

**Final Submittal**  
(Blue Paper)

**FINAL SAMPLE PLANS / OUTLINES**

**WATTS BAR EXAM 2003-301**  
**50-390/2003-301**

**MAY 15, 2003**

**Facility:** Watts Bar Nuclear Plant

Form ES-401-3

**Exam Date:** 05/12/2003**Exam Level:** SRO

Tier	Group	K/A Category Points											Point Total
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	
1. Emergency & Abnormal Plant Evolutions	1	4	4	4				4	4			4	24
	2	3	3	2				2	3			3	16
	3	0	1	0				0	1			1	3
	Tier Totals	7	8	6				6	8			8	43
2. Plant Systems	1	2	2	2	3	1	1	2	2	1	1	2	19
	2	1	2	2	2	1	1	1	2	1	2	2	17
	3	0	1	0	0	0	1	0	0	1	0	1	4
	Tier Totals	3	5	4	5	2	3	3	4	3	3	5	40
3. Generic Knowledge And Abilities					Cat 1		Cat 2		Cat 3		Cat 4		
					4		4		4		5		17

Note: 1. Ensure that at least two topics from every K/A category are sampled within each tier (i.e., the "Tier Totals" in each K/A category shall not be less than two).

2. Actual point totals must match those specified in the table.

3. Select topics from many systems; avoid selecting more than two or three K/A topics from a given system 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 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.

7. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings for the RO license level, and the point totals for each system and category. K/As below 2.5 should be justified on the basis of plant-specific priorities. Enter the tier totals for each category in the table above.

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Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-3

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
001	Continuous Rod Withdrawal / 1					X		AA2.05 - Uncontrolled rod withdrawal, from available indications	4.6	1
003	Dropped Control Rod / 1			X				AK3.08 - Criteria for inoperable control rods	4.2	1
005	Inoperable/Stuck Control Rod / 1			X				AK3.06 - Actions contained in EOP for inoperable/stuck control rod	4.2	1
011	Large Break LOCA / 3				X			EA1.03 - Securing of RCPs	4.0	1
015	Reactor Coolant Pump (RCP) Malfunctions / 4	X						AK1.05 - Effects of unbalanced RCS flow on in-core average temperature, core imbalance, and quadrant power tilt	3.3	1
024	Emergency Boration / 1					X		AA2.02 - When use of manual boration valve is needed	4.4	1
026	Loss of Component Cooling Water (CCW) / 8						X	2.4.11 - Knowledge of abnormal condition procedures.	3.6	1
029	Anticipated Transient Without Scram (ATWS) / 1		X					EK2.06 - Breakers, relays, and disconnects	3.1*	1
040	Steam Line Rupture / 4				X			AA1.24 - Main steam header pressure gauges	3.8	1

Facility:

Bar Nuclear Plant

## PWR SR Examination Outline

Printed: 03/25

ES - 401

## Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-3

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
051	Loss of Condenser Vacuum / 4				X			AA1.04 - Rod position	2.5*	1
055	Loss of Offsite and Onsite Power (Station Blackout) / 6						X	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.	3.3	1
057	Loss of Vital AC Electrical Instrument Bus / 6					X		AA2.12 - PZR level controller, instrumentation, and heater indications	3.7	1
059	Accidental Liquid Radwaste Release / 9						X	2.4.8 - Knowledge of how the event-based emergency/abnormal operating procedures are used in conjunction with the symptom-based EOPs.	3.7	1
062	Loss of Nuclear Service Water / 4					X		AA2.03 - The valve lineups necessary to restart the SWS while bypassing the portion of the system causing the abnormal condition	2.9	1
067	Plant Fire on Site / 9			X				AK3.02 - Steps called out in the site fire protection plan, FPS manual, and fire zone manual	3.3	1
068	Control Room Evacuation / 8		X					AK2.03 - Controllers and positioners	3.1	1
069	Loss of Containment Integrity / 5	X						AK1.01 - Effect of pressure on leak rate	3.1	1
074	Inadequate Core Cooling / 4	X						EK1.08 - Definition of subcooled liquid	3.1	1

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Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-3

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
076	High Reactor Coolant Activity / 9				X			AA1.04 - Failed fuel-monitoring equipment	3.4	1
E01	Radiagnosis / 3		X					EK2.2 - 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	3.8	1
E04	LOCA Outside Containment / 3			X				EK3.3 - Manipulation of controls required to obtain desired operating results during abnormal, and emergency situations	3.8	1
E06	Degraded Core Cooling / 4						X	2.4.10 - Knowledge of annunciator response procedures.	3.1	1
E08	Pressurized Thermal Shock / 4	X						EK1.3 - Annunciators and conditions indicating signals, and remedial actions associated with the Pressurized Thermal Shock	4.0	1
E10	Natural Circulation with Steam Void in Vessel with/without RVLIS / 4		X					EK2.2 - 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	3.9	1

K/A Category Totals: 4 4 4 4 4 4

Group Point Total: 24

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Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-3

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
008	Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open) / 3			X				AK3.01 - Why PZR level may come back on scale if RCS is saturated	4.4	1
009	Small Break LOCA / 3		X					EK2.03 - S/Gs	3.3*	1
022	Loss of Reactor Coolant Makeup / 2				X			AA1.08 - VCT level	3.3	1
025	Loss of Residual Heat Removal System (RHRS) / 4		X					AK2.01 - RHR heat exchangers	2.9	1
027	Pressurizer Pressure Control (PZR PCS) Malfunction / 3	X						AK1.03 - Latent heat of vaporization/condensation	2.9	1
032	Loss of Source Range Nuclear Instrumentation / 7					X		AA2.09 - Effect of improper HV setting	2.9	1
037	Steam Generator (S/G) Tube Leak / 3						X	2.4.2 - Knowledge of system set points, interlocks and automatic actions associated with EOP entry conditions. Note: The issue of setpoints and automatic safety features is not specifically covered in the systems sections.	4.1	1
038	Steam Generator Tube Rupture (SGTR) / 3				X			EA1.08 - Core cooling monitor	3.8*	1
054	Loss of Main Feedwater (MFW) / 4					X		AA2.08 - Steam flow-feed trend recorder	3.3*	1

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Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-3

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
060	Accidental Gaseous Radwaste Release / 9	X						AK1.02 - Biological effects on humans of the various types of radiation, exposure levels that are acceptable for personnel in a nuclear reactor power plant; the units used for radiation intensity measurements and for radiation exposure levels	3.1*	1
060	Accidental Gaseous Radwaste Release / 9			X				AK3.02 - Isolation of the auxiliary building ventilation	3.5*	1
061	Area Radiation Monitoring (ARM) System Alarms / 7						X	2.3.8 - Knowledge of the process for performing a planned gaseous radioactive release.	3.2	1
061	Area Radiation Monitoring (ARM) System Alarms / 7		X					AK2.01 - Detectors at each ARM system location	2.6*	1
E03	LOCA Cooldown and Depressurization / 4	X						EK1.1 - Components, capacity, and function of emergency systems	4.0	1
E05	Loss of Secondary Heat Sink / 4						X	2.4.41 - Knowledge of the emergency action level thresholds and classifications.	4.1	1
E11	Loss of Emergency Coolant Recirculation / 4					X		EA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	4.2	1

K/A Category Totals: 3 3 2 2 3 3

Group Point Total: 16

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Emergency and Abnormal Plant Evolutions - Tier 1 / Group 3

Form ES-401-3

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
028	Pressurizer (PZR) Level Control Malfunction / 2					X		AA2.11 - Leak in PZR	3.6	1
056	Loss of Offsite Power / 6						X	2.4.21 - 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. Reactor coolant system integrity; 4. Containment conditions; 5. Radioactivity release control.	4.3	1
E13	Steam Generator Overpressure / 4		X					EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.1	1

K/A Category Totals: 0 1 0 0 1 1

Group Point Total: 3



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Plant Systems - Tier 2 / Group 1

Form ES-401-3

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
001	Control Rod Drive System / 1								X				A2.16 - Possible causes of mismatched control rods	3.8	1
003	Reactor Coolant Pump System (RCPS) / 4						X						K6.02 - RCP seals and seal water supply	3.1	1
004	Chemical and Volume Control System (CVCS) / 1				X								K4.08 - Hydrogen control in RCS	3.2	1
013	Engineered Safety Features Actuation System (ESFAS) / 2		X										K2.01 - ESFAS/safeguards equipment control	3.8	1
014	Rod Position Indication System (RPIS) / 1					X							K5.01 - Reasons for differences between RPIS and step counter	3.0	1
015	Nuclear Instrumentation System / 7							X					A1.04 - Quadrant power tilt ratio	3.7	1
017	In-Core Temperature Monitor (ITM) System / 7				X								K4.03 - Range of temperature indication	3.3	1
022	Containment Cooling System (CCS) / 5				X								K4.05 - Containment cooling after LOCA destroys ventilation ducts	2.7	1
025	Ice Condenser System / 5											X	2.1.14 - Knowledge of system status criteria which require the notification of plant personnel.	3.3	1
025	Ice Condenser System / 5			X									K3.01 - Containment	3.8*	1

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Plant Systems - Tier 2 / Group 1

Form ES-401-3

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
026	Containment Spray System (CSS) / 5											X	2.2.9 - Knowledge of the process for determining if the proposed change, test or experiment increases the probability of occurrence or consequences of an accident during the change, test or experiment.	3.3	1
056	Condensate System / 4								X				A2.04 - Loss of condensate pumps	2.8*	1
059	Main Feedwater (MFW) System / 4									X			A3.04 - Turbine driven feed pump	2.6*	1
061	Auxiliary / Emergency Feedwater (AFW) System / 4		X										K2.01 - AFW system MOVs	3.3	1
063	D.C. Electrical Distribution System / 6										X		A4.02 - Battery voltage indicator	2.9	1
068	Liquid Radwaste System (LRS) / 9	X											K1.07 - Sources of liquid wastes for LRS	2.9	1
071	Waste Gas Disposal System (WGDS) / 9			X									K3.04 - Ventilation system	2.9	1
072	Area Radiation Monitoring (ARM) System / 7	X											K1.02 - Containment isolation	3.9	1
072	Area Radiation Monitoring (ARM) System / 7							X					A1.01 - Radiation levels	3.6	1

K/A Category Totals: 2 2 2 3 1 1 2 2 1 1 2

Group Point Total: 19

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Plant Systems - Tier 2 / Group 2

Form ES-401-3

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
002	Reactor Coolant System (RCS) / 2										X		A4.04 - The filling/drainage of LPI pumps during refueling	2.6	1
011	Pressurizer Level Control System (PZR LCS) / 2				X								K4.07 - Cold-calibrated channel	3.2	1
012	Reactor Protection System / 7				X								K4.05 - Spurious trip protection	2.9	1
016	Non-Nuclear Instrumentation System (NNIS) / 7					X							K5.01 - Separation of control and protection circuits	2.8*	1
028	Hydrogen Recombiner and Purge Control System (HRPS) / 5		X										K2.01 - Hydrogen recombiners	2.8*	1
029	Containment Purge System (CPS) / 8									X			A3.01 - CPS isolation	4.0	1
034	Fuel Handling Equipment System (FHES) / 8											X	2.2.6 - Knowledge of the process for making changes in procedures as described in the safety analysis report.	3.3	1
035	Steam Generator System (S/GS) / 4											X	2.4.22 - Knowledge of the bases for prioritizing safety functions during abnormal/emergency operations.	4.0	1
039	Main and Reheat Steam System (MRSS) / 4								X				A2.02 - Decrease in turbine load as it relates to steam escaping from relief valves	2.7*	1
055	Condenser Air Removal System (CARS) / 4	X											K1.06 - PRM system	2.6	1

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Plant Systems - Tier 2 / Group 2

Form ES-401-3

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
062	A.C. Electrical Distribution System / 6								X				A2.07 - Consequences of opening a disconnect under load	3.4*	1
064	Emergency Diesel Generator (ED/G) System / 6		X										K2.03 - Control power	3.6	1
073	Process Radiation Monitoring (PRM) System / 7							X					A1.01 - Radiation levels	3.5	1
075	Circulating Water System / 8			X									K3.07 - ESFAS	3.5*	1
079	Station Air System (SAS) / 8										X		A4.01 - Cross-tie valves with IAS	2.7	1
086	Fire Protection System (FPS) / 8						X						K6.04 - Fire, smoke, and heat detectors	2.9	1
103	Containment System / 5			X									K3.03 - Loss of containment integrity under refueling operations	4.1	1

K/A Category Totals: 1 2 2 2 1 1 1 2 1 2 2

Group Point Total: 17

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Plant Systems - Tier 2 / Group 3

Form ES-401-3

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
008	Component Cooling Water System (CCWS) / 8											X	2.1.12 - Ability to apply technical specifications for a system.	4.0	1
041	Steam Dump System (SDS) and Turbine Bypass Control / 4						X						K6.03 - Controller and positioners, including ICS, S/G, CRDS	2.9	1
076	Service Water System (SWS) / 4		X										K2.04 - Reactor building closed cooling water	2.6*	1
078	Instrument Air System (IAS) / 8									X			A3.01 - Air pressure	3.2	1

K/A Category Totals: 0 1 0 0 0 1 0 0 1 0 1

Group Point Total: 4

# Generic Knowledge and Abilities Outline (Tier 3)

Printed: 03/25/200

## PWR SRO Examination Outline

Form ES-401-5

Facility: Watts Bar Nuclear Plant

Generic Category	KA	KA Topic	Imp.	Points
Conduct of Operations	2.1.3	Knowledge of shift turnover practices.	3.4	1
	2.1.7	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	4.4	1
	2.1.25	Ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data.	3.1	1
	2.1.34	Ability to maintain primary and secondary plant chemistry within allowable limits.	2.9	1
Category Total:				4
Equipment Control	2.2.20	Knowledge of the process for managing troubleshooting activities.	3.3	1
	2.2.28	Knowledge of new and spent fuel movement procedures.	3.5	1
	2.2.31	Knowledge of procedures and limitations involved in initial core loading.	2.9*	1
	2.2.33	Knowledge of control rod programming.	2.9	1
Category Total:				4
Radiation Control	2.3.2	Knowledge of facility ALARA program.	2.9	1
	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	1
	2.3.9	Knowledge of the process for performing a containment purge.	3.4	1
	2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	3.3	1
Category Total:				4

# Generic Knowledge and Abilities Outline (Tier 3)

Printed: 03/25/200

## PWR SRO Examination Outline

Form ES-401-5

Facility: Watts Bar Nuclear Plant

Generic Category	KA	KA Topic	Imp.	Points
Emergency Procedures/Plan	2.4.20	Knowledge of operational implications of EOP warnings, cautions, and notes.	4.0	1
	2.4.21	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. Reactor coolant system integrity; 4. Containment conditions; 5. Radioactivity release control.	4.3	1
	2.4.27	Knowledge of fire in the plant procedure.	3.5	1
	2.4.29	Knowledge of the emergency plan.	4.0	1
	2.4.50	Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	3.3	1

Category Total: 5

Generic Total: 17

## Newman, Terry Lee

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From: Robert Monk [RLM2@nrc.gov]  
nt: Thursday, March 13, 2003 4:09 PM  
tlnewman@tva.gov  
Subject: Sample plan

I transferred it over to the standard form and some patterns came up that could be problematic. That is, too many questions for a given line item (topic area) on the form.

For example, there are 4 questions on RCP's. Topic area 15/17 is really one topic in the K/A catalog. Some other areas had multiple questions for a topic.

Here is a suggestion that will keep it random, provide a broader sample and not require any adjustments to the cover sheet matrix.

First, manually transfer the items to the ES 401 form.

Using the WE01 and WE02 as an example:

Skip the first X in the K2 column, go to the second X in the K3 column. Move that X up to the first empty topic area (row) which is WE04. Go to the third X in column A1 and move it up to row 000011.

Continue the process, moving either up or down based on where you are on the page.

The result will be a broader test and you won't have to write multiple questions on ornery topics like Accidental Gas release.

Attach this email to your sample plan to show the methodology of the modification.

bob