

Draft Submittal

**BROWNS FERRY EXAM**

**50-259, 50-260, &  
50-296/2004-301**

**April 23 - 30, 2004**

Written Exam Sample outlines

**Draft Outline**

Facility: <b>BROWNS FERRY</b>		Date of Exam: <b>05/03/2004</b> <i>4/23/04</i>																
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 2	G *	Total	
1. Emergency & Abnormal Plant Evolutions	1	4	4	3				3	3			3	20	0	0	4	4	8
	2	2	1	1				1	1			1	7	0	0	2	2	4
	Tier Totals	6	5	4				4	4			4	27	0	0	6	6	12
2. Plant Systems	1	3	3	3	3	2	2	2	2	2	2	2	26	0	0	2	2	4
	2	2	1	1	1	1	1	1	1	1	1	1	12	0	0	1	1	2
	Tier Totals	5	4	4	4	3	3	3	3	3	3	3	38	0	0	3	3	6
3. Generic Knowledge and Abilities Categories				1	2	3	4					1	2	3	4			
				3	4	1	2	10				2	1	1	3	7		

- Note:
1. Ensure that at least two topics from every K/A category are sampled within each tier of the RO outline (i.e., the "Tier Totals" in each K/A category shall not be less than two). Refer to Section D.1.c for additional guidance regarding SRO sampling.
  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  $\pm 1$  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. Select topics from many systems and evolutions; avoid selecting more than two K/A topics from a given system or evolution unless they relate to plant-specific priorities.
  4. Systems/evolutions within each group are identified on the associated outline.
  5. The shaded areas are not applicable to the category/tier.
  - 6.\* 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. The SRO K/As must also be linked to 10 CFR 55.43 or an SRO-level learning objective.
  7. 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; summarize all the SRO-only knowledge and non-A2 ability categories in the columns labeled "K" and "A." Use duplicate pages for RO and SRO-only exams.
  - h. For Tier 3, enter the K/A numbers, descriptions, importance ratings, and point totals on Form ES-401-3.
  - i. Refer to ES-401, Attachment 2, for guidance regarding the elimination of inappropriate K/A statements.

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
295001 Partial or Complete Loss of Forced Core Flow Circulation / 1 & 4					1		AA2.01 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Power/flow map.	3.5/3.8	1
					2		AA2.02 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF FORCED CORE FLOW CIRCULATION: Neutron monitoring.	3.1/3.2	1
295003 Partial or Complete Loss of AC / 6					2		AA2.02 Ability to determine and/or interpret the following as they apply to LOSS OF MAIN CONDENSER VACUUM: Reactor power.	3.2/3.3	1
295004 Partial or Total Loss of DC Pwr / 6			2			2.4	G2.4.11 Knowledge of abnormal condition procedures.	3.4/3.6	1
							AK3.02 Knowledge of the reasons for the following responses as they apply to PARTIAL OR COMPLETE LOSS OF D.C. POWER: Reactor SCRAM.	3.1/3.5	1
295005 Main Turbine Generator Trip / 3		4			4		AA2.04 Ability to determine and/or interpret the following as they apply to MAIN TURBINE GENERATOR TRIP: Reactor pressure.	3.7/3.8	1
							AK2.04 Knowledge of the interrelations between MAIN TURBINE GENERATOR TRIP and the following: Main generator protection.	3.3/3.3	1
295006 SCRAM / 1	1		1				AK1.01 Knowledge of the operational implications of the following concepts as they apply to SCRAM: Decay heat generation and removal.	3.7/3.9	1
							AK3.01 Knowledge of the reasons for the following responses as they apply to SCRAM: Reactor water level response.	3.8/3.9	1
295016 Control Room Abandonment / 7			1				AK3.01 Knowledge of the reasons for the following responses as they apply to CONTROL ROOM ABANDONMENT: Reactor SCRAM.	4.1/4.2	1
295018 Partial or Total Loss of CCW / 8					4	2.4	AA2.04 Ability to determine and/or interpret the following as they apply to PARTIAL OR COMPLETE LOSS OF COMPONENT COOLING WATER: System flow.	2.9/2.9	1
							G2.4.10 Knowledge of annunciator response procedures.	3.0/3.1	1
295019 Partial or Total Loss of Inst. Air / 8				4			AA1.04 Ability to operate and/or monitor the following as they apply to PARTIAL OR COMPLETE LOSS OF INSTRUMENT AIR: Service air isolation valves.	3.3/3.2	1
295021 Loss of Shutdown Cooling / 4				6			AA1.06 Ability to operate and/or monitor the following as they apply to LOSS OF SHUTDOWN COOLING: Containment/drywell temperature.	2.8/3.0	1
295023 Refueling Acc Cooling Mode / 8	3						AK1.03 Knowledge of the operational implications of the following concepts as they apply to REFUELING ACCIDENTS: Inadvertent criticality.	3.7/4.0	1
295024 High Drywell Pressure / 5						2.4	G2.4.1 Knowledge of EOP entry conditions and immediate action steps.	4.3/4.6	1
295025 High Reactor Pressure / 3						2.3	G2.3.10 Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	2.9/3.3	1
						2.3	G2.3.11 Ability to control radiation releases.	2.7/3.2	1

295026 Suppression Pool High Water Temp. / 5		5					EK2.05 Knowledge of the interrelations between SUPPRESSION POOL HIGH WATER TEMPERATURE and the following: Containment pressure.	3.0/3.3	1
295027 High Containment Temperature / 5							Mark III Containment only.		
295028 High Drywell Temperature / 5				4	6		EA2.06 Ability to determine and/or interpret the following as they apply to HIGH DRYWELL TEMPERATURE: Torus/suppression chamber pressure.  EA1.04 Ability to operate and/or monitor the following as they apply to HIGH DRYWELL TEMPERATURE: Drywell pressure.	3.4/3.7  3.9/4.0	1  1
295030 Low Suppression Pool Wtr Lvl / 5					1		EA2.01 Ability to determine and/or interpret the following as they apply to LOW SUPPRESSION POOL WATER LEVEL: Suppression pool level.	4.1/4.2	1
295031 Reactor Low Water Level / 2		1				2.2	G2.2.23 Ability to track limiting conditions for operations.  EK2.01 Knowledge of the interrelations between REACTOR LOW WATER LEVEL and the following: Reactor water level indication.	2.6/3.8  4.4/4.4	1  1
295037 SCRAM Condition Present and Power Above APRM Downscale or Unknown / 1	2					2.2	G2.2.22 Knowledge of limiting conditions for operations and safety limits.  EK1.02 Knowledge of the operational implications of the following concepts as they apply to SCRAM CONDITION PRESENT AND REACTOR POWER ABOVE APRM DOWNSCALE OR UNKNOWN: Reactor water level effects on reactor power.	3.4/4.1  4.1/4.3	1  1
295038 High Off-site Release Rate / 9	2						EK1.02 Knowledge of the operational implications of the following concepts as they apply to HIGH OFF-SITE RELEASE RATE: Protection of the general public.	4.2/4.4	1
600000 Plant Fire On Site / 8		4					AK2.04 Knowledge of the interrelations between PLANT FIRE ON SITE and the following: Breakers/relays/and disconnects.	2.5/2.6	1
K/A Category Totals:	4	4	3	3	3/4	3/4	Group Point Total:		20/8

E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	G	K/A Topic(s)	IR	#
295002 Loss of Main Condenser Vac / 3					2		AA2.02 Ability to determine and/or interpret the following as they apply to LOSS OF MAIN CONDENSER VACUUM: Reactor power.	3.2/3.3	1
295007 High Reactor Pressure / 3				3			AA1.03 Ability to operate and/or monitor the following as they apply to HIGH REACTOR PRESSURE: RCIC.	3.4/3.5	1
295008 High Reactor Water Level / 2		8				2.1	G2.1.7 Ability to evaluate plant performance and make operational judgments based on operating characteristics/reactor behavior/and instrument interpretation. AK2.08 Knowledge of the interrelations between HIGH REACTOR WATER LEVEL and the following: Main turbine.	3.7/4.4 3.4/3.5	1 1
295009 Low Reactor Water Level / 2	3						AK1.03 Knowledge of the operational implications of the following concepts as they apply to LOW REACTOR WATER LEVEL: Jet pump net positive suction head.	2.7/2.7	1
295010 High Drywell Pressure / 5							Not selected.		
295011 High Containment Temp / 5							Mark III Containment only.		
295012 High Drywell Temperature / 5							Not selected.		
295013 High Suppression Pool Temp. / 5							Not selected.		
295014 Inadvertent Reactivity Addition / 1					3		AA2.03 Ability to determine and/or interpret the following as they apply to INADVERTENT REACTIVITY ADDITION: Cause of reactivity addition.	4.0/4.3	1
295015 Incomplete SCRAM / 1					1		AA2.01 Ability to determine and/or interpret the following as they apply to INCOMPLETE SCRAM: Reactor power.	4.2/4.3	1
295017 High Off-site Release Rate / 9	2						AK1.02 Knowledge of the operational implications of the following concepts as they apply to HIGH OFF-SITE RELEASE RATE: Protection of the general public.	3.8/4.3	1
295020 Inadvertent Cont. Isolation / 5 & 7						2.4	G2.4.11 Knowledge of abnormal condition procedures.	3.2/3.6	1
295022 Loss of CRD Pumps / 1			2				AK3.02 Knowledge of the reasons for the following responses as they apply to LOSS OF CRD PUMPS: CRDM high temperature.	2.9/3.1	1
295029 High Suppression Pool Wtr Lvl / 5							Not selected.		
295032 High Secondary Containment Area Temperature / 5							Not selected.		
295033 High Secondary Containment Area Radiation Levels / 9						2.3	G2.3.1 Knowledge of 10 CFR:20 and related facility radiation control requirements.	2.6/3.0	1
295034 Secondary Containment Ventilation High Radiation / 9							Not selected.		
295035 Secondary Containment High Differential Pressure / 5							Not selected.		
295036 Secondary Containment High Sump/Area Water Level / 5							Not selected.		
500000 High CTMT Hydrogen Conc. / 5							Not selected.		
K/A Category Point Totals:	2	1	1	1	1/2	1/2	Group Point Total:		7/4

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
203000 RHR/LPCI: Injection Mode					1							K5.01 Knowledge of the operational implications of the following concepts as they apply to RHR/LPCI: INJECTION MODE: Testable check valve operation.	2.7/2.9	1
205000 Shutdown Cooling		1										K2.01 Knowledge of electrical power supplies to the following: Pump motors.	3.1/3.1	1
206000 HPCI		1										K2.01 Knowledge of electrical power supplies to the following: System valves.	3.2/3.3	1
207000 Isolation (Emergency) Condenser												Not applicable to Browns Ferry.		
209001 LPCS								6				A2.06 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: Inadequate system flow.	3.2/3.2	1
209002 HPCS												Not applicable to Browns Ferry.		
211000 SLC											2.2	G2.2.1 Ability to perform pre-startup procedures for the facility/including operating those controls associated with plant equipment that could affect reactivity.	3.7/3.6	1
212000 RPS				3				3				K4.03 Knowledge of REACTOR PROTECTION SYSTEM design feature(s) and/or interlocks which provide for the following: The prevention of supplying power to a given RPS bus from multiple sources simultaneously.	3.0/3.1	1
												A2.03 Ability to (a) predict the impacts of the following on the REACTOR PROTECTION SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Surveillance testing.	3.3/3.5	1

215003 IRM							2	3			<p>A2.02 Ability to (a) predict the impacts of the following on the INTERMEDIATE RANGE MONITOR (IRM) SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: IRM inop condition.</p> <p>A3.03 Ability to monitor automatic operations of the INTERMEDIATE RANGE MONITOR (IRM) SYSTEM including: RPS status.</p>	3.5/3.7	1
215004 Source Range Monitor	1										<p>K1.01 Knowledge of the physical connections and/or cause-effect relationships between SOURCE RANGE MONITOR (SRM) SYSTEM and the following: Reactor protection system.</p>	3.6/3.7	1
215005 APRM / LPRM					5				5		<p>K6.05 Knowledge of the effect that a loss or malfunction of the following will have on the AVERAGE POWER RANGE MONITOR/LOCAL POWER RANGE MONITOR SYSTEM: IRM.</p> <p>A4.05 Ability to manually operate and/or monitor in the control room: Trip bypasses.</p>	2.9/3.1	1
217000 RCIC		3								2.4	<p>G2.4.30 Knowledge of which events related to system operations/status should be reported to outside agencies.</p> <p>K2.03 Knowledge of electrical power supplies to the following: RCIC flow controller.</p>	2.2/3.6	1
218000 ADS					4						<p>A1.04 Ability to predict and/or monitor changes in parameters associated with operating the AUTOMATIC DEPRESSURIZATION SYSTEM controls including: Reactor pressure.</p>	4.1/4.2	1
223002 PCIS/Nuclear Steam Supply Shutoff			3							2.1	<p>K3.03 Knowledge of the effect that a loss or malfunction of the PRIMARY CONTAINMENT ISOLATION SYSTEM/NUCLEAR STEAM SUPPLY SHUT-OFF will have on the following: Off-site radioactive release rates.</p> <p>G2.1.8 Ability to coordinate personnel activities outside the control room.</p>	3.6/3.8	1
239002 SRVs									1		<p>A4.01 Ability to manually operate and/or monitor in the control room: SRV's.</p>	4.4/4.4	1

259002 Reactor Water Level Control				11								K4.11 Knowledge of REACTOR WATER LEVEL CONTROL SYSTEM design feature(s) and/or interlocks which provide for the following: DP control.	3.3/3.3	1
261000 SGTS	11											K1.11 Knowledge of the physical connections and/or cause-effect relationships between STANDBY GAS TREATMENT SYSTEM and the following: Primary containment pressure.	3.2/3.3	1
												A3.02 Ability to monitor automatic operations of the STANDBY GAS TREATMENT SYSTEM including: Fan start.	3.2/3.1	1
262001 AC Electrical Distribution						3					2.3	G2.3.3 Knowledge of SRO responsibilities for auxiliary systems that are outside the control room (e.g./waste disposal and handling systems).	1.8/2.9	1
												K6.03 Knowledge of the effect that a loss or malfunction of the following will have on the A.C. ELECTRICAL DISTRIBUTION: Generator trip.	3.5/3.7	1
262002 UPS (AC/DC)							2					A1.02 Ability to predict and/or monitor changes in parameters associated with operating the UNINTERRUPTABLE POWER SUPPLY (A.C./D.C.) controls including: Motor generator outputs.	2.5/2.9	1
263000 DC Electrical Distribution	2		2									K1.02 Knowledge of the physical connections and/or cause-effect relationships between D.C. ELECTRICAL DISTRIBUTION and the following: Battery charger and battery.	3.2/3.3	1
												K3.02 Knowledge of the effect that a loss or malfunction of the D.C. ELECTRICAL DISTRIBUTION will have on the following: Components using D.C. control power (i.e. breakers)	3.5/3.8	1

264000 EDGs			2					9					<p><b>A2.09</b> Ability to (a) predict the impacts of the following on the EMERGENCY GENERATORS (DIESEL/JET); and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Maintaining minimum load on emergency generator (to prevent reverse power).</p> <p><b>K3.02</b> Knowledge of the effect that a loss or malfunction of the EMERGENCY GENERATORS (DIESEL/JET) will have on the following: A.C. electrical distribution.</p>	3.0/3.1	1
300000 Instrument Air				1									<p><b>K5.01</b> Knowledge of the operational implications of the following concepts as they apply to the INSTRUMENT AIR SYSTEM: Air compressors.</p>	2.5/2.5	1
400000 Component Cooling Water				1									<p><b>K4.01</b> Knowledge of CCWS design feature(s) and/or interlocks which provide for the following: Automatic start of standby pump.</p>	3.4/3.9	1
K/A Category Point Totals:	3	3	3	3	2	2	2	2/2	2	2	2/2	Group Point Total:			26/4

System # / Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	K/A Topic(s)	IR	#
201001 CRD Hydraulic												Not selected.		
201002 RMCS												Not Applicable to Browns Ferry.		
201003 Control Rod and Drive Mechanism								10				A2.10 Ability to (a) predict the impacts of the following on the CONTROL ROD AND DRIVE MECHANISM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Excessive SCRAM time for a given drive mechanism.	3.0/3.4	1
201004 RSCS												Not selected.		
201005 RCIS												Not Applicable to Browns Ferry.		
201006 RWM												Not selected.		
202001 Recirculation												Not selected.		
202002 Recirculation Flow Control												Not selected.		
204000 RWCU												Not selected.		
214000 RPIS												Not selected.		
215001 Traversing In-core Probe												Not selected.		
215002 RBM		3						5				A2.05 Ability to (a) predict the impacts of the following on the ROD BLOCK MONITOR SYSTEM; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those abnormal conditions or operations: Back panel meters and indicating lights.  K2.03 Knowledge of electrical power supplies to the following: APRM channels.	3.2/3.2  2.8/2.9	1  1
216000 Nuclear Boiler Inst.												Not selected.		
219000 RHR/LPCI: Torus/Pool: Cooling Mode												Not selected.		
223001 Primary CTMT and Aux.	3											K1.03 Knowledge of the physical connections and/or cause-effect relationships between PRIMARY CONTAINMENT SYSTEM AND AUXILIARIES and the following: Containment/drywell atmosphere control.	3.2/3.3	1

226001 RHR/LPCI: CTMT Spray Mode									6		A3.06 Ability to monitor automatic operations of the RHR/LPCI: CONTAINMENT SPRAY SYSTEM MODE including: Containment temperature.	3.5/3.5	1
230000 RHR/LPCI: Torus/Pool Spray Mode										2.3	G2.3.9 Knowledge of the process for performing a containment purge.	2.5/3.4	1
233000 Fuel Pool Cooling/Cleanup											Not selected.		
234000 Fuel Handling Equipment											Not selected.		
239001 Main and Reheat Steam										1	A4.01 Ability to manually operate and/or monitor in the control room: MSIV's.	4.2/4.0	1
239003 MSIV Leakage Control											Not selected.		
241000 Reactor/Turbine Pressure Regulator				10						2.2	G2.2.11 Knowledge of the process for controlling temporary changes.  K4.10 Knowledge of REACTOR/TURBINE PRESSURE REGULATING SYSTEM design feature(s) and/or interlocks which provide for the following: Turbine shell warming: EHC-Only.	2.5/3.4  2.5/2.5	1  1
245000 Main Turbine Gen. / Aux.											Not selected.		
256000 Reactor Condensate									8		A1.08 Ability to predict and/or monitor changes in parameters associated with operating the REACTOR CONDENSATE SYSTEM controls including: System water quality.	2.7/2.9	1
259001 Reactor Feedwater				2							K5.02 Knowledge of the operational implications of the following concepts as they apply to REACTOR FEEDWATER SYSTEM: Water hammer.	2.5/2.5	1
268000 Radwaste											Not selected.		
271000 Offgas											Not selected.		
272000 Radiation Monitoring											Not selected.		
286000 Fire Protection	7		1								K1.07 Knowledge of the physical connections and/or cause-effect relationships between FIRE PROTECTION SYSTEM and the following: A.C. power supplies.  K3.01 Knowledge of the effect that a loss or malfunction of the FIRE PROTECTION SYSTEM will have on the following: The ability to detect fires.	2.8/2.9  3.2/3.4	1  1

288000 Plant Ventilation						1								K6.01 Knowledge of the effect that a loss or malfunction of the following will have on the PLANT VENTILATION SYSTEMS: A.C. electrical.	2.7/2.7	1
290001 Secondary CTMT														Not selected.		
290003 Control Room HVAC														Not selected.		
290002 Reactor Vessel Internals														Not selected.		
K/A Category Point Totals:	2	1	1	1	1	1	1	1/1	1	1	1/1	Group Point Total:			12/2	

Facility: **BROWNS FERRY**

Date of Exam: \_\_\_\_\_

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Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1.4	Knowledge of shift staffing requirements.			3.4	1
	2.1.16	Ability to operate plant phone/paging system/and two-way radio.	2.9	1		
	2.1.22	Ability to determine Mode of Operation.	2.8	1		
	2.1.22	Ability to determine Mode of Operation.			3.3	1
	2.1.28	Knowledge or the purpose and function of major system components and controls.	3.2	1		
	Subtotal				3	
2. Equipment Control	2.2.3	Knowledge of the design/procedural/and operational differences between units.	3.1	1		
	2.2.11	Knowledge of the process for controlling temporary changes.	2.5	1		
	2.2.12	Knowledge of surveillance procedures.	3.0	1		
	2.2.14	Knowledge of the process for making configuration changes.			3.0	1
	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	1		
Subtotal				4		1
3. Radiation Control	2.3.9	Knowledge of the process for performing a containment purge.			3.4	1
	2.3.11	Ability to control radiation releases.	2.7	1		
	Subtotal				1	
4. Emergency Procedures / Plan	2.4.8	Knowledge of how the event-based emergency/abnormal operating procedures are used in conjunction with the symptom-based EOP's.			3.7	1
	2.4.16	Knowledge of EOP implementation hierarchy and coordination with other support procedures.	3.0	1		
	2.4.22	Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.			4.0	1
	2.4.44	Knowledge of emergency plan protective action recommendations.			4.0	1
	2.4.49	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.0	1		
	Subtotal				2	
Tier 3 Point Total				10		7