

INITIAL SUBMITTAL

WATTS BAR EXAM
50-390, 391/2001-301

JANUARY 29 - FEBRUARY 6,
2001

INITIAL SUBMITTAL

INITIAL OUTLINE SUBMITTALS
NRC SUBMITTED/WRITTEN OUTLINES

6:1 WATTS BAR

SAMPLE PLAN

Facility: TVA - WATTS BAR NUCLEAR PLANT

Form ES-401-3

Exam Date: 01/26/2001Exam 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	5			3	24
	2	3	3	3				3	4			0	16
	3	1	0	0				0	1			1	3
	Tier Totals	8	7	7				7	10			4	43
2. Plant Systems	1	1	3	2	2	2	1	2	2	2	1	1	19
	2	2	1	1	2	1	2	2	1	2	1	2	17
	3	1	0	0	1	0	0	1	0	0	0	1	4
	Tier Totals	4	4	3	5	3	3	5	3	4	2	4	40
3. Generic Knowledge And Abilities					Cat 1		Cat 2		Cat 3		Cat 4		
					5		4		4		4		17
<p>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</p> <p>2. Actual point totals must match those specified in the table.</p> <p>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.</p> <p>4. Systems/evolutions within each group are identified on the associated outline.</p> <p>5. The shaded areas are not applicable to the category/tier.</p> <p>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.</p> <p>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</p>													

PWR SRO Examination Outline

Printed: 02/13/2001

Facility: TVA - WATTS BAR NUCLEAR PLANT

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
005	Inoperable/Stuck Control Rod / 1			X				AK3.02 - Rod insertion limits	4.2	1
011	Large Break LOCA / 3		X					EK2.02 - Pumps	2.7*	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
017	Reactor Coolant Pump (RCP) Malfunctions (Loss of RC Flow) / 4			X				AK3.03 - Sequence of events for manually tripping reactor and RCP as a result of an RCP malfunction	4.0	1
017	Reactor Coolant Pump (RCP) Malfunctions (Loss of RC Flow) / 4				X			AA1.13 - Reactor power level indicators	3.4*	1
024	Emergency Boration / 1						X	2.4.16 - Knowledge of EOP implementation hierarchy and coordination with other support procedures.	4.0	1
024	Emergency Boration / 1	X						AK1.02 - Relationship between boron addition and reactor power	3.9	1
029	Anticipated Transient Without Scram (ATWS) / 1				X			EA1.02 - Charging pump suction valves from RWST operating switch	3.3	1
055	Loss of Offsite and Onsite Power (Station Blackout) / 6					X		EA2.05 - When battery is approaching fully discharged	3.7	1
055	Loss of Offsite and Onsite Power (Station Blackout) / 6						X	2.4.45 - Ability to prioritize and interpret the significance of each annunciator or alarm.	3.6	1

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

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E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
057	Loss of Vital AC Electrical Instrument Bus / 6				X			AA1.05 - Backup instrument indications	3.4	1
059	Accidental Liquid Radwaste Release / 9	X						AK1.01 - Types of radiation, their units of intensity and the location of the sources of radiation in a nuclear power plant	3.1	1
069	Loss of Containment Integrity / 5		X					AK2.03 - Personnel access hatch and emergency access hatch	2.9	1
074	Inadequate Core Cooling / 4					X		EA2.04 - Relationship between RCS temperature and main steam pressure	4.2	1
074	Inadequate Core Cooling / 4	X						EK1.03 - Processes for removing decay heat from the core	4.9	1
076	High Reactor Coolant Activity / 9				X			AA1.04 - Failed fuel-monitoring equipment	3.4	1
E01	Rediagnosis / 3			X				EK3.4 - RO or SRO function within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated	3.6	1
E02	SI Termination / 3					X		EA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	4.0	1

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

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E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
E06	Degraded Core Cooling / 4		X					EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.8	1
E07	Saturated Core Cooling / 4		X					EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.5	1
E09	Natural Circulation Operations / 4						X	2.1.34 - Ability to maintain primary and secondary plant chemistry within allowable limits.	2.9	1
E10	Natural Circulation with Steam Void in Vessel with/without RVLIS / 4					X		EA2.1 - Facility conditions and selection of appropriate procedures during abnormal and emergency operations	3.9	1
E12	Uncontrolled Depressurization of all Steam Generators / 4					X		EA2.2 - Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments	3.9	1
E14	High Containment Pressure / 5			X				EK3.2 - Normal, abnormal and emergency operating procedures associated with High Containment Pressure	3.7	1

K/A Category Totals: 4 4 4 4 5 3

Group Point Total: 24

PWR SRO Examination Outline

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Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

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
007	Reactor Trip / 1					X		EA2.06 - Occurrence of a reactor trip	4.5	1
007	Reactor Trip / 1		X					EK2.02 - Breakers, relays and disconnects	2.8	1
008	Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open) / 3	X						AK1.01 - Thermodynamics and flow characteristics of open or leaking valves	3.7	1
027	Pressurizer Pressure Control (PZR PCS) Malfunction / 3					X		AA2.02 - Normal values for RCS pressure	3.9	1
027	Pressurizer Pressure Control (PZR PCS) Malfunction / 3			X				AK3.02 - Verification of alternate transmitter and/or plant computer prior to shifting flow chart transmitters	3.0	1
032	Loss of Source Range Nuclear Instrumentation / 7			X				AK3.02 - Guidance contained in EOP for loss of source-range nuclear instrumentation	4.1	1
033	Loss of Intermediate Range Nuclear Instrumentation / 7				X			AA1.01 - Power-available indicators in cabinets or equipment drawers	3.1	1
038	Steam Generator Tube Rupture (SGTR) / 3	X						EK1.01 - Use of steam tables	3.4	1
058	Loss of DC Power / 6			X				AK3.01 - Use of dc control power by ED/Gs	3.7	1

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ES - 401

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		AA2.05 - That the automatic safety actions have occurred as a result of a high ARM system signal	4.2	1
060	Accidental Gaseous Radwaste Release / 9					X		AA2.04 - The effects on the power plant of isolating a given radioactive-gas leak	3.4*	1
065	Loss of Instrument Air / 8				X			AA1.04 - Emergency air compressor	3.4*	1
E03	LOCA Cooldown and Depressurization / 4	X						EK1.3 - Annunciators and conditions indicating signals, and remedial actions associated with the LOCA Cooldown and Depressurization	3.8	1
E03	LOCA Cooldown and Depressurization / 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	4.0	1
E05	Loss of Secondary Heat Sink / 4		X					EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.9	1
E11	Loss of Emergency Coolant Recirculation / 4				X			EA1.2 - Operating behavior characteristics of the facility	3.8	1

K/A Category Totals: 3 3 3 3 4 0

Group Point Total: 16

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Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 3

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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	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
036	Fuel Handling Incidents / 8					X		AA2.01 - ARM system indications	3.9	1
036	Fuel Handling Incidents / 8	X						AK1.03 - Indications of approaching criticality	4.3	1

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

Group Point Total: 3

PWR SRO Examination Outline

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Facility: TVA - WATTS BAR NUCLEAR PLANT

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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							K5.28 - Boron reactivity worth vs. boron concentration, i.e., amount of boron needed (ppm) to change core reactivity to desired amount	3.8	1
001	Control Rod Drive System / 1						X						K6.02 - Purpose and operation of sensors feeding into the CRDS	3.3	1
003	Reactor Coolant Pump System (RCPS) / 4											X	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	1
003	Reactor Coolant Pump System (RCPS) / 4							X					A1.08 - Seal water temperature	2.6	1
004	Chemical and Volume Control System (CVCS) / 1			X									K3.01 - CRDS (automatic)	2.9	1
004	Chemical and Volume Control System (CVCS) / 1		X										K2.03 - Charging pumps	3.5	1
013	Engineered Safety Features Actuation System (ESFAS) / 2		X										K2.01 - ESFAS/safeguards equipment control	3.8	1
013	Engineered Safety Features Actuation System (ESFAS) / 2				X								K4.08 - Redundancy	3.4	1
015	Nuclear Instrumentation System / 7								X				A2.03 - Xenon oscillations	3.5*	1
017	In-Core Temperature Monitor (ITM) System / 7									X			A3.01 - Indications of normal, natural, and interrupted circulation of RCS	3.8*	1

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ES - 401

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
022	Containment Cooling System (CCS) / 5				X								K4.03 - Automatic containment isolation	4.0	1
022	Containment Cooling System (CCS) / 5										X		A4.02 - CCS pumps	3.1*	1
025	Ice Condenser System / 5									X			A3.02 - Isolation valves	3.4*	1
026	Containment Spray System (CSS) / 5								X				A2.09 - Radiation hazard potential of BWST	2.9*	1
059	Main Feedwater (MFW) System / 4			X									K3.04 - RCS	3.8	1
061	Auxiliary / Emergency Feedwater (AFW) System / 4					X							K5.02 - Decay heat sources and magnitude	3.6	1
063	D.C. Electrical Distribution System / 6		X										K2.01 - Major DC loads	3.1*	1
071	Waste Gas Disposal System (WGDS) / 9							X					A1.06 - Ventilation system	2.8	1
072	Area Radiation Monitoring (ARM) System / 7	X											K1.02 - Containment isolation	3.9	1

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

Group Point Total: 19

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Facility: TVA - WATTS BAR NUCLEAR PLANT

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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											K1.02 - CRDS	3.0*	1
002	Reactor Coolant System (RCS) / 2				X								K4.05 - Detection of RCS leakage	4.2	1
010	Pressurizer Pressure Control System (PZR PCS) / 3						X						K6.04 - PRT	3.2	1
010	Pressurizer Pressure Control System (PZR PCS) / 3									X			A3.01 - PRT temperature and pressure during PORV testing	3.2	1
011	Pressurizer Level Control System (PZR LCS) / 2											X	2.4.45 - Ability to prioritize and interpret the significance of each annunciator or alarm.	3.6	1
012	Reactor Protection System / 7					X							K5.02 - Power density	3.3*	1
012	Reactor Protection System / 7								X				A2.04 - Erratic power supply operation	3.2	1
027	Containment Iodine Removal System (CIRS) / 5		X										K2.01 - Fans	3.4*	1
028	Hydrogen Recombiner and Purge Control System (HRPS) / 5						X						K6.01 - Hydrogen recombiners	3.1	1
034	Fuel Handling Equipment System (FHES) / 8				X								K4.01 - Fuel protection from binding and dropping	3.4	1
034	Fuel Handling Equipment System (FHES) / 8							X					A1.02 - Water level in the refueling canal	3.7	1

PWR SRO Examination Outline

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Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

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
039	Main and Reheat Steam System (MRSS) / 4							X					A1.03 - Primary system temperature indications, and required values, during main steam system warm-up	2.7	1
039	Main and Reheat Steam System (MRSS) / 4									X			A3.02 - Isolation of the MRSS	3.5*	1
064	Emergency Diesel Generator (ED/G) System / 6											X	2.2.18 - Knowledge of the process for managing maintenance activities during shutdown operations.	3.6	1
073	Process Radiation Monitoring (PRM) System / 7	X											K1.01 - Those systems served by PRMs	3.9	1
075	Circulating Water System / 8			X									K3.07 - ESFAS	3.5*	1
075	Circulating Water System / 8										X		A4.01 - Emergency/essential SWS pumps	3.2*	1

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

Group Point Total: 17

PWR SRO Examination Outline

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Facility: TVA - WATTS BAR NUCLEAR PLANT

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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
005	Residual Heat Removal System (RHRS) / 4				X								K4.07 - System protection logics, including high-pressure interlock, reset controls, and valve interlocks	3.5	1
041	Steam Dump System (SDS) and Turbine Bypass Control / 4											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
045	Main Turbine Generator (MT/G) System / 4							X					A1.05 - Expected response of primary plant parameters (temperature and pressure) following T/G trip	4.1	1
078	Instrument Air System (IAS) / 8	X											K1.05 - MSIV air	3.5*	1

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

Group Point Total: 4

Generic Knowledge and Abilities Outline (Tier 3)

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Form ES-401-5

Facility: TVA - WATTS BAR NUCLEAR PLANT

Generic Category	KA	KA Topic	Imp.	Points
Conduct of Operations	2.1.6	Ability to supervise and assume a management role during plant transients and upset conditions.	4.3	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
	2.1.11	Knowledge of less than one hour technical specification action statements for systems.	3.8	1
	2.1.12	Ability to apply technical specifications for a system.	4.0	1
	2.1.33	Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	4.0	1
Category Total:			5	
Equipment Control	2.2.20	Knowledge of the process for managing troubleshooting activities.	3.3	1
	2.2.22	Knowledge of limiting conditions for operations and safety limits.	4.1	1
	2.2.24	Ability to analyze the affect of maintenance activities on LCO status.	3.8	1
	2.2.28	Knowledge of new and spent fuel movement procedures.	3.5	1
Category Total:			4	
Radiation Control	2.3.1	Knowledge of 10 CFR: 20 and related facility radiation control requirements.	3.0	1
	2.3.4	Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	3.1	1
	2.3.6	Knowledge of the requirements for reviewing and approving release permits.	3.1	1
	2.3.11	Ability to control radiation releases.	3.2	1
Category Total:			4	

Generic Knowledge and Abilities Outline (Tier 3)

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Form ES-401-5

Facility: TVA - WATTS BAR NUCLEAR PLANT

Generic Category	KA	KA Topic	Imp.	Points
Emergency Procedures/Plan	2.4.1	Knowledge of EOP entry conditions and immediate action steps.	4.6	1
	2.4.7	Knowledge of event based EOP mitigation strategies.	3.8	1
	2.4.19	Knowledge of EOP layout, symbols, and icons.	3.7	1
	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	1

Category Total: 4

Generic Total: 17

Facility: TVA - WATTS BAR NUCLEAR PLANT

Form ES-401-4

Exam Date: 01/26/2001Exam Level: RO

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	3	3	4				3	2			1	16
	2	4	4	3				3	2			1	17
	3	1	0	1				1	0			0	3
	Totals Tier	8	7	8				7	4			2	36
2. Plant Systems	1	3	2	2	2	2	2	2	2	2	2	2	23
	2	2	2	2	2	2	2	2	2	2	1	1	20
	3	1	1	0	2	0	1	2	1	0	0	0	8
	Tier Totals	6	5	4	6	4	5	6	5	4	3	3	51
3. Generic Knowledge And Abilities					Cat 1		Cat 2		Cat 3		Cat 4		
					3		4		2		4		13

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

Form ES-401-4

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
005	Inoperable/Stuck Control Rod / 1			X				AK3.02 - Rod insertion limits	3.6	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	2.7	1
017	Reactor Coolant Pump (RCP) Malfunctions (Loss of RC Flow) / 4			X				AK3.03 - Sequence of events for manually tripping reactor and RCP as a result of an RCP malfunction	3.7	1
017	Reactor Coolant Pump (RCP) Malfunctions (Loss of RC Flow) / 4				X			AA1.13 - Reactor power level indicators	3.4*	1
024	Emergency Boration / 1	X						AK1.02 - Relationship between boron addition and reactor power	3.6	1
027	Pressurizer Pressure Control (PZR PCS) Malfunction / 3			X				AK3.02 - Verification of alternate transmitter and/or plant computer prior to shifting flow chart transmitters	2.9*	1
027	Pressurizer Pressure Control (PZR PCS) Malfunction / 3					X		AA2.12 - PZR level	3.7	1
057	Loss of Vital AC Electrical Instrument Bus / 6				X			AA1.05 - Backup instrument indications	3.2	1
068	Control Room Evacuation / 8						X	2.3.10 - Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	2.9	1

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ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 1

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E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
069	Loss of Containment Integrity / 5		X					AK2.03 - Personnel access hatch and emergency access hatch	2.8*	1
074	Inadequate Core Cooling / 4	X						EK1.03 - Processes for removing decay heat from the core	4.5	1
076	High Reactor Coolant Activity / 9				X			AA1.04 - Failed fuel-monitoring equipment	3.2	1
E06	Degraded Core Cooling / 4		X					EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.6	1
E07	Saturated Core Cooling / 4		X					EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.2	1
E10	Natural Circulation with Steam Void in Vessel with/without RVLIS / 4					X		EA2.1 - Facility conditions and selection of appropriate procedures during abnormal and emergency operations	3.2	1
E14	High Containment Pressure / 5			X				EK3.2 - Normal, abnormal and emergency operating procedures associated with High Containment Pressure	3.1	1

K/A Category Totals: 3 3 4 3 2 1

Group Point Total: 16

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Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-4

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
003	Dropped Control Rod / 1					X		AA2.01 - Rod position indication to actual rod position	3.7	1
007	Reactor Trip / 1		X					EK2.02 - Breakers, relays and disconnects	2.6	1
008	Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open) / 3	X						AK1.01 - Thermodynamics and flow characteristics of open or leaking valves	3.2	1
008	Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open) / 3						X	2.2.25 - Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	2.5	1
011	Large Break LOCA / 3		X					EK2.02 - Pumps	2.6*	1
029	Anticipated Transient Without Scram (ATWS) / 1				X			EA1.02 - Charging pump suction valves from RWST operating switch	3.6*	1
032	Loss of Source Range Nuclear Instrumentation / 7			X				AK3.02 - Guidance contained in EOP for loss of source-range nuclear instrumentation	3.7*	1
033	Loss of Intermediate Range Nuclear Instrumentation / 7				X			AA1.01 - Power-available indicators in cabinets or equipment drawers	2.9	1
038	Steam Generator Tube Rupture (SGTR) / 3	X						EK1.01 - Use of steam tables	3.1	1

PWR RO Examination Outline

Printed: 02/13/2001

Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-4

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
058	Loss of DC Power / 6			X				AK3.01 - Use of dc control power by ED/Gs	3.4*	1
059	Accidental Liquid Radwaste Release / 9	X						AK1.01 - Types of radiation, their units of intensity and the location of the sources of radiation in a nuclear power plant	2.7	1
060	Accidental Gaseous Radwaste Release / 9					X		AA2.05 - That the automatic safety actions have occurred as a result of a high ARM system signal	3.7	1
E01	Rediagnosis / 3			X				EK3.4 - RO or SRO function within the control room team as appropriate to the assigned position, in such a way that procedures are adhered to and the limitations in the facilities license and amendments are not violated	3.3	1
E03	LOCA Cooldown and Depressurization / 4	X						EK1.3 - Annunciators and conditions indicating signals, and remedial actions associated with the LOCA Cooldown and Depressurization	3.5	1
E03	LOCA Cooldown and Depressurization / 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	3.7	1
E05	Loss of Secondary Heat Sink / 4		X					EK2.1 - Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.7	1
E11	Loss of Emergency Coolant Recirculation / 4				X			EA1.2 - Operating behavior characteristics of the facility	3.5	1

K/A Category Totals: 4 4 3 3 2 1

Group Point Total: 17

PWR RO Examination Outline

Printed: 02/13/2001

Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

Emergency and Abnormal Plant Evolutions - Tier 1 / Group 3

Form ES-401-4

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
036	Fuel Handling Incidents / 8	X						AK1.03 - Indications of approaching criticality	4.0	1
056	Loss of Offsite Power / 6			X				AK3.02 - Actions contained in EOP for loss of offsite power	4.4	1
065	Loss of Instrument Air / 8				X			AA1.04 - Emergency air compressor	3.5*	1

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

Group Point Total: 3

PWR RO Examination Outline

Printed: 02/13/2001

Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-4

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							K5.28 - Boron reactivity worth vs. boron concentration, i.e., amount of boron needed (ppm) to change core reactivity to desired amount	3.5	1
001	Control Rod Drive System / 1						X						K6.02 - Purpose and operation of sensors feeding into the CRDS	2.8	1
003	Reactor Coolant Pump System (RCPS) / 4							X					A1.08 - Seal water temperature	2.5	1
003	Reactor Coolant Pump System (RCPS) / 4											X	2.4.6 - Knowledge symptom based EOP mitigation strategies.	3.1	1
004	Chemical and Volume Control System (CVCS) / 1			X									K3.01 - CRDS (automatic)	2.5*	1
004	Chemical and Volume Control System (CVCS) / 1		X										K2.03 - Charging pumps	3.3	1
013	Engineered Safety Features Actuation System (ESFAS) / 2		X										K2.01 - ESFAS/safeguards equipment control	3.6*	1
013	Engineered Safety Features Actuation System (ESFAS) / 2				X								K4.08 - Redundancy	3.1	1
015	Nuclear Instrumentation System / 7								X				A2.03 - Xenon oscillations	3.2	1
015	Nuclear Instrumentation System / 7						X						K6.01 - Sensors, detectors, and indicators	2.9	1

PWR RO Examination Outline

Printed: 02/13/2001

Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-4

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
017	In-Core Temperature Monitor (ITM) System / 7									X			A3.01 - Indications of normal, natural, and interrupted circulation of RCS	3.6*	1
017	In-Core Temperature Monitor (ITM) System / 7	X											K1.01 - Plant computer	3.2*	1
022	Containment Cooling System (CCS) / 5				X								K4.03 - Automatic containment isolation	3.6*	1
022	Containment Cooling System (CCS) / 5										X		A4.02 - CCS pumps	3.2*	1
025	Ice Condenser System / 5									X			A3.02 - Isolation valves	3.4*	1
056	Condensate System / 4	X											K1.03 - MFW	2.6*	1
059	Main Feedwater (MFW) System / 4			X									K3.04 - RCS	3.6	1
059	Main Feedwater (MFW) System / 4										X		A4.12 - Initiation of automatic feedwater isolation	3.4	1
061	Auxiliary / Emergency Feedwater (AFW) System / 4					X							K5.02 - Decay heat sources and magnitude	3.2	1
071	Waste Gas Disposal System (WGDS) / 9							X					A1.06 - Ventilation system	2.5	1
071	Waste Gas Disposal System (WGDS) / 9											X	2.4.18 - Knowledge of the specific bases for EOPs.	2.7	1

PWR RO Examination Outline

Printed: 02/13/2001

Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-4

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
072	Area Radiation Monitoring (ARM) System / 7	X											K1.02 - Containment isolation	3.5	1
072	Area Radiation Monitoring (ARM) System / 7								X				A2.03 - Blown power-supply fuses	2.7	1

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

Group Point Total: 23

PWR RO Examination Outline

Printed: 02/13/2001

Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

Plant Systems - Tier 2 / Group 2

Form ES-401-4

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											K1.02 - CRDS	2.9*	1
002	Reactor Coolant System (RCS) / 2				X								K4.05 - Detection of RCS leakage	3.8	1
010	Pressurizer Pressure Control System (PZR PCS) / 3						X						K6.04 - PRT	2.9	1
010	Pressurizer Pressure Control System (PZR PCS) / 3									X			A3.01 - PRT temperature and pressure during PORV testing	3.0	1
012	Reactor Protection System / 7					X							K5.02 - Power density	3.1*	1
012	Reactor Protection System / 7								X				A2.04 - Erratic power supply operation	3.1	1
016	Non-Nuclear Instrumentation System (NNIS) / 7			X									K3.03 - SDS	3.0*	1
016	Non-Nuclear Instrumentation System (NNIS) / 7					X							K5.01 - Separation of control and protection circuits	2.7*	1
026	Containment Spray System (CSS) / 5								X				A2.09 - Radiation hazard potential of BWST	2.5*	1
029	Containment Purge System (CPS) / 8							X					A1.02 - Radiation levels	3.4	1

PWR RO Examination Outline

Printed: 02/13/2001

Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

Plant Systems - Tier 2 / Group 2

Form ES-401-4

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
035	Steam Generator System (S/GS) / 4											X	2.4.34 - Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications.	3.8	1
035	Steam Generator System (S/GS) / 4				X								K4.06 - S/G pressure	3.1	1
039	Main and Reheat Steam System (MRSS) / 4							X					A1.03 - Primary system temperature indications, and required values, during main steam system warm-up	2.6	1
039	Main and Reheat Steam System (MRSS) / 4									X			A3.02 - Isolation of the MRSS	3.1	1
063	D.C. Electrical Distribution System / 6		X										K2.01 - Major DC loads	2.9*	1
064	Emergency Diesel Generator (ED/G) System / 6		X										K2.03 - Control power	3.2*	1
064	Emergency Diesel Generator (ED/G) System / 6						X						K6.08 - Fuel oil storage tanks	3.2	1
073	Process Radiation Monitoring (PRM) System / 7	X											K1.01 - Those systems served by PRMs	3.6	1
075	Circulating Water System / 8			X									K3.07 - ESFAS	3.4*	1
075	Circulating Water System / 8										X		A4.01 - Emergency/essential SWS pumps	3.2*	1

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

Group Point Total: 20

PWR RO Examination Outline

Printed: 02/13/2001

Facility: TVA - WATTS BAR NUCLEAR PLANT

ES - 401

Plant Systems - Tier 2 / Group 3

Form ES-401-4

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
005	Residual Heat Removal System (RHRS) / 4				X								K4.07 - System protection logics, including high-pressure interlock, reset controls, and valve interlocks	3.2	1
005	Residual Heat Removal System (RHRS) / 4								X				A2.01 - Failure modes for pressure, flow, pump motor amps, motor temperature, and tank level instrumentation	2.7	1
027	Containment Iodine Removal System (CIRS) / 5		X										K2.01 - Fans	3.1*	1
028	Hydrogen Recombiner and Purge Control System (HRPS) / 5						X						K6.01 - Hydrogen recombiners	2.6	1
034	Fuel Handling Equipment System (FHES) / 8				X								K4.01 - Fuel protection from binding and dropping	2.6	1
034	Fuel Handling Equipment System (FHES) / 8							X					A1.02 - Water level in the refueling canal	2.9	1
045	Main Turbine Generator (MT/G) System / 4							X					A1.05 - Expected response of primary plant parameters (temperature and pressure) following T/G trip	3.8	1
078	Instrument Air System (IAS) / 8	X											K1.05 - MSIV air	3.4*	1

K/A Category Totals: 1 1 0 2 0 1 2 1 0 0 0

Group Point Total: 8

Generic Knowledge and Abilities Outline (Tier 3)

Printed: 02/13/2001

PWR RO Examination Outline

Form ES-401-5

Facility: TVA - WATTS BAR NUCLEAR PLANT

Generic Category	KA	KA Topic	Imp.	Points
Conduct of Operations	2.1.7	Ability to evaluate plant performance and make operational judgments based on operating characteristics, reactor behavior, and instrument interpretation.	3.7	1
	2.1.17	Ability to make accurate, clear and concise verbal reports.	3.5	1
	2.1.19	Ability to use plant computer to obtain and evaluate parametric information on system or component status.	3.0	1
Category Total:			3	
Equipment Control	2.2.1	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.	3.7	1
	2.2.13	Knowledge of tagging and clearance procedures.	3.6	1
	2.2.26	Knowledge of refueling administrative requirements.	2.5	1
	2.2.28	Knowledge of new and spent fuel movement procedures.	2.6	1
Category Total:			4	
Radiation Control	2.3.1	Knowledge of 10 CFR: 20 and related facility radiation control requirements.	2.6	1
	2.3.11	Ability to control radiation releases.	2.7	1
Category Total:			2	
Emergency Procedures/Plan	2.4.1	Knowledge of EOP entry conditions and immediate action steps.	4.3	1
	2.4.19	Knowledge of EOP layout, symbols, and icons.	2.7	1
	2.4.34	Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications.	3.8	1
	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.	3.5	1
Category Total:			4	
Generic Total:			13	

**WATTS BAR NUCLEAR PLANT
REACTOR OPERATOR NRC EXAMINATION
01/26/01**

32. Given the following plant conditions:

- Reactor trip and safety injection occurred.
- The crew implemented FR-H.1, "Loss of Secondary Heat Sink" due to heat sink red path.
- Operators are preparing for main feedwater startup.

Which ONE of the following lists the minimum actions required to reset Main Feedwater Pump 1A?

- a. Reset safety injection and cycle reactor trip breakers.
- b. Reset safety injection and reset feedwater isolation signal.
- c. Cycle the reactor trip breakers and reset feedwater isolation signal.
- d. Reset safety injection, cycle reactor trip breakers, and reset feedwater isolation signal.

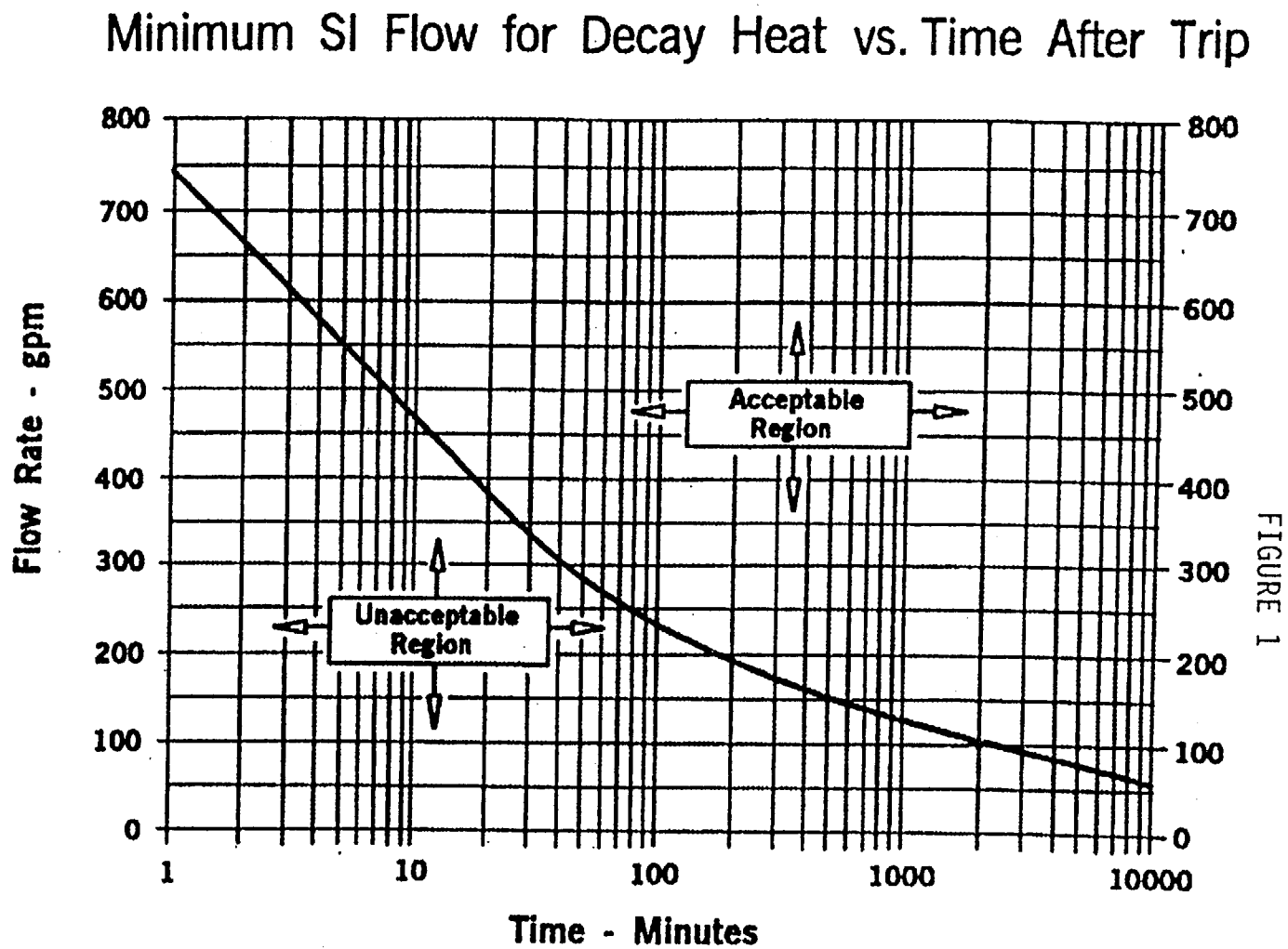
33. Given the following plant conditions:

SRD question #40

- Reactor trip and SI occurred at 0200 due to a small LOCA.
- At 0300 the crew transitioned to ECA-1.1, "Loss of RHR Sump Recirculation", due to the failure of both RHR pumps.
- Crew has reduced ECCS flow to 1 SIP and 1 CCP per ECA-1.1.
- At 0500 the crew is performing step 17 RNO to establish the minimum required ECCS flow to remove decay heat.

Using Figure 1 from ECA-1.1, which ONE of the following flow rates would satisfy the intent of the RNO?

- a. 170 gpm
- b. 210 gpm
- c. 240 gpm
- d. 280 gpm



ECA111

**WATTS BAR NUCLEAR PLANT
REACTOR OPERATOR NRC EXAMINATION
01/26/01**

36. Following an automatic start due to low instrument air pressure, which ONE of the following describes what will cause Aux Air Compressors to shutdown?
- a. Running unloaded for 5 minutes.
 - b. Running unloaded for 10 minutes.
 - c. Low crankcase oil pressure.
 - d. High discharge air temperature.

37. Given the following plant conditions:

- SRD question 44
- The Unit is at 1% power after an extended shutdown.
 - Core burnup is 2000 MWD/MTU.
 - RCS boron concentration is 1000 ppm.
 - Control rods at 175 steps
 - The STA has determined that 236 pcm of reactivity must be added to increase power to 10%.

Using the attached NUPOP curve and assuming no control rod movement, which ONE of the following identifies the final boron concentration of the RCS after the reactivity change has been made?

- a. 966 ppm
- b. 969 ppm
- c. 1031 ppm
- d. 1034 ppm

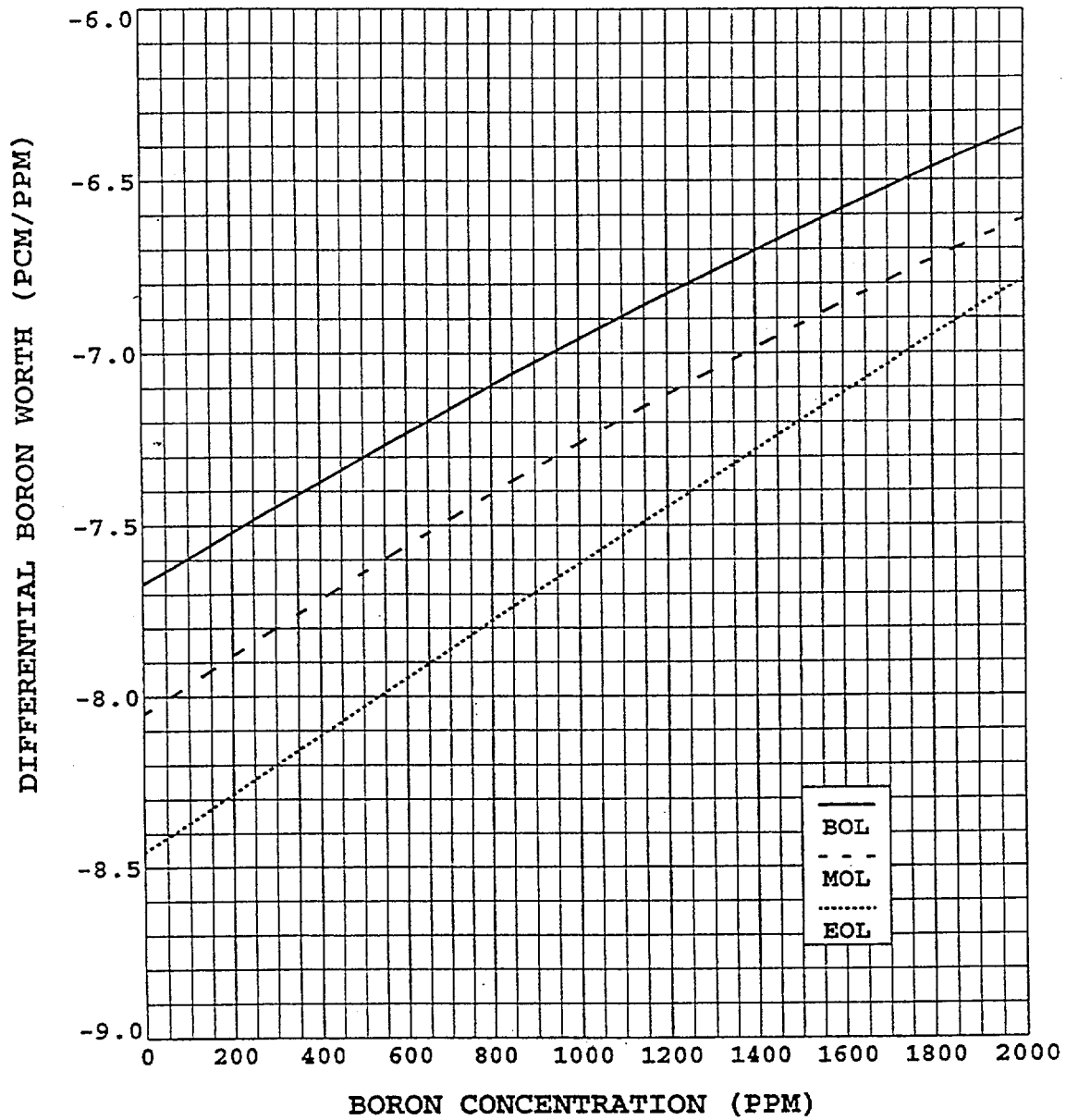


Figure 6-22 Differential Boron Worth Versus Boron Concentration at BOL, MOL, and EOL, HZP, With No Xenon