, current, power, and frequency on A.C. buses. CFR: 41.7	3.3	48

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	#
262002 UPS (AC/DC)									0 1			Ability to monitor automatic operations of the UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) including: Transfer from preferred to alternate source. CFR: 41.7	2.8	49
263000 DC Electrical Distribution	0 1											Knowledge of the physical connections and/or cause effect relationships between D.C. ELECTRICAL DISTRIBUTION and the following: A.C. electrical distribution. CFR: 41.2 to 41.9	3.3	50
264000 EDGs			0 2									Knowledge of the effect that a loss or malfunction of the EMERGENCY GENERATORS (DIESEL/JET) will have on following: A.C. electrical distribution. CFR: 41.7	3.9	51
300000 Instrument Air			0 2									Knowledge of the effect that a loss or malfunction of the INSTRUMENT AIR SYSTEM will have on the following: Systems having pneumatic valves and controls. CFR: 41.7	3.3	52
400000 Component Cooling Water				0 1								Knowledge of CCWS design feature(s) and or interlocks which provide for the following: Automatic start of standby pump. CFR: 41.7	3.4	53
<b>K/A Category Point Totals:</b>	<b>3</b>	<b>2</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>Group Point Total: 26</b>		<b>26/ 5</b>





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	#
268000 Radwaste											R	2.4.21: Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment conditions, radioactivity release control, etc. CFR: 41.7	4.0	62
271000 Offgas									0 5			Ability to monitor automatic operations of the OFFGAS SYSTEM including: System indicating lights and alarms. CFR: 41.7	2.9	63
272000 Radiation Monitoring		0 5										Knowledge of electrical power supplies to the following: Reactor building ventilation monitors: Plant-Specific. CFR: 41.7	2.6	64
286000 Fire Protection														
288000 Plant Ventilation														
290001 Secondary CTMT														
290003 Control Room HVAC			0 4									Knowledge of the effect that a loss or malfunction of the CONTROL ROOM HVAC will have on following: Control room pressure. CFR: 41.7	2.8	65
290002 Reactor Vessel Internals														
K/A Category Point Totals:	1	2	2	1	0	1	1	0	1	1	2	Group Point Total: 12		12/3

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4					0 6		Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION : Nuclear boiler instrumentation. CFR: 41.10 / 43.5	3.3	76
295003 Partial or Complete Loss of AC / 6									
295004 Partial or Total Loss of DC Pwr / 6					0 3		Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF D.C. POWER: Battery voltage. CFR: 41.10 / 43.5	2.9	77
295005 Main Turbine Generator Trip / 3									
295006 SCRAM / 1									
295016 Control Room Abandonment / 7									
295018 Partial or Total Loss of CCW / 8						S	2.1.20: Ability to interpret and execute procedure steps. CFR: 41.10 / 43.5	4.6	78
295019 Partial or Total Loss of Inst. Air / 8									
295021 Loss of Shutdown Cooling / 4									
295023 Refueling Acc / 8									
295024 High Drywell Pressure / 5									
295025 High Reactor Pressure / 3									
295026 Suppression Pool High Water Temp. / 5									
295027 High Containment Temperature / 5							(Not applicable; applies to Mark III Containments)		
295028 High Drywell Temperature / 5						S	2.2.38: Knowledge of conditions and limitations in the facility license. CFR: 41.7 / 41.10 / 43.1	4.5	79
295030 Low Suppression Pool Wtr Lvl / 5									
295031 Reactor Low Water Level / 2									
295037 SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1									
295038 High Off-site Release Rate / 9						S	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. CFR: 41.5 / 43.5	4.4	80
600000 Plant Fire On Site / 8						S	2.4.35: Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. CFR: 41.10 / 43.5	4.0	81
700000 Generator Voltage and Electric Grid Disturbances / 6					0 4		Ability to determine and/or interpret the following as they apply to GENERATOR VOLTAGE AND ELECTRIC GRID DISTURBANCES: VARs outside capability curve. CFR: 41.5 and 43.5	3.6	82
K/A Category Totals:					3	4	Group Point Total: 7		20/7

E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
295002 Loss of Main Condenser Vac / 3									
295007 High Reactor Pressure / 3									
295008 High Reactor Water Level / 2									
295009 Low Reactor Water Level / 2									
295010 High Drywell Pressure / 5									
295011 High Containment Temp / 5									
295012 High Drywell Temperature / 5									
295013 High Suppression Pool Temp. / 5									
295014 Inadvertent Reactivity Addition / 1						S	2.1.23: Ability to perform specific system and integrated plant procedures during all modes of plant operation. CFR: 41.10 / 43.5	4.4	83
295015 Incomplete SCRAM / 1					0 1		Ability to determine and/or interpret the following as they apply to INCOMPLETE SCRAM : Reactor power. CFR: 41.10 / 43.5	4.3	84
295017 High Off-site Release Rate / 9									
295020 Inadvertent Cont. Isolation / 5 & 7									
295022 Loss of CRD Pumps / 1									
295029 High Suppression Pool Wtr Lvl / 5									
295032 High Secondary Containment Area Temperature / 5									
295033 High Secondary Containment Area Radiation Levels / 9									
295034 Secondary Containment Ventilation High Radiation / 9									
295035 Secondary Containment High Differential Pressure / 5									
295036 Secondary Containment High Sump/Area Water Level / 5						S	2.4.49: Ability to perform without reference to procedures those actions that require immediate operation of system components and controls. CFR: 41.10 / 43.2	4.4	85
500000 High CTMT Hydrogen Conc. / 5									
K/A Category Point Totals:					1	2	Group Point Total: 3		7/3



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	#
263000 DC Electrical Distribution														
264000 EDGs														
300000 Instrument Air														
400000 Component Cooling Water														
K/A Category Point Totals:								3			2	Group Point Total: 5		26/5





Procedures / Plan	2.4.18	Knowledge of the specific bases for EOPs. CFR: 41.10	3.3	74		
	2.4.19	Knowledge of EOP layout, symbols, and icons. CFR: 41.10	3.4	75		
	2.4.16	Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, abnormal operating procedures, and severe accident management guidelines. CFR: 41.10 / 43.5			4.4	99
	2.4.35	Knowledge of local auxiliary operator tasks during an emergency and the resultant operational effects. CFR: 41.10 / 43.5			4.0	100
	Subtotal				3	
Tier 3 Point Total				10		7