

EXAMINATION OUTLINE SUBMITTAL

FOR THE BYRON INITIAL EXAMINATION - DEC 2003

Outline Submittal

Contains the following:

Letter	Exelon cover letter transmitting the Outline
ES-201-1	Examination Preparation Checklist
ES-201-2	Examination Outline Quality Checklist
ES-301-1	Administrative Topics Outline (RO & SRO)
ES-301-2	Control Room/In-Plant System Outline (RO & SRO)
ES-301-5	Transient and Event Checklist
D-1	Dynamic Simulator Scenario Outline for 2 scenarios
ES-401-2	PWR Examination Outline (RO/SRO)
ES-401-3	Generic Knowledge and Abilities Outline (Tier 3) (RO/SRO)
ES-401-4	Record of Rejected K/As
Admin	There were no NRC Comments on the submitted test outlines

Exelon Generation
Byron Generating Station
4450 North German Church Road
Byron, IL 61010-9794
Tel 815-234-5441

www.exeloncorp.com

August 18, 2003

LTR: BYRON 2003-0063
File: 1.06.5110

Mr. James E. Dyer
Regional Administrator
U. S. Nuclear Regulatory Commission, Region III
801 Warrenville Road
Lisle, IL 60532-4351

Byron Station, Units 1 and 2
Facility Operating License Nos. NPF-37 and NPF-66
NRC Docket Nos. STN 50-454 and STN 50-455

Subject: Submittal of Initial Operator Licensing Examination Outline

Enclosed are the examination outlines, supporting the initial operator license examination scheduled for the weeks of December 1, 2003, through December 12, 2003, at Byron Station.

This submittal includes all appropriate examination standard forms and outlines in accordance with NUREG-1021, "Operator Licensing Examination Standards," Draft Revision 9.

In accordance with NUREG 1021, Draft Revision 9, Section ES-201, "Initial Operator Licensing Examination Process," please ensure that these materials are withheld from public disclosure until after the examinations are complete.

Should you have any questions concerning this letter, please contact W. Grundmann, Regulatory Assurance Manager, at (815) 406-2800. For questions concerning examination outlines, please contact Tim Foss at (815) 406-3224 or (815) 406-3111.

Respectfully,



Stephen E. Kuczynski
Site Vice President
Byron Nuclear Generating Station

SEK/DD/rah

August 18, 2003
Mr. James E. Dyer
Page 2

Enclosures: (Hand delivered to Dell McNeil, Chief Examiner, NRC Region III)

Examination Security Agreements (Form ES-201-3)
Administrative Topics Outline (Form ES-301-1)
Control Room/In-Plant Systems Outline (Form ES-301-2)
PWR Examination Outline (Tier 1 and 2) (Forms ES-401-2 and 401-1)
Generic Knowledge and Abilities Outline (Tier 3) (Form ES-401-3)
Scenario Outline (Form ES-D-1)
Record of Rejected K/As (Form ES-401-4)
Completed Checklists:
 Examination Outline Quality Checklist (Form ES-201-2)
 Transient and Event Checklist (Form ES-301-5)

cc: (without attachments)
Chief, NRC Operator Licensing Branch
NRC Senior Resident Inspector – Byron Station

Facility: <u>BYRON NUCLEAR STATION U1/U2</u>		Date of Examination: <u>December 1 -10, 2003</u>
Examinations Developed by: <input checked="" type="checkbox"/> Facility / NRC (circle one)		
Target Date*	Task Description / Reference	Chief Examiner's Initials
-180	1. Examination administration date confirmed (C.1.a; C.2.a & b)	drm
-120	2. NRC examiners and facility contact assigned (C.1.d; C.2.e)	drm
-120	3. Facility contact briefed on security & other requirements (C.2.c)	drm
-120	4. Corporate notification letter sent (C.2.d)	drm
[-90]	[5. Reference material due (C.1.e; C.3.c)]	n/a
-75	6. Integrated examination outline(s) due (C.1.e & f; C.3.d)	drm
-70	7. Examination outline(s) reviewed by NRC and feedback provided to facility licensee (C.2.h; C.3.e)	drm
-45	8. Proposed examinations, supporting documentation, and reference materials due (C.1.e, f, g & h; C.3.d)	drm
-30	9. Preliminary license applications due (C.1.i; C.2.g; ES-202)	drm
-14	10. Final license applications due and assignment sheet prepared (C.1.i; C.2.g; ES-202)	drm
-14	11. Examination approved by NRC supervisor for facility licensee review (C.2.h; C.3.f)	drm
-14	12. Examinations reviewed with facility licensee (C.1.j; C.2.f & h; C.3.g)	drm
-7	13. Written examinations and operating tests approved by NRC supervisor (C.2.i; C.3.h)	drm
-7	14. Final applications reviewed; assignment sheet updated; waiver letters sent (C.2.g, ES-204)	drm
-7	15. Proctoring/written exam administration guidelines reviewed with facility licensee and authorization granted to give written exams (if applicable) (C.3.k)	drm
-7	16. Approved scenarios, job performance measures, and questions distributed to NRC examiners (C.3.i)	drm
<p>* Target dates are keyed to the examination date identified in the corporate notification letter. They are for planning purposes and may be adjusted on a case-by-case basis in coordination with the facility licensee.</p> <p>[] Applies only to examinations prepared by the NRC.</p>		

Facility: <u>BYRON</u>		Date of Examination: <u>12/01/2003</u>		
Item	Task Description	Initials		
		a	b*	c#
1. WRITTEN	a. Verify that the outline(s) fit(s) the appropriate model per ES-401.	AF	TTZ	DM
	b. Assess whether the outline was systematically and randomly prepared in accordance with Section D.1 of ES-401 and whether all KA categories are appropriately sampled.	AF	TTZ	DM
	c. Assess whether the outline over-emphasizes any systems, evolutions, or generic topics.	AF	TTZ	DM
	d. Assess whether the justification for deselected or rejected K/A statements are appropriate.	AF	TTZ	DM
2. SIM	a. Using Form ES-301-5, verify that the proposed scenario sets cover the required number of normal evolutions, instrument and component failures, and major transients.	AF	TTZ	DM
	b. Assess whether there are enough scenario sets (and spares) to test the projected number and mix of applicants in accordance with the expected crew composition and rotation schedule without compromising exam integrity; ensure each applicant can be tested using at least one new or significantly modified scenario, that no scenarios are duplicated from the applicants' audit test(s)*, and scenarios will not be repeated on subsequent days.	AF	TTZ	DM
	c. To the extent possible, assess whether the outline(s) conform(s) with the qualitative and quantitative criteria specified on Form ES-301-4 and described in Appendix D.	AF	TTZ	DM
3. W/T	a. Verify that: (1) the outline(s) contain(s) the required number of control room and in-plant tasks, ✓ (2) no more than 30% of the test material is repeated from the last NRC examination, ✓ (3)* no tasks are duplicated from the applicants' audit test(s), and ✓ (4) no more than 80% of any operating test is taken directly from the licensee's exam banks. ✓	AF	TTZ	DM
	b. Verify that: (1) the tasks are distributed among the safety function groupings as specified in ES-301, ✓ (2) one task is conducted in a low-power or shutdown condition, ✓ (3) 4 – 6 (2 – 3 for SRO-U) of the tasks require the applicant to implement an alternate path procedure, ✓ (4) one in-plant task tests the applicant's response to an emergency or abnormal condition, and ✓ (5) the in-plant walk-through requires the applicant to enter the RCA. ✓	AF	TTZ	DM
	c. Verify that the required administrative topics are covered.	AF	TTZ	DM
	d. Determine if there are enough different outlines to test the projected number and mix of applicants and ensure that no items are duplicated on subsequent days.	AF	TTZ	DM
	e. Check the entire exam for balance of coverage.	AF	TTZ	DM
4. GENERAL	a. Assess whether plant-specific priorities (including PRA and IPE insights) are covered in the appropriate exam section.	AF	TTZ	DM
	b. Assess whether the 10 CFR 55.41/43 and 55.45 sampling is appropriate.	AF	TTZ	DM
	c. Ensure that K/A importance ratings (except for plant-specific priorities) are at least 2.5.	AF	TTZ	DM
	d. Check for duplication and overlap among exam sections.	AF	TTZ	DM
	e. Check the entire exam for balance of coverage.	AF	TTZ	DM
	f. Assess whether the exam fits the appropriate job level (RO or SRO).	AF	TTZ	DM

a. Author	<u>TIMOTHY J. FOSS</u>	Printed Name / Signature	<u>Timothy J. Foss</u>	Date	<u>8/15/03</u>
b. Facility Reviewer (*)	<u>TROY LEAF</u>		<u>Troy Leaf</u>		
c. NRC Chief Examiner (#)	<u>DELL R. McNEIL</u>		<u>DeLL R. McNeil</u>		<u>8/23/03</u>
d. NRC Supervisor	<u>Michael E. Bielby</u>		<u>Michael E. Bielby Sr. for RDL</u>		<u>8/25/03</u>

NOTE: * Not applicable for NRC-developed examinations.
Independent NRC Reviewer initial items in Column "c" chief examiner concurrence required.

Facility: Byron Generating StationDate of Examination: December 2003Examination Level (circle one): RO SRO

Operating Test Number: _____

Administrative (see Note)	Describe activity to be performed
Conduct of Operations	Perform Change to AMAG FW Flow Calorimetric Computer Constant (KA 2.1.19 RO 2.9)
Conduct of Operations	NONE
Equipment Control	Perform Normal and Reserve Offsite AC Power Surveillance (KA 2.2.12 RO 3.0)
Radiation Control	Perform CNMT Vent Release Rad Monitor Setpoint Change (KA 2.3.9 RO 2.5)
Emergency Plan	Perform NARs Notification with Failure of ENS (KA 2.4.39 RO 3.3)

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 5 are required.

Facility: Byron Generating StationDate of Examination: December 2003Examination Level (circle one): RO / SRO

Operating Test Number: _____

Administrative (see Note)	Describe activity to be performed
Conduct of Operations	Review Shutdown Margin Surveillance and Determine Inadequate (KA 2.1.25 SRO 3.1)
Conduct of Operations	Initiate a LCOAR (KA 2.1.12 SRO 4.0)
Equipment Control	Review Normal and Reserve Offsite AC Power Surveillance (KA 2.2.12 SRO 3.4)
Radiation Control	Review and Approve a Liquid Release (KA 2.3.6 SRO 3.1)
Emergency Plan	Classify Event and Fill Out NARS Form (Site Area Emergency due to Release Rate) (KA 2.4.41 SRO 4.1)

NOTE: All items (5 total) are required for SROs. RO applicants require only 4 items unless they are retaking only the administrative topics, when 5 are required.

Facility: ByronDate of Examination: 2003Exam Level (circle one) RO / SRO(I) / SRO(U)

Operating Test Number: _____

Control Room Systems (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)

System / JPM Title	Type Code*	Safety Function
a. Start the Standby Containment Chiller	N, S, L	5
b. Respond to a DRPI Failure	N, S, L	1
c. Swap SX Pumps (_SX16B Closed) (N-109)	D, S	8
d. Synchronize a DG to a Bus & Load to >5400 KW (will not load) (N-19a)	D, A, S	6
e. Decrease SI Accumulator Pressure (N-4)	D, S	3
f. NI Adjustment following Calorimetric	N,A,S	7
g. Restore FW per Attachment C of 1BEP ES-0.1 (N-121)	D, S, L	4
h. Perform a Seal Injection Flow Verification Monthly Surveillance.	M, A, S	2

In-Plant System (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)

i. Local Emergency Start of a Diesel Generator (cranking air valve closed) (N-35c)	D, A	6
j. Remote Shutdown Panel Local Operation of the Aux. Feedwater Flow Control Valves	N	4
k. Local Initiation of CO2 to _B Aux Feedwater Pump Room	N, A, R	8

* Type Codes: (D)irect from bank, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow Power, (R)CA

Facility: ByronDate of Examination: 2003Exam Level (circle one): RO / SRO(I) / SRO(U)

Operating Test Number: _____

Control Room Systems (8 for RO; 7 for SRO-I; 2 or 3 for SRO-U)

System / JPM Title	Type Code*	Safety Function
a. Start the Standby Containment Chiller	N, S, L	5
b. None	N/A	N/A
c. Swap SX Pumps (_SX16B Closed) (N-109)	D, S	8
d. Synchronize a DG to a Bus & Load to >5400 KW (will not load) (N-19a)	D, A, S	6
e. Decrease SI Accumulator Pressure (N-4)	D, S	3
f. NI Adjustment following Calorimetric	N,A,S	7
g. Restore FW per Attachment C of 1BEP ES-0.1 (N-121)	D, S, L	4
h. Perform a Seal Injection Flow Verification Monthly Surveillance.	M, A, S	2

In-Plant System (3 for RO; 3 for SRO-I; 3 or 2 for SRO-U)

i. Local Emergency Start of a Diesel Generator (cranking air valve closed) (N-35c)	D, A	6
j. Remote Shutdown Panel Local Operation of the Aux. Feedwater Flow Control Valves	N	4
k. Local Initiation of CO ₂ to _B Aux Feedwater Pump Room	N, A, R	8

* Type Codes: (D)irect from bank, (M)odified from bank, (N)ew, (A)lternate path, (C)ontrol room, (S)imulator, (L)ow Power, (R)CA

OPERATING TEST NO.: 2003

Applicant Type	Evolution Type	Minimum Number	Scenario Number							
			1		2		3		4	
			RO	BOP	RO	BOP	RO	BOP	RO	BOP
RO	Reactivity	1*	1	-	1	-	1			
	Normal	1	-	1	-	1		1		
	Instrument / Component	4*	2,4	3,8	3,4	2,5, 6,8	2,4, 6	3,5		
	Major	1*	5,6,7	5,6,7	7	7	7,8	7,8		
As RO	Reactivity	1*	1	-	1	-	1			
	Normal	0	-	1	-	1		1		
	Instrument / Component	2*	2,4	3,8	3,4	2,5, 6,8	2,4, 6	3,5		
	Major	1	5,6,7	5,6,7	7	7	7,8	7,8		
	SRO-I									
	Reactivity	0	1	-	1	-	1			
	Normal	1*	-	1	-	1		1		
	Instrument / Component	2*	2,4	3,8	3,4	2,5, 6,8	2,4, 6	3,5		
As SRO	Major	1	5,6,7	5,6,7	7	7	7,8	7,8		
	SRO-U									
	Reactivity	0								
	Normal	1*								
SRO-U	Instrument / Component	2*								
	Major	1								

- Instructions: (1) Enter the operating test number and Form ES-D-1 event numbers for each evolution type.
- (2) Reactivity manipulations may be conducted under normal or *controlled* abnormal conditions (refer to Section D.5.d) but must be significant per Section C.2.a of Appendix D. * Reactivity and normal evolutions may be replaced with additional instrument or component malfunctions on a one-for-one basis.
- (3) Whenever practical, both instrument and component malfunctions should be included; only those that require verifiable actions that provide insight to the applicant's competence count toward the minimum requirement.

Author:

Timothy J. Foss
William R. McNeil

NRC Reviewer:

Simulation Facility	<u>Byron</u>	Scenario No. 1	Operating Test No. 2003
Examiners:	_____	Applicant:	<u>SRO</u>
	_____		<u>RO</u>
	_____		<u>BOP</u>

Initial Conditions: IC-21 , 100% power, BOL, equilibrium Xenon, steady state

Turnover: 100% power. 1A CS Pump is OOS for a motor bearing replacement. 1C HD pump is OOS for an alignment and vibration problem.

Event No.	Malf. No.	Event Type*	Event Description
Preload	RP02A&B CS01A FW35C ED06H	M RO SRO BOP M BOP	Failure of RTB A&B to auto AND manual open. (can be opened locally) 1A CS pump OOS Failure of CS to Actuate on Hi-3 Cnmt Press. Train B CS must be manually started from the MCR 1C HD pump OOS 6.9KV Breaker 1591 fails to ABT.
Preload	(preload note)	C RO SRO	1SI8801A will not auto open nor open from the MCB 1SI8801B will not open automatically. Will open manually from MCB
1		N BOP SRO	Ramp down turbine power to 1000 Mwe at directed MW/min
		R RO SRO	Lower reactor power using rods and/or boration.
2	RX21A	I RO SRO	PT-455 Controlling Pressurizer Pressure channel fails high
3	RX03E, 4.8	I BOP SRO	Steam Flow Transmitter FT-532 (input to controlling channel) fails high.
4	RD09, 8	C RO SRO	Automatic rod motion fails at 8 step per minute.
5	ED05D RP09A	M BOP RO SRO	SAT feed breaker to bus 159 trips opens, no ABT. Loss of RCS flow (Loop 1D) ATWS
6	RP02A,B	M RO BOP SRO	Reactor Trip Breakers fail to open / ATWS
7	TH06	M RO BOP SRO	Large Break LOCA inside containment. Leads to high-3 containment pressure
8	(OR) CS01B MRF RP63	C BOP RO SRO	Failure of CS to auto actuate.

*(N)ormal, (R)eactivity (I)nstrument, (C)omponent, (M)ajor Transient

Simulation Facility Byron

Scenario No. 2

Operating Test No. 2003

Examiners: _____

_____Applicant: _____ SRO
_____ RO
_____ BOP

Initial Conditions: IC-18, 76% power, steady state, BOC.

Turnover: Ramp to full power requested by Electric Operations. 1A MFP is out of service due to breaker cubicle work.

Event No.	Malf. No.	Event Type*	Event Description
Preload	FW48B FW43 RP30 OUT RP37 OUT MS01A 75 MS01B 80 MS01C 60 MS01D 90 FW45E, 100 Override ZDI1AF013E AUTO	C BOP C BOP C BOP C RO BOP SRO C BOP C BOP SRO	1B AFW pump fails to auto start, can be manually started. 1A AFW pump fails to auto or manually start. Failure of Phase A valves to close All MSIVs fail partially open, no closure available. 1AF005E potentiometer fails to 100% demand. 1AF013E stuck open.
1		R RO SRO N BOP	Raise Reactor Power using rods and dilution Ramp up turbine power from 76% to full power.
2	RX29C 65	C BOP SRO	Steam Generator 1C FRV Controller card failure resulting in manual control of FRV
3	RX13A, 0	I RO SRO	1LT-459, Controlling PZR Level Channel fails low.
4	CV09, 50	C RO SRO	TCV-130A modulates closed
5	MS04D, 100	C BOP SRO	1MS018D, 1D SG PORV fails open.
6	CC03B CC01C CC02A	I BOP SRO	Component Cooling (CC) Surge Tank level transmitter level tree leak results in auto makeup and 1B CC pump trip with failure of 1A CC pump auto start on low header pressure.
7	FW19A, 2.0 (Pre-loaded)	M BOP RO SRO	1A SG Feed line break (2 MLB/HR) inside containment. 4 faulted steam generators. All MSIVs fail to Close. Stuck open
8	1A and 1B AFW pumps fail to Start	C BOP SRO	Pre-loaded. 1A AFW pump fails to start. 1B AFW can only be manually started.

*(N)ormal, (R)eactivity (I)nstrument, (C)omponent, (M)ajor Transient

Facility Name: Byron		Date of Exam: 12/01/2003																	
Tier	Group	RO K/A Category Points											Total	SRO-Only Points					
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G *		K	A	A 2	G *	Total	
1. Emergency & Abnormal Plant Evolution	1	4	2	4				2	2				4	18	3	0	2	2	7
	2	1	1	2				2	1				2	9	2	1	2	0	5
	Tier Totals	5	3	6				4	3				6	27	5	1	4	2	12
2. Plant Systems	1	5	2	2	3	1	1	3	3	2	3	3	28	0	1	2	1	4	
	2	1	0	1	1	1	1	1	1	1	1	1	10	1	0	1	0	2	
	Tier Totals	6	2	3	4	2	2	4	4	3	4	4	38	1	1	3	1	6	
3. Generic Knowledge and Abilities Categories				1	2	3	4	10	1	2	3	4	7						
				3	3	2	2		1	2	2	2							

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 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.

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.

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (RO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000007 Reactor Trip - Stabilization - Recovery / 1									0
000008 Pressurizer Vapor Space Accident / 3	0 2						Change in leak rate with change in pressure	3.1	1
000009 Small Break LOCA / 3					1 0		Airborne activity	3.1	1
000011 Large Break LOCA / 3									0
000015 RCP Malfunctions / 4									1
000017 RCP Malfunctions (Loss of RC Flow) / 4		0 7					RCP seals	2.9	
000022 Loss of Rx Coolant Makeup / 2			0 3				Performance of lineup to establish excess letdown after determining need	3.1	1
000025 Loss of RHR System / 4	0 1						Loss of RHRS during all modes of operation	3.9	1
000026 Loss of Component Cooling Water / 8						04. 50	Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	3.3	1
000027 Pressurizer Pressure Control System Malfunction / 3	0 1						Definition of saturation temperature	3.1	1
000029 ATWS / 1									0
000038 Steam Gen. Tube Rupture / 3	0 4						Reflux boiling	3.1	1
000040 Steam Line Rupture - Excessive Heat Transfer / 4									1
WE12 Uncontrolled Depressurization of all Steam Generators / 4			0 1				Facility operating characteristics during transient conditions, including coolant chemistry and the effects of temperature, pressure, and reactivity changes and operating limitations and	3.5	
000054 (CE/E06) Loss of Main Feedwater / 4			0 3				Manual control of AFW flow control valves	3.8	1
000055 Station Blackout / 6						04. 50	Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.	3.3	1
000056 Loss of Off-site Power / 6				3 1			PZR heater group control switches	3.3	1
000057 Loss of Vital AC Inst. Bus / 6					0 4		ESF system panel alarm annunciators and channel status indicators	3.7	1
000058 Loss of DC Power / 6				0 1			Cross-tie of the affected dc bus with the alternate supply	3.4	1
000062 Loss of Nuclear Svc Water / 4			0 3				Guidance actions contained in EOP for Loss of nuclear service water	4	1
000065 Loss of Instrument Air / 8						01. 23	Ability to perform specific system and integrated plant procedures during all modes of plant operation.	3.9	1
W/E04 LOCA Outside Containment / 3									0
W/E11 Loss of Emergency Coolant Recirc. / 4		0 1					Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.6	1
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4						04. 49	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls	4	1
K/A Category Totals:	4	2	4	2	2	4	Group Point Total:		18

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (RO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000001 Continuous Rod Withdrawal / 1									0
000003 Dropped Control Rod / 1									0
000005 Inoperable/Stuck Control Rod / 1									0
000024 Emergency Boration / 1									0
000028 Pressurizer Level Malfunction / 2									0
000032 Loss of Source Range NI / 7									0
000033 Loss of Intermediate Range NI / 7									0
000036 Fuel Handling Accident / 8				03			Reactor building containment evacuation alarm enable switch	3.5	1
000037 Steam Generator Tube Leak / 3						01. 32	Ability to explain and apply all system limits and precautions.	3.4	1
000051 Loss of Condenser Vacuum / 4									0
000059 Accidental Liquid RadWaste Rel. / 9		01					Radioactive-liquid monitors	2.7	1
000060 Accidental Gaseous Radwaste Rel. / 9									0
000061 ARM System Alarms / 7									0
000067 Plant Fire On-site / 9 8									0
000068 Control Room Evac. / 8			14				Safety injection setpoint of main steam line pressure	3.2	1
000069 Loss of CTMT Integrity / 5									0
W/E14 High Containment Pressure / 5									
000074 Inad. Core Cooling / 4						02. 25	Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	2.5	
W/E06 Degraded Core Cooling / 4									1
W/E07 Saturated Core Cooling / 4									
000076 High Reactor Coolant Activity / 9									0
W/E01 Rediagnosis / 3									1
W/E02 SI Termination / 3	01						Components, capacity, and function of emergency systems	3.2	
W/E13 Steam Generator Over-pressure / 4			03				Manipulation of controls required to obtain desired operating results during abnormal, and emergency situations	3.2	1
W/E15 Containment Flooding / 5				03			Desired operating results during abnormal and emergency situations	2.8	1
W/E16 High Containment Radiation / 9									0
W/E03 LOCA Cooldown - Depress. / 4									0
W/E09 Natural Circulation Operations / 4					01		Facility conditions and selection of appropriate procedures during abnormal and emergency operations	3.1	1
W/E10 Natural Circulation with Steam Voide in Vessel with/without RVLIS. / 4									
W/E08 RCS Overcooling - PTS / 4									0
K/A Category Totals:	1	1	2	2	1	2	Group Point Total:		9

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 2/Group 1 (RO)										Form ES-401-4 2		
E/APE # / Name / Safety Function	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
003 Reactor Coolant Pump					0 1							The relationship between the RCPS flow rate and the nuclear reactor core operating parameters (quadrant power tilt, imbalance, DNB rate, local power density, difference in	3.3	1
004 Chemical and Volume Control		0 1										Boric acid makeup pumps	2.9	1
005 Residual Heat Removal						0 3						RHR heat exchanger	2.5	1
006 Emergency Core Cooling								0 1				High bearing temperature	2.9	1
007 Pressurizer Relief/Quench Tank							0 2					Maintaining quench tank pressure	2.7	1
008 Component Cooling Water			0 3									RCP	4.1	1
010 Pressurizer Pressure Control										0 1		PZR spray valve	3.7	1
012 Reactor Protection				0 6								Automatic or manual enable/disable of RPS trips	3.2	1
013 Engineered Safety Features Actuation									0 2		04. 49	Operation of actuated equipment; Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4.1; 4	2
022 Containment Cooling		0 1									01. 33	Containment cooling fans; Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	3; 3.4	2
025 Ice Condenser														0
026 Containment Spray							0 4					Containment humidity	3.1	1
039 Main and Reheat Steam							0 5	0 5				RCS T-ave; Increasing steam demand, its relationship to increases in reactor power	3.2; 3.3	2
056 Condensate	0 3											MFW	2.6	1
059 Main Feedwater										0 1		MFW turbine trip indication	3.1	1
061 Auxiliary/Emergency Feedwater				1 2					0 2			Natural circulation flow; RCS cooldown during AFW operations	3.5; 4	2
062 AC Electrical Distribution	0 2											ED/G	4.1	1
063 DC Electrical Distribution	0 3										04. 31	Battery charger and battery; Knowledge of annunciators alarms and indications, and use of the response instructions.	2.9; 3.3	2
064 Emergency Diesel Generator								0 2				Load, VARS, pressure on air compressor, speed droop, frequency, voltage, fuel oil level, temperatures	2.7	1
073 Process Radiation Monitoring			0 1									Radioactive effluent releases	3.6	1
076 Service Water										0 1		SWS pumps	2.9	1
078 Instrument Air	0 2			0 3								Service air; Securing of SAS upon loss of cooling water	2.7; 3.1	2
103 Containment	0 5											Personnel access hatch and emergency access hatch	2.8	1
K/A Category Totals:	5	2	2	3	1	1	3	3	2	3	3	Group Point Total:		28

Emergency and Abnormal Plant Evolutions - Tier 2/Group 2 (RO)

E/APE # / Name / Safety Function	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive														0
002 Reactor Coolant											04. 06	Knowledge symptom based EOP mitigation strategies.	3.1	1
011 Pressurizer Level Control			0 2									RCS	3.5	1
014 Rod Position Indication														0
015 Nuclear Instrumentation														0
016 Non-nuclear Instrumentation	0 7											ECCS	3.7	1
017 In-core Temperature Monitor														0
027 Containment Iodine Removal														0
028 Hydrogen Recombiner and Purge Control										0 3		Location and operation of hydrogen sampling and analysis of containment atmosphere, including alarms and indications	3.1	1
029 Containment Purge														0
033 Spent Fuel Pool Cooling														0
034 Fuel Handling Equipment						0 2						Radiation monitoring systems	2.6	1
035 Steam Generator														0
041 Steam Dump/Turbine Bypass Control									0 5			Main steam pressure	2.9	1
045 Main Turbine Generator					1 8							Purpose of low-power reactor trips (limited to 25% power)	2.7	1
055 Condenser Air Removal														0
068 Liquid Radwaste									0 4			Failure of automatic isolation	3.3	1
071 Waste Gas Disposal														0
072 Area Radiation Monitoring														0
075 Circulating Water														0
079 Station Air				0 1								Cross-connect with IAS	2.9	1
086 Fire Protection							0 3					Fire doors	2.7	1
K/A Category Totals:	1	0	1	1	1	1	1	1	1	1	1	Group Point Total:		10

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 1 (SRO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000007 Reactor Trip - Stabilization - Recovery / 1					0 2		Proper actions to be taken if the automatic safety functions have not taken place	4.6	1
000008 Pressurizer Vapor Space Accident / 3						4.4 9	Ability to perform without reference to procedures those actions that require immediate operation of system components and controls.	4	1
000009 Small Break LOCA / 3			2 3				RCP tripping requirements	4.3	1
000011 Large Break LOCA / 3			0 9				Maintaining D/Gs available to provide standby power	4.5	1
000015 RCP Malfunctions / 4					1 1		When to jog RCPs during ICC	3.8	1
000017 RCP Malfunctions (Loss of RC Flow) / 4									
000022 Loss of Rx Coolant Makeup / 2									0
000025 Loss of RHR System / 4									0
000026 Loss of Component Cooling Water / 8									0
000027 Pressurizer Pressure Control System Malfunction / 3									0
000029 ATWS / 1									0
000038 Steam Gen. Tube Rupture / 3									0
000040 Steam Line Rupture - Excessive Heat Transfer / 4									0
WE12 Uncontrolled Depressurization of all Steam Generators / 4									
000054 (CE/E06) Loss of Main Feedwater / 4									0
000055 Station Blackout / 6									0
000056 Loss of Off-site Power / 6									0
000057 Loss of Vital AC Inst. Bus / 6			0 1				Actions contained in EOP for loss of vital ac electrical instrument bus	4.4	1
000058 Loss of DC Power / 6						01. 28	Knowledge of the purpose and function of major system components and controls.	3.3	1
000062 Loss of Nuclear Svc Water / 4									0
000065 Loss of Instrument Air / 8									0
W/E04 LOCA Outside Containment / 3									0
W/E11 Loss of Emergency Coolant Recirc. / 4									0
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4									0
K/A Category Totals:	0	0	3	0	2	2	Group Point Total:		7

ES-401		PWR Examination Outline						Form ES-401-2	
Emergency and Abnormal Plant Evolutions - Tier 1/Group 2 (SRO)									
E/APE # / Name / Safety Function	K 1	K 2	K 3	A 1	A 2	G	K/A Topic(s)	IR	#
000001 Continuous Rod Withdrawal / 1									0
000003 Dropped Control Rod / 1									0
000005 Inoperable/Stuck Control Rod / 1				05			RPI	3.4	1
000024 Emergency Boration / 1									0
000028 Pressurizer Level Malfunction / 2									0
000032 Loss of Source Range NI / 7									0
000033 Loss of Intermediate Range NI / 7									0
000036 Fuel Handling Accident / 8									0
000037 Steam Generator Tube Leak / 3									0
000051 Loss of Condenser Vacuum / 4									0
000059 Accidental Liquid RadWaste Rel. / 9									0
000060 Accidental Gaseous Radwaste Rel. / 9	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	3.1	1
000061 ARM System Alarms / 7					06		Required actions if alarm channel is out of service	4.1	1
000067 Plant Fire On-site / 9 8									0
000068 Control Room Evac. / 8									0
000069 Loss of CTMT Integrity / 5									0
W/E14 High Containment Pressure / 5									0
000074 Inad. Core Cooling / 4									
W/E06 Degraded Core Cooling / 4									
W/E07 Saturated Core Cooling / 4									0
000076 High Reactor Coolant Activity / 9									
W/E01 Rediagnosis / 3		01					Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.5	1
W/E02 SI Termination / 3									
W/E13 Steam Generator Over-pressure / 4									0
W/E15 Containment Flooding / 5									0
W/E16 High Containment Radiation / 9									0
W/E03 LOCA Cooldown - Depress. / 4					01		Facility conditions and selection of appropriate procedures during abnormal and emergency operations.	4.2	1
W/E09 Natural Circulation Operations / 4									0
W/E10 Natural Circulation with Steam Voide in Vessel with/without RVLIS. / 4									
W/E08 RCS Overcooling - PTS / 4									0
K/A Category Totals:	1	1	0	1	2	0	Group Point Total:		5

ES-401		PWR Examination Outline Emergency and Abnormal Plant Evolutions - Tier 2/Group 1 (SRO)										Form ES-401-2		
E/APE # / Name / Safety Function	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
003 Reactor Coolant Pump														0
004 Chemical and Volume Control														0
005 Residual Heat Removal														0
006 Emergency Core Cooling														0
007 Pressurizer Relief/Quench Tank														0
008 Component Cooling Water								0 1				Loss of CCW pump	3.6	1
010 Pressurizer Pressure Control											01. 32	Ability to explain and apply all system limits and precautions.	3.8	1
012 Reactor Protection								0 2				Loss of instrument power	3.9	1
013 Engineered Safety Features Actuation														0
022 Containment Cooling														0
025 Ice Condenser														0
026 Containment Spray														0
039 Main and Reheat Steam														0
056 Condensate														0
059 Main Feedwater														0
061 Auxiliary/Emergency Feedwater														0
062 AC Electrical Distribution														0
063 DC Electrical Distribution														0
064 Emergency Diesel Generator								0 2				Fuel consumption rate with load	2.8	1
073 Process Radiation Monitoring														0
076 Service Water														0
078 Instrument Air														0
103 Containment														0
K/A Category Totals:	0	0	0	0	0	0	1	2	0	0	1	Group Point Total:		4

Emergency and Abnormal Plant Evolutions - Tier 2/Group 2 (SRO)

E/APE # / Name / Safety Function	K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	G	K/A Topic(s)	IR	#
001 Control Rod Drive														0
002 Reactor Coolant														0
011 Pressurizer Level Control														0
014 Rod Position Indication														0
015 Nuclear Instrumentation								0 3				Xenon oscillations	3.5	1
016 Non-nuclear Instrumentation														0
017 In-core Temperature Monitor														0
027 Containment Iodine Removal														0
028 Hydrogen Recombiner and Purge Control														0
029 Containment Purge														0
033 Spent Fuel Pool Cooling														0
034 Fuel Handling Equipment														0
035 Steam Generator														0
041 Steam Dump/Turbine Bypass Control														0
045 Main Turbine Generator														0
055 Condenser Air Removal														0
068 Liquid Radwaste														0
071 Waste Gas Disposal														0
072 Area Radiation Monitoring		0 1										Radiation monitoring systems	2.5	1
075 Circulating Water														0
079 Station Air														0
086 Fire Protection														0
K/A Category Totals:	0	1	0	0	0	0	0	1	0	0	0	Group Point Total:		2

ES-401		Generic Knowledge and Abilities Outline (Tier 3)			Form ES-401-3	
Facility Name: Byron		Date of Exam: 12/01/2003				
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1. 11	Knowledge of less than one hour technical specification action statements for systems.	3	1		
	2.1. 21	Ability to obtain and verify controlled procedure copy.	3.1	1		
	2.1. 32	Ability to explain and apply all system limits and precautions.	3.4	1		
	2.1. 14	Knowledge of system status criteria which require the notification of plant personnel.			3.3	1
	2.1.					
	2.1.					
	Subtotal			3		1
2. Equipment Control	2.2. 25	Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	2.5	1		
	2.2. 34	Knowledge of the process for determining the internal and external effects on core reactivity.	2.8	1		
	2.2. 03	(multi-unit) Knowledge of the design, procedural, and operational differences between units.	3.1	1		
	2.2. 29	Knowledge of SRO fuel handling responsibilities.			3.8	1
	2.2. 09	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
	2.2.					
	Subtotal			3		2
3. Radiation Control	2.3. 02	Knowledge of facility ALARA program.	2.5	1		
	2.3. 04	Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	2.5	1		
	2.3. 09	Knowledge of the process for performing a containment purge.			3.4	1
	2.3. 11	Ability to control radiation releases.			3.2	1
	2.3.					
	2.3.					
	Subtotal			2		2
4. Emergency Procedures / Plan	2.4. 02	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.	3.9	1		
	2.4. 19	Knowledge of EOP layout, symbols, and icons.	2.7	1		
	2.4. 08	Knowledge of how the event-based emergency/abnormal operating procedures are used in conjunction with the symptom-based EOPs.			3.7	1
	2.4. 50	Ability to verify system alarm setpoints and operate controls identified in the alarm response manual.			3.3	1
	2.4.					
	2.4.					
	Subtotal			2		2
Tier 3 Point Total				10		7

