

Draft Submittal
CATAWBA OCTOBER 2004
EXAM 50-413, 414/2004-301
OCTOBER 4 - 8, 2004 &
OCTOBER 13, 2004 (WRITTEN)

DRAFT Written Exam Quality Checklist (ES-401-6)
& Written Exam Sample Plan

Facility: Catawba Nuclear Station		Date of Exam: 10/16/2004		Exam Level: SRO	
Item Description	Initial				
	a	b*	c#		
1. Questions and answers technically accurate and applicable to facility	BJ	JMS			
2. a. NRC K/As referenced for all questions b. Facility learning objectives referenced as available	BJ	JMS			
3. SRO questions are appropriate per Section D.2.d of ES-401	BJ	JMS			
4. Question selection and duplication from the last two NRC licensing exams appears consistent with a systematic sampling process	BJ	JMS			
5. Question duplication from the license screening/audit exam was controlled as indicated below (check the item that applies) and appears appropriate: 6. ___ the audit exam was systematically and randomly developed; or 7. ___ the audit exam was completed before the license exam was started; or 8. <input checked="" type="checkbox"/> the examinations were developed independently; or 9. <input checked="" type="checkbox"/> the licensee certifies that there is no duplication; or 10. <input checked="" type="checkbox"/> other (explain)	BJ	JMS			
6. Bank use meets limits (no more than 75 percent from the bank at least 10 percent new, and the rest modified); enter the actual RO / SRO-only question distribution(s) at right	Bank 6 / 24%	Modified 6 / 24%	New 13 / 52%	BJ	JMS
7. Between 50 and 60 percent of the questions on the RO exam are written at the comprehension/analysis level; the SRO exam may exceed 60 percent if the randomly selected K/As support the higher cognitive levels; enter the actual RO / SRO question distribution(s) at right	Memory 9 / 36%	C/A 16 / 64%		BJ	JMS
8. References/handouts provided do not give away answers				BJ	JMS
9. Question content conforms with specific K/A statements in the previously approved examination outline and is appropriate for the Tier to which they are assigned; deviations are justified				BJ	JMS
10. Question psychometric quality and format meet ES, Appendix B, guidelines				BJ	JMS
11. The exam contains the required number of one-point, multiple choice items; the total is correct and agrees with value on cover sheet				BJ	JMS
a. Author		Printed Name / Signature		Date	
b. Facility Reviewer (*)		BRIAN C. HAAGENSEN / Brian C. Haagensen		9/1/04	
c. NRC Chief Examiner (#)		JOHN K. SUPAN / John K. Supan		9/1/04	
d. NRC Regional Supervisor					
Note: * The facility reviewer's initials/signature are not applicable for NRC-developed examinations. # Independent NRC reviewer initial items in Column "c;" chief examiner concurrence required.					

ES-401 PWR Examination Outline ES-401-2 draft Rev 2

Facility: Catawba		Date of Exam: 10/16/2004																	
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	A 2	G *	Total	
1 Emergency & Abnormal Plant Evolutions	1	4	2	3				3	3				3	18	0	0	2	5	7
	2	2	1	2				2	1				1	9	0	0	2	3	5
	Tier Totals	6	3	5				5	4				4	27	0	0	4	8	12
2 Plant Systems	1	2	3	4	3	2	2	3	3	1	3	2	28	0	0	2	2	4	
	2	1	0	0	0	2	1	2	1	1	1	1	10	0	0	2	0	2	
	Tier Totals	3	3	4	3	4	3	5	4	2	4	3	38	0	0	4	2	6	
3 Generic Knowledge and Abilities Categories			1		2		3		4				1	2	3	4			
			2		3		2		3		10		2	2	1	2	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 ±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; avoid selecting more than two K/A topics from a 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 (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 topic's 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

8. For Tier 3, enter the K/A numbers, descriptions, importance ratings, and point totals on Form ES-401-3.

9. Refer to ES-401, Attachment 2, for guidance regarding the elimination of inappropriate K/A statements.

E/APE Examination Criteria										
Emergency and Abnormal Event Scenarios - The Ultimate 3 (UAC)										
E/APE # / Name / Safety Function	K			A			G	K/A Topic(s)	Imp.	#
	1	2	3	1	2	2				
2.2.3.6 Loss of Intermediate Range Instrumentation						2.04		AA2. Ability to determine and interpret the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: AA2.04 Satisfactory overlap between source-range, intermediate-range and power-range instrumentation 2.2.3.6 (CFR: 43.5 / 45.13)	2.2/3.6	235.3
2.4.4.4 Reactor Powering Assesses 4.4								2.4.4 Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures. (CFR 41.10 / 43.2 / 45.6)	4.0/4.3	1186
2.4.2.7 High Reactor Coolant Activity 1.9						2.03		AA1. Ability to operate and / or monitor the following as they apply to the High Reactor Coolant Activity: AA2.07 When demineralizer resin needs to be replaced 2.4.2.7 (CFR 41.7 / 45.5 / 45.6)	2.4/2.7	1195
2.1.3.2 OCA Completion - Scenario 1.4								2.1.3.2 Ability to explain and apply all system limits and precautions. (CFR 41.10 / 43.2 / 45.12)	3.4/3.6	571.3
2.4.6.4 Knowledge symptom based EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)								2.4.6 Knowledge symptom based EOP mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)	3.1/4.0	616.2
Group Point Total:										
K/A Category Totals:	0	0	0	0	2	3			5	5

KIA Category Totals:													
System # / Name	K1	K2	K3	K4	K5	A1	A2	A3	A4	G	K/A Topic(s)	Imp.	#
200											A2 Ability to (a) predict the impacts of the following malfunctions or operations on the ED/G system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.14 Effects (verification) of stopping ED/G under load on isolated bus 2.7.2.9 (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.7/2.9	189
202											2.4.6 Knowledge symptom based EOF mitigation strategies. (CFR: 41.10 / 43.5 / 45.13)	3.1/4.3	63.1
202											2.4.23 Knowledge of which events related to system operations/status should be reported to outside agencies. (CFR: 43.5 / 45.13)	2.2/3.6	1190
203											A2 Ability to (a) predict the impacts of the following malfunctions or operations on the IAS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.01 Air dryer and filter malfunctions 2.4.2.9 (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.4/2.9	1191
											Group Point Total:	4	4

ES-401		Generic Knowledge and Abilities Outline (Tier 3)		ES-401 Rev 3	
Facility	Catawba	Date of Examp	10/1/02	Level	500
Category	K/A #	Topic	Imp.	#	
1	2.1.5	2.1.5 Ability to locate and use procedures and directives related to shift staffing and activities. (CFR: 41.10 / 43.5 / 45.12) IMPORTANCE RO 2.3 SRO 3.4	2.3/3.4	121.2	
	2.1.12	2.1.12 Ability to apply technical specifications for a system. (CFR: 43.2 / 43.5 / 45.3) IMPORTANCE RO 2.9 SRO 4.0	2.9/4.0	705.2	
	Subtotal			2	2
1	2.2.9	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 (CFR: 43.3 / 45.13) IMPORTANCE RO 2.0 SRO 3.3	2.0/3.3	1196	
	2.2.0	2.2.20 Knowledge of the process for managing troubleshooting activities. (CFR: 43.5 / 45.13) IMPORTANCE RO 2.2 SRO 3.3	2.2/3.3	1197	
	Subtotal			2	2
3	2.3.2	2.3.1 Knowledge of 10 CFR: 20 and related facility radiation control requirements. (CFR: 41.12 / 43.4. 45.9 / 45.10) IMPORTANCE RO 2.6 SRO 3.0	2.6/3.0	1198	
	Subtotal			1	1
4	2.4.3	2.4.40 Knowledge of the SRO's responsibilities in emergency plan implementation. (CFR: 45.11) IMPORTANCE RO 2.3 SRO 4.0	2.3/4.0	491.1	
	2.4.31	2.4.31 Knowledge of annunciators alarms and indications, and use of the response instructions. (CFR: 41.10 / 45.3) IMPORTANCE RO 3.3 SRO 3.4	5.3/3.4	453.3	
	Subtotal			2	2
Tier 3 Point Total			7	7	

Tier and Group	Randomly Selected KIA	Reason for Rejection
T1G1 RO Exam	EPE 029 [ATWS]	The originally selected KIA [EK1.02 Knowledge of the operational implications of the following concepts as they apply to the ATWS: EK1.02 Definition of reactivity 2.6 2.8 (CFR 41.8 / 41.10 / 45.3)] was too fundamental to use for a site-specific exam. The NRC Chief Examiner approved changing this KIA and randomly selected [EK1.01 Reactor nucleonics and thermo-hydraulics behavior. 2.8 3.1].
T1G1 RO Exam	APF056G2.25 [Loss of Offsite Power]	The originally selected KIA [G2.2.25 Knowledge of basos in technical specifications for limiting conditions for operations and safety limits. (CFR: 43.2)] is not appropriate for RO level questions. Randomly resampled KIA G2.1.23 [Ability to perform specific system and integrated plant procedures during all modes of plant operation. (CFR: 45.2 / 45.6)] for testing.
T1G1 RO Exam	EPE007EA2.03 [Reactor Trip - Stabilization - Recovery]	The originally selected KIA [EA2 Ability to determine or interpret the following as they apply to a reactor trip: EA2.03 Reactor trip breaker position 4.2 4.4 (CFR 41.7 / 45.5 / 45.6)] is not linked to 10CFR55.43 - as all other EA2s are linked. Randomly resampled to G2.4.6 [Knowledge symptom based EOP mitigation strategies (CFR: 41.10 / 43.5 / 45.13)]
T1G1 SRO Exam	APE: 065 [Loss of Instrument Air]	The originally selected KIA [G2.2.22 Knowledge of limiting conditions for operations and safety limits. (CFR: 43.2 / 45.2)] is not applicable at Catawba. The VI system does not have any Tech Specs or safety limits associated with it. The NRC Chief Examiner Randomly resampled KIA G2.2.8 [Knowledge of the process for determining if the proposed change, test, or experiment involves an unreviewed safety question. (CFR: 43.3 / 45.13) IMPORTANCE RO 1.8 SRO 3.3] as a replacement.
T1G2 SRO Exam	APE 076 [High Reactor Coolant Activity]	The originally selected KIA [AA1. Ability to operate and / or monitor the following as they apply to the High Reactor Coolant Activity: AA2.03 RCS radioactivity level meter 2.5 3.0 (CFR 41.7 / 45.5 / 45.6)] was not considered to be suitable for an SRO test question. At the direction of the NRC Chief Examiner, this KIA was randomly reselected to [AA1. Ability to operate and / or monitor the following as they apply to the High Reactor Coolant Activity: AA2.07 When demineralizer resin needs to be replaced 2.4 2.7* (CFR 41.7 / 45.5 / 45.6)]
T2G1 RO Exam	SYS 005K4.10 RHR System	The originally selected KIA [K4 10 K4 10 Control of RHR heat exchanger outlet flow 3.1 3.] was too close to a JPM that tested the same concept. Randomly resampled KIA to K4.02 [Modes of operation 3.2 3.5*] for this test question.
T2G1 RO Exam	SYS 026K4.07 Containment Spray	The originally sampled KIA [K4 Knowledge of CSS design feature(s) and/or interlock(s) which provide for the following: K4.07 Adequate level in containment sump for suction (interlock) 3.8* 4.1*] was not applicable at Catawba because they do not have a sump level interlock. Randomly resampled [K4.08 Automatic swapper to containment sump suction for recirculation phase after LOCA (RWST low-low level alarm) 4.1* 4.3*].
T2G1 RO Exam	SYS 061K2.01 Auxiliary Feedwater	The originally sampled KIA K201 was judged too close to the KIA for the second AFW system question [K6.01 - K6 Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: K6.01 Controllers and positioners 2.5 2.8* (CFR: 41.7 / 45.7)]. Randomly resampled [K2.02 [AFW electric drive pumps 3.7* 3.7] to prevent overlapping with the other KIA. In a conversation with the Chief Examiner on 8/5/04, the NRC directed that the originally sampled KIA be restored for testing - K2.01.
T2G2 RO Exam	SYS 071A4.20 Waste Gas	The originally sampled KIA [A4 Ability to manually operate and/or monitor in the control room: A4.20 Placing WGDS gas compressors in automatic operation. 2.5* 2.2* (CFR: 41.7 / 45.5 to 45.8)] is not applicable at Catawba. The operators do not operate the waste gas compressors in automatic mode. Randomly resampled to [A4.05 Gas decay tanks, including valves, indicators, and sample line 2.6* 2.6*].
Generics SRO Exam	G2.3.2	The original KIA [2.3.2 Knowledge of facility ALARA program. (CFR: 41.12 / 43.4 / 45.9 / 45.10) IMPORTANCE RO 2.5 SRO 2.9] was determined not to be suitable for SRO level testing. The NRC Chief Examiner randomly selected a replacement KIA [G2.3.1 Knowledge of 10 CFR: 20 and related facility radiation control requirements. (CFR: 41.12 / 43.4. 45.9 / 45.10) IMPORTANCE RO 2.6 SRO 3.0]
Generics SRO Exam	G2.4.32	The original KIA [G2.4.3 Ability to identify post-accident instrumentation. (CFR: 41.6 / 45.4) IMPORTANCE RO 3.5 SRO 3.8] was determined to be unsuitable for SRO level testing. The NRC Chief Examiner replaced this KIA with a new randomly selected KIA [2.4.40 Knowledge of the SRO's responsibilities in emergency plan implementation. (CFR: 45.11) IMPORTANCE RO 2.3 SRO 4.0]
Generics RO Exam	G2.4.32	The originally sampled KIA [2.4.32 Knowledge of operator response to loss of all annunciators. (CFR: 41.10 / 43.5 / 45.13) IMPORTANCE RO 3.3 SRO 3.5] was not suitable for testing because Catawba does not have a loss of all annunciators procedure. Without procedural direction, the ability to draft a test question is limited because there is no "right answer". The NRC Chief Examiner randomly directed that this KIA be replaced. He randomly selected G2.4.5 [2.4.5 Knowledge of the organization of the operating procedures network for normal, abnormal, and emergency evolutions. (CFR: 41.10 / 43.5 / 45.13) IMPORTANCE RO 2.9 SRO 3.6] as the replacement.

Facility: <u>CATAWBA</u>		Date of Exam: <u>10-7-04</u>		Exam Level: <u>RO/SRO</u>	
Item Description	Initial				
	a	b*	c#		
1. Questions and answers technically accurate and applicable to facility	SCD	RWS			
2. a. NRC K/As referenced for all questions b. Facility learning objectives referenced as available	SCD	RWS			
3. SRO questions are appropriate per Section D.2.d of ES-401	N/A	RWS			
4. Question selection and duplication from the last two NRC licensing exams appears consistent with a systematic sampling process					
5. Question duplication from the license screening/audit exam was controlled as indicated below (check the item that applies) and appears appropriate: <input type="checkbox"/> the audit exam was systematically and randomly developed; or <input type="checkbox"/> the audit exam was completed before the license exam was started; or <input checked="" type="checkbox"/> the examinations were developed independently; or <input type="checkbox"/> the licensee certifies that there is no duplication; or <input type="checkbox"/> other (explain)	SCD	RWS			
6. Bank use meets limits (no more than 75 percent from the bank at least 10 percent new, and the rest modified); enter the actual RO / SRO-only question distribution(s) at right	Bank	Modified	New		
	18 / 338	12 / 16%	38 / 51%		
7. Between 50 and 60 percent of the questions on the RO exam are written at the comprehension/analysis level; the SRO exam may exceed 60 percent if the randomly selected K/As support the higher cognitive levels; enter the actual RO / SRO question distribution(s) at right	Memory	CIA			
	34 / 45%	4 / 55%			
8. References/handouts provided do not give away answers	SCD	RWS			
9. Question content conforms with specific K/A statements in the previously approved examination outline and is appropriate for the Tier to which they are assigned; deviations are justified	SCD	RWS			
10. Question psychometric quality and format meet ES, Appendix B, guidelines	SCD	RWS			
11. The exam contains the required number of one-point, multiple choice items; the total is correct and agrees with value on cover sheet	SCD	RWS			
Printed Name / Signature		Date			
a. Author	<u>BEIRN C. HAACONSEN / B.C. Haagen</u>	<u>8/22/04</u>			
b. Facility Reviewer (*)	<u>ROBERT W SMITH / R.W. Smith</u>	<u>8/20/04</u>			
c. NRC Chief Examiner (#)	_____	_____			
d. NRC Regional Supervisor	_____	_____			
Note: * The facility reviewer's initials/signature are not applicable for NRC-developed examinations. # Independent NRC reviewer initial items in Column Ac; chief examiner concurrence required.					

ES-401 PWR Examination Outline ES-401-2 draft Rev 9

Facility: Catawba		Date of Exam: 10/16/2004																			
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	A 2	G *	Total			
1 Emergency & Abnormal Plant Evolutions	1	4	2	3				3	3					3	18	0	0	2	5	7	
	2	2	1	2				2	1					1	9	0	0	2	3	5	
	Tier Totals	6	3	5				5	4					4	27	0	0	4	8	12	
2 Plant Systems	1	2	3	4	3	2	2	3	3	1	3	2		28	0	0	2	2	4		
	2	1	0	0	0	2	1	2	1	1	1	1		10	0	0	2	0	2		
	Tier Totals	3	3	4	3	4	3	5	4	2	4	3		38	0	0	4	2	6		
3 Generic Knowledge and Abilities Categories												1	2	3	4		1	2	3	4	
												2	3	2	3	10	2	2	1	2	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 ±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; avoid selecting more than two K/A topics from a 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 (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 topic's 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

8. For Tier 3, enter the K/A numbers, descriptions, importance ratings, and point totals on Form ES-401-3.

9. Refer to ES-401, Attachment 2, for guidance regarding the elimination of inappropriate K/A statements.

PWR Examination Outline										ES-001-2 Draft Rev. 3									
Emergency and Abnormal Plant Evolutions - Reactor (Group 1) (R)																			
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	A 3	G 2	K/A Topic(s)	Imp.	#									
000007 Reactor Trip - Stabilization - Recovery / 1							2.02	EA2 Ability to determine or interpret the following as they apply to a reactor trip: EA2.02 Proper actions to be taken if the automatic safety functions have not taken place 4.3.4.6 (CFR 41.7 / 45.5 / 45.6)	4.3/4.6	1136									
000008 Pressurizer Vapor Space Accident / 3							1.08	AA1. Ability to operate and / or monitor the following as they apply to the Pressurizer Vapor Space Accident: AA1.06 PRT level pressure and temperature 3.8.3.8 (CFR 41.7 / 45.5 / 45.6)	3.8/3.8	311.1									
000009 Small Break LOCA / 3							1.07	EA1 Ability to operate and monitor the following as they apply to a small break LOCA: EA1.07 CCS 3.7.3.9 (CFR 41.7 / 45.5 / 45.6)	3.7/3.9	1185									
000011 Large Break LOCA / 3							1.05	EK1 Knowledge of the operational implications of the following concepts as they apply to the Large Break LOCA: EK1.01 Natural circulation and cooling, including reflux boiling. 4.1.4.4 (CFR 41.8 / 41.10 / 45.3)	4.1/4.4	601.1									
000015/17 RCP Malfunction / 4																			
000022 Loss of Reactor Coolant Makeup / 2							3.02	AK3. Knowledge of the reasons for the following responses as they apply to the Loss of Reactor Coolant Makeup: AK3.02 Actions contained in SOPs and EOPs for RCPs, loss of makeup, loss of charging, and abnormal charging 3.5.3.8 (CFR 41.5, 41.10 / 45.6 / 45.13)	3.5/3.8	1140									
000025 Loss of RHR System / 4							2.25	2.2.25 Knowledge of bases in technical specifications for limiting conditions for operations and safety limits. (CFR: 43.2)	2.5/3.7	1164									
000026 Loss of Component Cooling Water / 8							3.02	AK3. Knowledge of the reasons for the following responses as they apply to the Loss of Component Cooling Water: AK3.02 The automatic actions (alignments) within the CCWS resulting from the actuation of the ESFAS 3.6.3.9 (CFR 41.5, 41.10 / 45.6 / 45.13)	3.6/3.9	1141									
000027 Pressurizer Pressure Control System Malfunction / 3							1.01	AK1. Knowledge of the operational implications of the following concepts as they apply to Pressurizer Pressure Control Malfunctions: AK1.01 Definition of saturation temperature. 3.1.3.4 (CFR 41.8 / 41.10 / 45.3)	3.1/3.4	1142									
000029 Anticipated Transient w/o Scram / 1							1.02	EK1 Knowledge of the operational implications of the following concepts as they apply to the ATWS: EK1.01 Reactor neutronics and thermohydraulics behavior 2.8.3.1 (CFR 41.8 / 41.10 / 45.3)	2.8/3.1	945									
000038 Steam Generator Tube Rupture / 3							1.02	EA1 Ability to operate and monitor the following as they apply to a SGTR: EA1.02 Steam and feedwater flow, for mismatched condition. 4.2.4.1 (CFR 41.7 / 45.5 / 45.6)	4.2/4.1	1176									
000040 Steam Line Rupture - Excessive Heat Transfer / 4							2.01	AK2. Knowledge of the interrelations between the Steam Line Rupture and the following: AK2.01 Valves 2.6*2.5 (CFR 41.7 / 45.7)	2.6*/2.5	791.1									
000054 Loss of Main Feedwater / 4							2.04	AA2. Ability to determine and interpret the following as they apply to the Loss of Main Feedwater (MFW): AA2.04 Proper operation of MFW pumps and regulating valves. 4.2.4.3 (CFR: 43.5 / 45.13)	4.2/4.3	1137									
000055 Station Blackout / 6							1.32	2.1.32 Ability to explain and apply all system limits and precautions. (CFR: 41.10 / 42.2 / 45.12)	3.4/3.8	670.1									
000056 Loss of Off-site Power / 6							1.23	2.1.23 Ability to perform specific system and integrated plant procedures during all modes of plant operation (CFR: 45.2 / 45.6)	3.9/4.0	497.1									
000057 Loss of Vital Ac Elec. Inst. Bus. / 6																			
000058 Loss of DC Power / 6							1.01	AK1 Knowledge of the operational implications of the following concepts as they apply to Loss of DC Power: AK1.01 Battery charger equipment and instrumentation. 2.8.3.1* (CFR 41.8 / 41.10 / 45.3)	2.8/3.1*	362.1									
000062 Loss of Nuclear Service Water / 4																			
000065 Loss of Instrument Air / 8							3.06	AK3. Knowledge of the reasons for the following responses as they apply to the Loss of Instrument Air: AK3.05 Actions contained in EOP for loss of instrument air. 3.7.3.9 (CFR 41.5, 41.10 / 45.6 / 45.13)	3.7/3.9	1138									
WE04 LOCA Outside Containment / 3							2.2	EK2. Knowledge of the interrelations between the (LOCA Outside Containment) and the following: 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. IMPORTANCE RO 3.8 SRO 4.0 (CFR: 41.7 / 45.7)	3.8/4.0	912.1									
WE11 Loss of Emergency Coolant Recirc / 4																			
WE05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4							2.2	EA2. Ability to determine and interpret the following as they apply to the Loss of Secondary Heat Sink: EA2.2 Adherence to appropriate procedures and operation within the limitations in the facility's license and amendments. IMPORTANCE RO 3.7 SRO 4.3 (CFR: 43.5 / 45.13)	3.7/4.3	1139									
K/A Category Totals:										4	2	3	3	3	3	3	Group Point Total:	18	18

PWR Examination Outline								ES-401.2	
Emergency and Essential Plant Knowledge - For SROs 2 (RO)								Rev. 05/01/00	
E/APE # / Name / Safety Function	K1	K2	K3	A1	A2	A3	K/A Topic(s)	Imp.	#
000001 Continuous Rod Withdrawal / 1									
000003 Dropped Control Rod / 1									
000005 Inoperable/Stuck Control Rod / 1	1.04						AK1. Knowledge of the operational implications of the following concepts as they apply to Inoperable / Stuck Control Rod: AK1.04 Definitions of axial imbalance, neutron error, power demand, actual power tracking mode, ICS tracking 3.0* 3.4* (CFR 41.8 / 41.10 / 45.3)	3.0*/3.4*	1144
000024 Emergency Boration / 1		2.0*					AK2. Knowledge of the interrelations between the Emergency Boration and the following: AK2.01 Valves 2.7 2.7 (CFR 41.7 / 45.7)	2.7/2.7	800.1
000028 Pressurizer Level Malfunction / 2			3.02				AK3. Knowledge of the reasons for the following responses as they apply to the Pressurizer Level Control Malfunctions: AK3.02 Relationships between PZR pressure increase and reactor makeup/letdown imbalance 2.9 3.2 (CFR 41.5, 41.10 / 45.6 / 45.13)	2.9/3.2	1181
000033 Loss of Source Range N / 7					2.05		Loss of Source Range Nuclear Instrumentation AA2.05 Nature of abnormality, from rapid survey of control room data 2.9* 3.2* (CFR: 43.5 / 45.13)	2.9*/3.2*	1146
000033 Loss of Intermediate Range N / 7					1.02		AA1. Ability to operate and / or monitor the following as they apply to the Loss of Intermediate Range Nuclear Instrumentation: AA1.02 Level trip bypass 3.0 3.1 (CFR 41.7 / 45.5 / 45.6)	3.0/3.1	926
000036 Fuel Handling Accident / 8									
000037 Steam Generator Tube Leak / 3									
000051 Loss of Condenser Vacuum / 4									
000059 Accidental Liquid Radwaste Rel. / 9									
000060 Accidental Gaseous Radwaste Rel. / 9									
000061 ARM System Alarms / 7	1.01						AK1. Knowledge of the operational implications of the following concepts as they apply to Area Radiation Monitoring (ARM) System Alarms: AK1.01 Detector limitations 2.5* 2.9* CFR 41.8 / 41.10 / 45.3)	2.5*/2.9*	1147
000067 Plant Fire On-site / 9									
000068 Control Room Evac. / 8									
000069 (W/E14) Loss of CTMT Integrity / 5									
000074 (W/E03&E07) Ined. Core Cooling / 4						1.27	2.1.27 Knowledge of system purpose and or function. (CFR: 41.7)	2.8/ 2.9	537
000076 High Reactor Coolant Activity / 9									
W/E01 & E02 Rediagnosis & SI Termination / 3									
W/E 13 Steam Generator Overpressure / 3			3.2				EK3. Knowledge of the reasons for the following responses as they apply to the (Steam Generator Overpressure) EK3.3 Manipulation of controls required to obtain desired operating results during abnormal, and emergency situations. IMPORTANCE RO 3.2 SRO 3.4 (CFR: 41.5 / 41.10, 45.6, 45.13)	3.2/3.4	1148
W/E 15 Containment Flooding / 5									
W/E16 High Containment Radiation / 9									
W/E03 LOCA Cooldown - Depress. / 4									
W/E09 & E10 Natural Circ. / 4									
W/E08 RCS Overcooling - FTB / 4					2.1		EA2. Ability to determine and interpret the following as they apply to the (Pressurized Thermal Shock) EA2.1 Facility conditions and selection of appropriate procedures during abnormal and emergency operations: IMPORTANCE RO 3.4 SRO 4.2 (CFR: 43.5 / 45.13)	3.4/4.2	1149
K/A Category Totals:	2	1	2	2	1	1		Group Point Total:	9

System # / Name	K/A Category Totals										K/A Topic(s)	Imp.	#
	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4			
003 Reactor Coolant Pump											2.4.50 Ability to verify system alarm setpoints and operate controls identified in the alarm response manual (CFR: 45.3)	3.3/3.3	1163
004 Chemical Volume Control						6/04					K6 Knowledge of the effect of a loss or malfunction on the following CVCS components: K6.04 Functions 2.8.3.1 (CFR: 41.7 / 45.7)	2.8/3.1	725
005 Residual Heat Removal				4/02							K4 Knowledge of RHRS design feature(s) and/or interlock(s) which provide or the following: K4.02 Modes of operation 3.2.3.5* (CFR: 41.7)	3.2/3.5*	1167
006 Emergency Core Cooling			3/02								K3 Knowledge of the effect that a loss or malfunction of the ECCS will have on the following: K3.03 Containment 4.2.4.4 (CFR: 41.7 / 45.6)	4.2/4.4	1166
007 Pressurizer Relief/Quench Tank					5/02						K5 Knowledge of the operational implications of the following concepts as they apply to PRTS: K5.02 Method of forming a steam bubble in the PZR 3.1.3.4 (CFR: 41.5 / 45.7)	3.1/3.4	1169
008 Component Cooling Water			3/03								K3 Knowledge of the effect that a loss or malfunction of the CCWS will have on the following: K3.03 RCF, A.1 4.2 (CFR: 41.7)	4.1/4.2	1170
010 Pressurizer Pressure Control									4/01		A4 Ability to manually operate and/or monitor in the control room: A4.01 PZR spray valve 3.7.3.5 (CFR: 41.7 / 45.5 to 45.8)	3.7/3.5	1171
010 Pressurizer Pressure Control	1/06										K1 Knowledge of the physical connections and/or cause-effect relationships between the PZR PCS and the following systems: K1.06 CVCS 2.9.3.1 (CFR: 41.2 to 41.9 / 45.7 to 45.8)	2.9/3.1	1170
012 Reactor Protection					5/02						K5 Knowledge of the operational implications of the following concepts as they apply to the RPS: K5.02 Power density 3.1* 3.3* (CFR: 41.5 / 45.7)	3.1*/3.3*	1165
013 Engineered Safety Features Actuation									4/02		A4 Ability to manually operate and/or monitor in the control room: A4.02 Reset of ESHAS channels 4.3.4.4 (CFR: 41.7 / 45.5 to 45.8)	4.3/4.4	405
022 Containment Cooling				4/04							K4 Knowledge of CCS design feature(s) and/or interlock(s) which provide for the following: K4.04 Cooling of control rod drive motors: 2.6.3.1 (CFR: 41.7)	2.6.3.1	855.1
022 Containment Cooling	1/01										K1 Knowledge of the physical connections and/or cause-effect relationships between the CCS and the following systems: K1.01 SWWS (cooling system) 3.5.3.7 (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.5/3.7	587.1
025 Ice Condenser									4/02		A4 Ability to manually operate and/or monitor in the control room: A4.02 Containment vent fans 2.7* 2.5* (CFR: 41.7 / 45.5 to 45.8)	2.7*/2.5*	1176
025 Ice Condenser						1/02					A1 Ability to predict and/or monitor changes in parameters associated with operating the ice condenser system controls including: A1.02 Glycol suspension tank level 2.5* 2.2* (CFR: 41.5 / 45.5)	2.5*/2.2*	806.1
026 Containment Spray				4/02							K4 Knowledge of CCS design feature(s) and/or interlock(s) which provide for the following: K4.08 Automatic switchover to containment sump suction for recirculation phase after LCGA (RWS: low low level alarm) 4.1* 4.3*	4.1*/4.3*	272.1
026 Containment Spray			3/02								K3 Knowledge of the effect that a loss or malfunction of the CSS will have on the following: K3.02 Recirculation spray system: 4.2* 4.3 (CFR: 41.7 / 45.6)	4.2*/4.3	741
039 Main and Reheat Steam	1/04										K1 Knowledge of the physical connections and/or cause-effect relationships between the MRS and the following systems: K1.04 RCS temperature monitoring and control: 3.1.3.1 (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.1/3.1	1180
056 Condensate							2/03				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the Condensate System, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.04 Loss of condensate pumps 2.8.2.8* (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.8/2.8*	1174
059 Main Feedwater	1/05										K1 Knowledge of the physical connections and/or cause-effect relationships between the MFW and the following systems: K1.05 RCS 3.1* 3.2 (CFR: 41.2 to 41.9 / 45.7 to 45.8)	3.1*/3.2	1573
061 Auxiliary/Emergency Feedwater	3/01										K2 Knowledge of bus power supplies to the following: K2.01 AFW system MOVs 3.2* 3.5 (CFR: 41.7)	3.2*/3.5	1164
061 Auxiliary/Emergency Feedwater					5/01						K6 Knowledge of the effect of a loss or malfunction of the following will have on the AFW components: K6.01 Controller and positioners 2.5.2.6* (CFR: 41.7 / 45.7)	2.5/2.6*	816.1
062 AC Electrical Distribution									1/25		2.1.28 Knowledge of the purpose and function of major system components and controls (CFR: 41.7)	3.2/3.3	570.1
063 DC Electrical			3/02								K3 Knowledge of the effect that a loss or malfunction of the DC electrical system will have on the following: K3.02 Components using DC control power: 3.5.3.7 (CFR: 41.7 / 45.8)	3.5/3.7	1181
064 Emergency Diesel Generator							2/07				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the ED/G system, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.07 Consequences of operating under/over excited: 2.6.2.7 (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.6/2.7	746.1
073 Process Radiation Monitoring							2/02				A2 Ability to (a) predict the impacts of the following malfunctions or operations on the PRM system, and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: A2.02 Detector failure 2.7.3.2 (CFR: 41.5 / 43.5 / 45.3 / 45.13)	2.7/3.2	663.1
076 Service Water				1/02							A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the SWWS controls including: A1.02 Reactor and turbine building closed cooling water temperatures: 2.6* 2.8* (CFR: 41.5 / 45.5)	2.6*/2.8*	1178
078 Instrument Air								3/01			A3 Ability to monitor automatic operation of the IAS, including: A3.01 Air pressure: 3.1.3.2 (CFR: 41.7 / 45.5)	3.1/3.2	282.3
102 Containment						1/01					A1 Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the containment system controls including: A1.01 Containment pressure, temperature, and humidity 3.7.4.1 (CFR: 41.5 / 45.5)	3.7/4.1	1160
K/A Category Totals:	2	3	4	5	2	3	3	1	3	2	Group Point Totals:	26	28

SYSTEMS T2 G1

For Official Use Only

45 Day Sample Plan

SYSTEMS T2 G2

For Official Use Only

45 Day Sample Plan