

2009 BRAIDWOOD STATION

INITIAL EXAMINATION

OUTLINE SUBMITTAL

June 25, 2009
BW090057

10 CFR 55.40(b)

U. S. Nuclear Regulatory Commission
Regional Administrator, Region III
2443 Warrenville Road, Suite 210
Lisle, IL 60532-4352

Braidwood Station, Units 1 and 2
Facility Operating License Nos. NPF-72 and NPF-77
NRC Docket Nos. STN 50-456 and STN 50-457

Subject: Submittal of Initial Operator Licensing Examination Outline

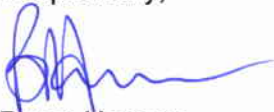
Enclosed are the examination outlines supporting the Initial License Examination scheduled for the weeks of October 5, 2009 through October 16, 2009 at Braidwood Station.

This submittal includes all appropriate Examination Standard forms and outlines in accordance with NUREG-1021, "Operator Licensing Examination Standards for Power Reactors," Revision 9.

In accordance with NUREG 1021, 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 Mr. David Gullott, Regulatory Assurance Manager, at (815) 417-2800. For questions concerning examination materials, please contact Brian Kempen at (815) 458-7860.

Respectfully,



Bryan Hanson
Site Vice President
Braidwood Station

me 6/26/09 *HP*

Enclosures: (Hand delivered to Bruce Palagi, Chief Examiner, Region III)

- Examination Security Agreements (Form ES-201-3)
- Administrative Topic Outline(s) (Form ES-301-1)
- Control Room/In-Plant Systems Outline (Form ES-301-2)
- PWR Examination Outline (Form ES-401-2)
- Generic Knowledge and Abilities Outline (Tier 3) (Form ES-401-3)
- Statement detailing method of Written Exam Outline generation
- Scenario Outlines (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 – Braidwood Station

**bcc: Braidwood Station Project Manager, NRR
Director, Licensing
Regulatory Assurance Manager – Braidwood Station
Manager, Licensing – Braidwood, Byron and LaSalle County Stations
Braidwood Nuclear Licensing Administrator
Exelon Document Control Desk Licensing
Human Resources – Braidwood Station
Director Site Training – Braidwood Station
B. Kempen – Braidwood Training Department**

Facility: Braidwood		Date of Examination: 10/5/09		
Item	Task Description	Initials		
		a	b*	c#
1. W R I T T E N	a. Verify that the outline(s) fit(s) the appropriate model, in accordance with ES-401.	BR	D	BP
	b. Assess whether the outline was systematically and randomly prepared in accordance with Section D.1 of ES-401 and whether all K/A categories are appropriately sampled.	BR	D	BP
	c. Assess whether the outline over-emphasizes any systems, evolutions, or generic topics.	BR	D	BP
	d. Assess whether the justifications for deselected or rejected K/A statements are appropriate.	BR	D	BP
2. S I M U L A T O R	a. Using Form ES-301-5, verify that the proposed scenario sets cover the required number of normal evolutions, instrument and component failures, technical specifications, and major transients.	BR	D	BP
	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, and ensure that 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.	BR	D	BP
	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.	BR	D	BP
3. W / T	a. Verify that the systems walk-through outline meets the criteria specified on Form ES-301-2: (1) the outline(s) contain(s) the required number of control room and in-plant tasks distributed among the safety functions as specified on the form (2) task repetition from the last two NRC examinations is within the limits specified on the form (3) no tasks are duplicated from the applicants' audit test(s) (4) the number of new or modified tasks meets or exceeds the minimums specified on the form (5) the number of alternate path, low-power, emergency, and RCA tasks meet the criteria on the form	BR	D	BP
	b. Verify that the administrative outline meets the criteria specified on Form ES-301-1: (1) the tasks are distributed among the topics as specified on the form (2) at least one task is new or significantly modified (3) no more than one task is repeated from the last two NRC licensing examinations	BR	D	BP
	c. 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.	BR	D	BP
4. G E N E R A L	a. Assess whether plant-specific priorities (including PRA and IPE insights) are covered in the appropriate exam section.	BR	D	BP
	b. Assess whether the 10 CFR 55.41/43 and 55.45 sampling is appropriate.	BR	D	BP
	c. Ensure that K/A importance ratings (except for plant-specific priorities) are at least 2.5.	BR	D	BP
	d. Check for duplication and overlap among exam sections.	BR	D	BP
	e. Check the entire exam for balance of coverage.	BR	D	BP
	f. Assess whether the exam fits the appropriate job level (RO or SRO).	BR	D	BP
a. Author	Brian Kempen	Printed Name / Signature		Date
b. Facility Reviewer (*)	Dan Ackerman	<i>[Signature]</i>		6/19/09
c. NRC Chief Examiner (#)	Bruce Pakyi	<i>[Signature]</i>		6/22/09
d. NRC Supervisor	Hiromori Paterson	<i>[Signature]</i>		7/9/09
				7/11/09
NOTE:	# Independent NRC Reviewer initial items in Column "c"; chief examiner concurrence required. * Not applicable for NRC-prepared examination outlines.			

Facility: <u>Braidwood</u>		Date of Examination: <u>10/5/2009</u>
Examination Level: RO <input checked="" type="checkbox"/> SRO <input type="checkbox"/>		Operating Test Number: <u>2009 NRC</u>
Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	D, S	R-101 Perform QPTR Calculation using the Process Computer K/A 2.1.19 Imp Factor 3.9
Conduct of Operations	N, C	R-109 Complete NRC Active License Maintenance Log K/A 2.1.4 Imp Factor 3.3
Equipment Control	D, R	R-200 Perform Worker Tagout Checklist K/A 2.2.13 Imp Factor 4.1
Radiation Control	N, S	R-301 Perform Containment Release Channel Check. BwRP 6110-13T1 and 1BwOS RETS 2.2.B-1 K/A 2.3.11 Imp Factor 3.8
Emergency Plan	N/A	N/A
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.		
* Type Codes & Criteria: (C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1 ; randomly selected)		

Facility: <u>Braidwood</u>		Date of Examination: <u>10/5/2009</u>
Examination Level: RO <input type="checkbox"/> SRO <input checked="" type="checkbox"/>		Operating Test Number: <u>2009 NRC</u>
Administrative Topic (See Note)	Type Code*	Describe activity to be performed
Conduct of Operations	N, S, R	S-108 Determine Venting Time for Rx Vessel Head Void (BwFR-I.3) K/A 2.1.25 Imp Factor 4.2
Conduct of Operations	N, C	R-109 Complete NRC Active License Maintenance Log K/A 2.1.4 Imp Factor 3.8
Equipment Control	D, S, R	S-200 Approve Worker Tagout. K/A 2.2.13 Imp Factor 4.3
Radiation Control	D, S	S-300 Review Containment Release for Approval K/A 2.3.11 Imp Factor 4.3
Emergency Plan	D, S, R	<i>S-404</i> S-403 Classify and Screen an Event for Reportability K/A 2.4.30 Imp Factor 4.1 <i>and complete ENS Form</i>
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.		
* Type Codes & Criteria: (C)ontrol room, (S)imulator, or Class(R)oom (D)irect from bank (≤ 3 for ROs; ≤ 4 for SROs & RO retakes) (N)ew or (M)odified from bank (≥ 1) (P)revious 2 exams (≤ 1 ; randomly selected)		

Facility: <u>Braidwood</u>		Date of Examination: <u>10/5/2009</u>
Exam Level: RO <input checked="" type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test Number: <u>2009 NRC</u>
Control Room Systems [@] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)		
System / JPM Title	Type Code*	Safety Function
a. SIM-111 Perform Movable Control Assembly Quarterly Surveillance K/A 001000A4.03 Imp Factor 4.0/3.7	D, S, A	1
b. SIM-207 Raise SI Accumulator Pressure K/A 006000A4.02 Imp Factor 4.0/3.8	D, S	2
c. SIM-304 Perform Pzr PORV valve stroke surv. K/A 010000A4.03 Imp Factor 4.0/3.8	N, S	3
d. SIM-407S Swap SX pumps K/A 076000A4.01 Imp Factor 2.9/2.9	M, S, A	4S
e. SIM-507 Perform RCFC Surveillance K/A 022000A4.01 Imp Factor 3.6/3.6	N, S, A	5
f. SIM-611 Cross-tie ESF to Non-ESF bus in ELEC-4 K/A 062000A4.01 Imp Factor 3.3/3.1	M, S, L	6
g. SIM-710 Respond to SR NI Failure K/A 015000A2.02 Imp Factor 3.1/3.5	N, S, L	7
h. SIM-803 Respond to CC malfunction (relief valve lifting) K/A 008000A2.02 Imp Factor 3.2/3.5	D, S, E	8
In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. IP-200 Locally Reset Feedwater Isolation K/A 013000A4.02 Imp Factor 4.3/4.4	D, E	2
j. IP-410S Locally start the 2B AF pump K/A 061000A2.04 Imp Factor 3.4/3.8	M, R, A	4S
k. IP-703 Local Reactor Trip K/A 029000EA1.12 Imp Factor 4.1/4.0	D, E, A	1
<p>@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.</p>		
*Type Codes	Criteria for RO / SRO-I / SRO-U	
(A)lternate path	4-6 / 4-6 / 2-3	
(C)ontrol room		
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4	
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1	
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1	
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1	
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)	
(R)CA	≥ 1 / ≥ 1 / ≥ 1	
(S)imulator		

Facility: <u>Braidwood</u>		Date of Examination: <u>10/5/2009</u>
Exam Level: RO <input type="checkbox"/> SRO-I <input checked="" type="checkbox"/> SRO-U <input type="checkbox"/>		Operating Test Number: <u>2009 NRC</u>
Control Room Systems [@] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)		
System / JPM Title	Type Code*	Safety Function
a. SIM-111 Perform Movable Control Assembly Quarterly Surveillance K/A 001000A4.03 Imp Factor 4.0/3.7	D, S, A	1
b. SIM-207 Raise SI Accumulator Pressure K/A 006000A4.02 Imp Factor 4.0/3.8	D, S	2
c. N/A		
d. SIM-407S Swap SX pumps K/A 076000A4.01 Imp Factor 2.9/2.9	M, S, A	4S
e. SIM-507 Perform RCFC Surveillance K/A 022000A4.01 Imp Factor 3.6/3.6	N, S, A	5
f. SIM-611 Cross-tie ESF to Non-ESF bus in ELEC-4 K/A 062000A4.01 Imp Factor 3.3/3.1	M, S, L	6
g. SIM-710 Respond to SR NI Failure K/A 015000A2.02 Imp Factor 3.1/3.5	N, S, L	7
h. SIM-803 Respond to CC malfunction (relief valve lifting) K/A 008000A2.02 Imp Factor 3.2/3.5	D, S, E	8
In-Plant Systems [@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)		
i. IP-200 Locally Reset Feedwater Isolation K/A 013000A4.02 Imp Factor 4.3/4.4	D, E	2
j. IP-410S Locally start the 2B AF pump K/A 061000A2.04 Imp Factor 3.4/3.8	M, R, A	4S
k. IP-703 Local Reactor Trip K/A 029000EA1.12 Imp Factor 4.1/4.0	D, E, A	1
<p>@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.</p>		
*Type Codes	Criteria for RO / SRO-I / SRO-U	
(A)lternate path	4-6 / 4-6 / 2-3	
(C)ontrol room		
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4	
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1	
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1	
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1	
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)	
(R)CA	≥ 1 / ≥ 1 / ≥ 1	
(S)imulator		

Facility: Braidwood

Date of Examination: 10/5/2009

Exam Level: RO SRO-I SRO-U

Operating Test Number: 2009 NRC

Control Room Systems[@] (8 for RO); (7 for SRO-I); (2 or 3 for SRO-U, including 1 ESF)

System / JPM Title	Type Code*	Safety Function
a. N/A		
b. N/A		
c. N/A		
d. N/A		
e. SIM-507 Perform RCFC Surveillance (ESF) K/A 022000A4.01 Imp Factor 3.6/3.6	N, S, A	5
f. SIM-611 Cross-tie ESF to Non-ESF bus in ELEC-4 K/A 062000A4.01 Imp Factor 3.3/3.1	M, S, L	6
g. N/A		
h. N/A		

In-Plant Systems[@] (3 for RO); (3 for SRO-I); (3 or 2 for SRO-U)

i. IP-200 Locally Reset Feedwater Isolation K/A 013000A4.02 Imp Factor 4.3/4.4	D, E	2
j. IP-410S Locally start the 2B AF pump K/A 061000A2.04 Imp Factor 3.4/3.8	M, R, A	4S
k. IP-703 Local Reactor Trip K/A 029000EA1.12 Imp Factor 4.1/4.0	D, E, A	1

@ All RO and SRO-I control room (and in-plant) systems must be different and serve different safety functions; all 5 SRO-U systems must serve different safety functions; in-plant systems and functions may overlap those tested in the control room.

*Type Codes	Criteria for RO / SRO-I / SRO-U
(A)lternate path	4-6 / 4-6 / 2-3
(C)ontrol room	
(D)irect from bank	≤ 9 / ≤ 8 / ≤ 4
(E)mergency or abnormal in-plant	≥ 1 / ≥ 1 / ≥ 1
(L)ow-Power / Shutdown	≥ 1 / ≥ 1 / ≥ 1
(N)ew or (M)odified from bank including 1(A)	≥ 2 / ≥ 2 / ≥ 1
(P)revious 2 exams	≤ 3 / ≤ 3 / ≤ 2 (randomly selected)
(R)CA	≥ 1 / ≥ 1 / ≥ 1
(S)imulator	

GROUP 2 3 SRO-I CANDIDATES

ES-301 Transient and Event Checklist Form ES-301-5

Facility: Braidwood		Date of Exam: October 5, 2009		Operating Test Number: 09-1													
APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		09-1			09-3			09-4			N/A						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/> <input type="checkbox"/>	RX					3								1	1	1	0
	NOR	1								1				2	1	1	1
	I/C	2 3 5				2 4				5				6	4	4	2
	MAJ	6				5				9				3	2	2	1
	TS	1 2												2	0	2	2
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/> <input type="checkbox"/>	RX								2					1	1	1	0
	NOR								1					1	1	1	1
	I/C		2 3 5				1		3 4 6 7					8	4	4	2
	MAJ		6				5		9					3	2	2	1
	TS								4 5					2	0	2	2
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/> <input type="checkbox"/>	RX					3			2					2	1	1	0
	NOR			1					X					2	1	1	1
	I/C					1 2 4			3 4 6 7					7	4	4	2
	MAJ			6		5			7					2	2	2	1
	TS					1 3								2	0	2	2
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/> <input type="checkbox"/>	RX													N/A	1	1	0
	NOR													N/A	1	1	1
	I/C													N/A	4	4	2
	MAJ													N/A	2	2	1
	TS													N/A	0	2	2

Instructions:

- Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an instant SRO *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.
- 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 1-for-1 basis.
- 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 requirements specified for the applicant's license level in the right-hand columns.

GROUP 3 3 SRO-I CANDIDATES

ES-301 Transient and Event Checklist Form ES-301-5

Facility: Braidwood			Date of Exam: October 5, 2009						Operating Test Number: 09-1								
APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)		
		09-1			09-3			09-5			N/A						
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION						
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP		R	I	U
<input type="checkbox"/> RO <input type="checkbox"/> SRO-I <input checked="" type="checkbox"/> SRO-U <input type="checkbox"/>	RX				3									1	1	1	0
	NOR	1									1			2	1	1	1
	I/C	2 3 5			2 4						5			6	4	4	2
	MAJ	6			5						7			3	2	2	1
	TS	1 2												2	0	2	2
<input type="checkbox"/> RO <input type="checkbox"/> SRO-I <input checked="" type="checkbox"/> SRO-U <input type="checkbox"/>	RX							2						1	1	1	0
	NOR								1					1	1	1	1
	I/C		2 3 5				1	4 5						6	4	4	2
	MAJ		6			5	7							3	2	2	1
	TS							3 4						2	0	2	2
<input type="checkbox"/> RO <input type="checkbox"/> SRO-I <input checked="" type="checkbox"/> SRO-U <input type="checkbox"/>	RX				3				2					2	1	1	0
	NOR			1										1	1	1	1
	I/C				1 2 4			4						4	4	4	2
	MAJ			6	5			7						3	2	2	1
	TS				1 3									2	0	2	2
<input type="checkbox"/> RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/>	RX													N/A	1	1	0
	NOR													N/A	1	1	1
	I/C													N/A	4	4	2
	MAJ													N/A	2	2	1
	TS													N/A	0	2	2
Instructions: <ol style="list-style-type: none"> Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an instant SRO <i>additionally</i> serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position. Reactivity manipulations may be conducted under normal or <i>controlled</i> 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 1-for-1 basis. 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 requirements specified for the applicant's license level in the right-hand columns. 																	

GROUP 4 3 SRO-I CANDIDATES

ES-301 Transient and Event Checklist Form ES-301-5

Facility: Braidwood		Date of Exam: October 5, 2009									Operating Test Number: 09-1							
APPLICANT	EVENT TYPE	Scenarios												TOTAL	MINIMUM(*)			
		09-2			09-3			09-5			N/A							
		CREW POSITION			CREW POSITION			CREW POSITION			CREW POSITION							
		SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP	SRO	ATC	BOP					
													R	I	U			
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/> <input type="checkbox"/>	RX	4				3								2	1	1	0	
	NOR	1								1				2	1	1	1	
	I/C	3 4				2 4					5			5	4	4	2	
	MAJ	5 7				5						7			4	2	2	1
	TS	2 3													2	0	2	2
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/> <input type="checkbox"/>	RX		4						2					2	1	1	0	
	NOR								1					1	1	1	1	
	I/C		3				1	4 5						4	4	4	2	
	MAJ		5 7				5	7						4	2	2	1	
	TS								3 4					2	0	2	2	
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input checked="" type="checkbox"/> <input type="checkbox"/>	RX					3			2					2	1	1	0	
	NOR			1										1	1	1	1	
	I/C			4	1 2 4				4					5	4	4	2	
	MAJ			5 7	5				7					4	2	2	1	
	TS					1 3								2	0	2	2	
RO <input type="checkbox"/> SRO-I <input type="checkbox"/> SRO-U <input type="checkbox"/> <input type="checkbox"/>	RX													N/A	1	1	0	
	NOR													N/A	1	1	1	
	I/C													N/A	4	4	2	
	MAJ													N/A	2	2	1	
	TS													N/A	0	2	2	

Instructions:

- Check the applicant level and enter the operating test number and Form ES-D-1 event numbers for each event type; TS are not applicable for RO applicants. ROs must serve in both the "at-the-controls (ATC)" and "balance-of-plant (BOP)" positions; Instant SROs must serve in both the SRO and the ATC positions, including at least two instrument or component (I/C) malfunctions and one major transient, in the ATC position. If an instant SRO *additionally* serves in the BOP position, one I/C malfunction can be credited toward the two I/C malfunctions required for the ATC position.
- 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 1-for-1 basis.
- 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 requirements specified for the applicant's license level in the right-hand columns.

Facility Name: Braidwood		Date of Exam: 10/5/09																								
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	A 2	G *	Total										
1. Emergency & Abnormal Plant Evolutions	1	3	3	3	N/A			3	3	N/A			3	18	3	3	6									
	2	1	1	1	N/A			2	2	N/A			2	9	2	2	4									
	Tier Totals	4	4	4	N/A			5	5	N/A			5	27	5	5	10									
2. Plant Systems	1	3	2	3	3	2	2	3	3	2	2	3	28	3	2	5										
	2	1	1	1	1	1	1	1	0	1	1	1	10	0	2	1	3									
	Tier Totals	4	3	4	4	3	3	4	3	3	3	4	38	5	3	8										
3. Generic Knowledge and Abilities Categories		1				2				3				4				10				1	2	3	4	7
		3				2				3				2				2	2	2	1					

- Note: 1. Ensure that at least two topics from every applicable K/A category are sampled within each tier of the RO and SRO-only outlines (i.e., except for one category in Tier 3 of the SRO-only outline, the "Tier Totals" in each K/A category shall not be less than two).
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. Systems/evolutions within each group are identified on the associated outline; systems or evolutions that do not apply at the facility should be deleted and justified; operationally important, site-specific systems that are not included on the outline should be added. Refer to Section D.1.b of ES-401 for guidance regarding the elimination of inappropriate K/A statements.
4. Select topics from as many systems and evolutions as possible; sample every system or evolution in the group before selecting a second topic for any system or evolution.
5. Absent a plant-specific priority, only those K/As having an importance rating (IR) of 2.5 or higher shall be selected. Use the RO and SRO ratings for the RO and SRO-only portions, respectively.
6. Select SRO topics for Tiers 1 and 2 from the shaded systems and K/A categories.
- 7.* 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. Refer to Section D.1.b of ES-401 for the applicable K/As.
8. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings (IRs) 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; if fuel handling equipment is sampled in other than Category A2 or G* on the SRO-only exam, enter it on the left side of Column A2 for Tier 2, Group 2 (Note #1 does not apply). Use duplicate pages for RO and SRO-only exams.
9. For Tier 3, select topics from Section 2 of the K/A catalog, and enter the K/A numbers, descriptions, IRs, and point totals (#) on Form ES-401-3. Limit SRO selections to K/As that are linked to 10 CFR 55.43.

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						02. 03	Knowledge of the design, procedural, and operational differences between units.	3.8	1
000008 Pressurizer Vapor Space Accident / 3		0 2					Sensors and detectors	2.7	1
000009 Small Break LOCA / 3					1 4		Actions to be taken if PTS limits are violated	3.8	1
000011 Large Break LOCA / 3									0
000015 RCP Malfunctions / 4					0 8		When to secure RCPs on high bearing temperature	3.4	1
000017 RCP Malfunctions (Loss of RC Flow) / 4									
000022 Loss of Rx Coolant Makeup / 2						01. 31	Ability to locate control room switches, controls, and indications, and to determine that they correctly reflect the desired plant lineup.	4.6	1
000025 Loss of RHR System / 4					0 2		Leakage of reactor coolant from RHR into closed cooling water system or into reactor building atmosphere	3.4	1
000026 Loss of Component Cooling Water / 8						04. 09	Knowledge of low power/shutdown implications in accident (e.g., loss of coolant accident or loss of residual heat removal) mitigation strategies.	3.8	1
000027 Pressurizer Pressure Control System Malfunction / 3				0 1			PZR heaters, sprays, and PORVs	4	1
000029 ATWS / 1				1 3			Manual trip of main turbine	4.1	1
000038 Steam Gen. Tube Rupture / 3									0
000040 Steam Line Rupture - Excessive Heat Transfer / 4									1
WE12 Uncontrolled Depressurization of all Steam Generators / 4		0 1					Components, and functions of control and safety systems, including instrumentation, signals, interlocks, failure modes, and automatic and manual features	3.4	
000054 (CE/E06) Loss of Main Feedwater / 4									0
000055 Station Blackout / 6			0 2				Actions contained in EOP for loss of offsite and onsite power	4.3	1
000056 Loss of Off-site Power / 6			0 1				Order and time to initiation of power for the load sequencer	3.5	1
000057 Loss of Vital AC Inst. Bus / 6									0
000058 Loss of DC Power / 6			0 1				Use of dc control power by ED/Gs	3.4	1
000062 Loss of Nuclear Svc Water / 4									0
000065 Loss of Instrument Air / 8				0 3			Restoration of systems served by instrument air when pressure is regained	2.9	1
W/E04 LOCA Outside Containment / 3		0 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	3.8	1
W/E11 Loss of Emergency Coolant Recirc. / 4	0 1						Components, capacity, and function of emergency systems	3.7	1
BW/E04; W/E05 Inadequate Heat Transfer - Loss of Secondary Heat Sink / 4	0 3						Annunciators and conditions indicating signals, and remedial actions associated with the Loss of Secondary Heat Sink	3.9	1
000077 Generator Voltage and Electric Grid Disturbances / 6	0 1						Definition of terms: volts, watts, amps, VARs, power factor	3.3	1
K/A Category Totals:	3	3	3	3	3	3	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					01		Rod position indication to actual rod position	3.7	1	
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									0	
000037 Steam Generator Tube Leak / 3						01. 23	Ability to perform specific system and integrated plant procedures during all modes of plant operation.	4.3	1	
000051 Loss of Condenser Vacuum / 4					02		Conditions requiring reactor and/or turbine trip	3.9	1	
000059 Accidental Liquid RadWaste Rel. / 9		02					Radioactive-gas monitors	2.7	1	
000060 Accidental Gaseous Radwaste Rel. / 9									0	
000061 ARM System Alarms / 7									0	
000067 Plant Fire On-site / 8				03			Bypass of a fire zone detector	2.5	1	
000068 Control Room Evac. / 8									0	
000069 Loss of CTMT Integrity / 5				01			Isolation valves, dampers, and electropneumatic devices	3.5	1	
W/E14 High Containment Pressure / 5										
000074 Inad. Core Cooling / 4										
W/E06 Degraded Core Cooling / 4									0	
W/E07 Saturated Core Cooling / 4										
000076 High Reactor Coolant Activity / 9									0	
W/E01 Rediagnosis / 3										
W/E02 SI Termination / 3						04. 46	Ability to verify that the alarms are consistent with the plant conditions.	4.2	1	
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									0	
W/E16 High Containment Radiation / 9									0	
W/E03 LOCA Cooldown - Depress. / 4									0	
W/E09 Natural Circulation Operations / 4	03						Annunciators and conditions indicating signals, and remedial actions associated with the Natural Circulation Operations	3.3	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	1	2	2	2	Group Point Total:		9	

ES-401	PWR Examination Outline											Form ES-401-2		
Plant Systems - Tier 2/Group 1 (RO)														
System # / Name	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 4											CVCS	2.6	1
004 Chemical and Volume Control		0 2										Makeup pumps	2.9	1
005 Residual Heat Removal			0 5									ECCS	3.7	1
006 Emergency Core Cooling			0 2									Fuel	4.3	1
007 Pressurizer Relief/Quench Tank								0 1	0 1			Stuck-open PORV or code safety; Components which discharge to the PRT	3.9; 2.7	2
008 Component Cooling Water	0 1											SWS	3.1	1
010 Pressurizer Pressure Control					0 1							Determination of condition of fluid in PZR, using steam tables	3.5	1
012 Reactor Protection		0 1				0 3						RPS channels, components, and interconnections; Trip logic circuits	3.3; 3.1	2
013 Engineered Safety Features Actuation						0 1						Sensors and detectors	2.7	1
022 Containment Cooling								0 5			04. 21	Major leak in CCS; Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor	3.1; 4	2
025 Ice Condenser														0
026 Containment Spray	0 1									0 5		ECCS; Containment spray reset switches	4.2; 3.5	2
039 Main and Reheat Steam					0 5							Bases for RCS cooldown limits	2.7	1
059 Main Feedwater							0 3					Power level restrictions for operation of MFW pumps and valves	2.7	1
061 Auxiliary/Emergency Feedwater			0 2									S/G	4.2	1
062 AC Electrical Distribution									0 1		04. 08	Vital ac bus amperage; Knowledge of how abnormal operating procedures are used in conjunction with EOPs.	3; 3.8	2
063 DC Electrical Distribution				0 4								Trips	2.6	1
064 Emergency Diesel Generator				1 0							01. 32	Automatic load sequencer: blackout; Ability to explain and apply system limits and precautions.	3.5; 3.8	2
073 Process Radiation Monitoring							0 1					Radiation levels	3.2	1
076 Service Water								0 1				Loss of SWS	3.5	1
078 Instrument Air				0 2						0 1		Cross-over to other air systems; Pressure gauges	3.2; 3.1	2
103 Containment							0 1					Containment pressure, temperature, and humidity	3.7	1
														0
K/A Category Totals:	3	2	3	3	2	2	3	3	2	2	3	Group Point Total:		28

ES-401	PWR Examination Outline											Form ES-401-2		
Plant Systems - Tier 2/Group 2 (RO)														
System # / Name	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							Relationship of pressure and temperature for water at saturation and subcooling conditions	3.7	1
011 Pressurizer Level Control					0							Relationship between PZR level and PZR heater control circuit	2.9	1
014 Rod Position Indication										0		Re-zeroing of rod position prior to startup	2.7	1
015 Nuclear Instrumentation		0										NIS channels, components, and interconnections	3.3	1
016 Non-nuclear Instrumentation		1								0		Automatic selection of NNIS inputs to control systems	2.9	1
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											04.20	Knowledge of the operational implications of EOP warnings, cautions, and notes.	3.8	1
041 Steam Dump/Turbine Bypass Control						0						Steam pressure	3.1	1
045 Main Turbine Generator				2								Calibrations of the nuclear instrumentation as flux shifts during T/G load increase (permissives and administrative holds)	2.6	1
055 Condenser Air Removal														0
056 Condensate														0
068 Liquid Radwaste		0										Waste gas vent header	2.5	1
071 Waste Gas Disposal		2												0
072 Area Radiation Monitoring														0
075 Circulating Water			0									ESFAS	3.4	1
079 Station Air			7											0
086 Fire Protection														0
K/A Category Totals:	1	1	1	1	1	1	1	0	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
000008 Pressurizer Vapor Space Accident / 3									0
000009 Small Break LOCA / 3					1 5		RCS parameters	3.4	1
000011 Large Break LOCA / 3									0
000015 RCP Malfunctions / 4						02. 40	Ability to apply Technical Specifications for a system.	4.7	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						02. 22	Knowledge of limiting conditions for operations and safety limits.	4.7	1
000040 Steam Line Rupture - Excessive Heat Transfer / 4					0 2		Conditions requiring a reactor trip	4.7	1
WE12 Uncontrolled Depressurization of all Steam Generators / 4									
000054 (CE/E06) Loss of Main Feedwater / 4						02. 40	Ability to apply Technical Specifications for a system.	4.7	1
000055 Station Blackout / 6									0
000056 Loss of Off-site Power / 6									0
000057 Loss of Vital AC Inst. Bus / 6									0
000058 Loss of DC Power / 6									0
000062 Loss of Nuclear Svc Water / 4					0 6		The length of time after the loss of SWS flow to a component before that component may be damaged	3.1	1
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
000077 Generator Voltage and Electric Grid Disturbances / 6									0
K/A Category Totals:	0	0	0	0	3	3	Group Point Total:		6

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					03		Dropped rod, using in-core/ex-core instrumentation, in-core or loop temperature measurements	3.8	1	
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									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									0	
000061 ARM System Alarms / 7									0	
000067 Plant Fire On-site / 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						04. 20	Knowledge of the operational implications of EOP warnings, cautions, and notes.	4.3	1	
W/E06 Degraded Core Cooling / 4										
W/E07 Saturated Core Cooling / 4										
000076 High Reactor Coolant Activity / 9									0	
W/E01 Rediagnosis / 3					01		Facility conditions and selection of appropriate procedures during abnormal and emergency operations	4	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									0	
W/E09 Natural Circulation Operations / 4									1	
W/E10 Natural Circulation with Steam Voide in Vessel with/without RVLIS. / 4						04. 21	Knowledge of the parameters and logic used to assess the status of safety functions, such as reactivity control, core cooling and heat removal, reactor coolant system integrity, containment	4.6		
W/E08 RCS Overcooling - PTS / 4									0	
K/A Category Totals:	0	0	0	0	2	2	Group Point Total:		4	

ES-401	PWR Examination Outline											Form ES-401-2		
Plant Systems - Tier 2/Group 1 (SRO)														
System # / Name	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								2 5				Uncontrolled boration or dilution	4.3	1
005 Residual Heat Removal														0
006 Emergency Core Cooling								1 1				Rupture of ECCS header	4.4	1
007 Pressurizer Relief/Quench Tank														0
008 Component Cooling Water														0
010 Pressurizer Pressure Control														0
012 Reactor Protection														0
013 Engineered Safety Features Actuation								0 4				Loss of instrument bus	4.2	1
022 Containment Cooling														0
025 Ice Condenser														0
026 Containment Spray														0
039 Main and Reheat Steam														0
059 Main Feedwater														0
061 Auxiliary/Emergency Feedwater														0
062 AC Electrical Distribution											04. 34	Knowledge of RO tasks performed outside the main control room during an emergency and the resultant operational effects.	4.1	1
063 DC Electrical Distribution														0
064 Emergency Diesel Generator														0
073 Process Radiation Monitoring														0
076 Service Water											02. 42	Ability to recognize system parameters that are entry-level conditions for Technical Specifications.	4.6	1
078 Instrument Air														0
103 Containment														0
														0
K/A Category Totals:	0	0	0	0	0	0	0	3	0	0	2	Group Point Total:		5

ES-401	PWR Examination Outline											Form ES-401-2			
Plant Systems - Tier 2/Group 2 (SRO)															
System # / Name	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	
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 2					Dropped cask	3.9	1
035 Steam Generator								0 6					Small break LOCA	4.6	1
041 Steam Dump/Turbine Bypass Control														0	
045 Main Turbine Generator														0	
055 Condenser Air Removal														0	
056 Condensate														0	
068 Liquid Radwaste														0	
071 Waste Gas Disposal														0	
072 Area Radiation Monitoring											04. 11	Knowledge of abnormal condition procedures.	4.2	1	
075 Circulating Water														0	
079 Station Air														0	
086 Fire Protection														0	
K/A Category Totals:	0	0	0	0	0	0	0	2	0	0	1	Group Point Total:		3	

Facility Name: Braidwood Date of Exam: 10/5/09						
Category	K/A #	Topic	RO		SRO-Only	
			IR	#	IR	#
1. Conduct of Operations	2.1. 18	Ability to make accurate, clear, and concise logs, records, status boards, and reports.	3.6	1		
	2.1. 40	Knowledge of refueling administrative requirements.	2.8	1		
	2.1. 44	Knowledge of RO duties in the control room during fuel handling such as responding to alarms from the fuel handling area, communication with the fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.	3.9	1		
	2.1. 20	Ability to interpret and execute procedure steps.			4.6	1
	2.1. 09	Ability to direct personnel activities inside the control room.			4.5	1
	2.1.					
	Subtotal			3		2
2. Equipment Control	2.2. 36	Ability to analyze the effect of maintenance activities, such as degraded power sources, on the status of limiting conditions for operations.	3.1	1		
	2.2. 44	Ability to interpret control room indications to verify the status and operation of a system, and understand how operator actions and directives affect plant and system conditions.	4.2	1		
	2.2. 11	Knowledge of the process for controlling temporary design changes.			3.3	1
	2.2. 19	Knowledge of maintenance work order requirements.			3.4	1
	2.2.					
	2.2.					
	Subtotal			2		2
3. Radiation Control	2.3. 04	Knowledge of radiation exposure limits under normal or emergency conditions.	3.2	1		
	2.3. 11	Ability to control radiation releases.	3.8	1		
	2.3. 15	Knowledge of radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.	2.9	1		
	2.3. 05	Ability to use radiation monitoring systems, such as fixed radiation monitors and alarms, portable survey instruments, personnel monitoring equipment, etc.			2.9	1
	2.3. 13	Knowledge of radiological safety procedures pertaining to licensed operator duties, such as response to radiation monitor alarms, containment entry requirements, fuel handling responsibilities, access to locked high-radiation areas, aligning filters, etc.			3.8	1
	2.3.					
	Subtotal			3		2
4. Emergency Procedures / Plan	2.4. 16	Knowledge of EOP implementation hierarchy and coordination with other support procedures or guidelines such as, operating procedures, abnormal operating procedures, and severe accident management guidelines.	3.5	1		
	2.4. 27	Knowledge of "fire in the plant" procedures.	3.4	1		
	2.4. 11	Knowledge of abnormal condition procedures.			4.2	1
	2.4.					
	2.4.					
	2.4.					
	Subtotal			2		1
Tier 3 Point Total				10		7

The Braidwood 2009-1 NRC written exam outline was generated in accordance with NUREG 1021, Revision 9, Supp 1, OPERATOR LICENSING EXAMINATION STANDARDS FOR POWER REACTORS, and TQ-AA-151, ILT CERTIFICATION AND NRC EXAM DEVELOPMENT AND ADMINISTRATION. The written exam outline was generated using commercially available, previously NRC approved, outline development software (Westinghouse NRC K/A Exam Generator, version 1.1) to systematically and randomly select K/A statements from NUREG-1122 to complete each of the three tiers of the written exam outline.

Simulation Facility Braidwood

Scenario

Operating Test No. **2009-1**

No.:

NRC 09-1

Examiners: _____

Applicant _____

SRO

:

RO

BOP

Initial Conditions: IC-18

Turnover Unit 1 is at 75% power, steady state, equilibrium xenon, MOL. Online risk is green. 1C CD/CB pump is OOS for an alignment and vibration problem. Expected back in service in one week. The CV Cation demin is scheduled to be placed on line for 30 minutes later in the shift.

Event No.	Malf. No.	Event Type*	Event Description
Preload	IMF RH01B IMF RP15E IMF RP01 IMF RH04A IOR ZDI1CD05PC PTL IOR ZDI1CD05PCB PTL IOR ZDI1CB113C CLS		RHR pump 1B trip RHR pump 1A auto start failure Auto Rx trip failure 1SI8811A fails to auto open 1C CD/CB pump OOS 1C CD/CB AOP OOS 1CB113C INFO Carded closed
1	None	N-BOP TS-US	1PR11J filter change
2	IMF NI09D (120 10)	C-RO, US TS-US	PR NI N-44 fails high
3	IMF RX17 -3.5	C-RO, US	Rod control failure
4	IMF TH18B		1B RCP shaft break
5	preload	C-RO, US	Failure of Rx to auto trip
6	IMF TH06B 540000 IMF NI01A IMF NI01B	M-ALL	Large break RCS LOCA (1B RCS cold leg) SR NI failures
7	Preload	C-BOP	1B RH pump trip
8	Preload	C-BOP	1SI8811A fail to auto open

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

SCENARIO OVERVIEW

Unit 1 is at 75% power, steady state, equilibrium xenon, MOL. Online risk is green. 1C CD/CB pump is OOS for an alignment and vibration problem. Expected back in service in one week. The CV Cation demin is scheduled to be placed on line for 30 minutes later in the shift

After completing shift turnover and relief, a Radiation Protection Technician will contact the main control room and request the crew shutdown 1PR11J sample pump to support daily filter replacement. The Unit Supervisor will enter Tech Spec 3.4.15, condition B. Approximately five minutes later, the RP Technician will request restart of the 1PR11J skid. 1PR11J will be restarted. LCO 3.4.15 will be exited after filter change completion and monitor is operating normally for plant conditions.

Nothing similar used on Cert Exam scenarios.

After changing the 1PR11J filter, a failure of power range N-44 lower detector will occur. The crew should take actions per 1BWOA INST-1 including defeating the channel functions. Technical Specifications 3.3.1 applies.

Closest event on Cert exam is Inst. Bus 111 fault on Cert scenario 09-4.

After the Power Range channel failure is addressed, the rod control summing amplifier will malfunction, resulting in uncontrolled inward rod motion. After checking turbine power stable, the RO will place rod control in manual to stop the inward rod motion. 1BWOA ROD-1, UNCONTROLLED ROD MOTION, will be implemented. After checking manual rod control operable, the control rods will remain in manual control.

Nothing similar used on Cert Exam scenarios.

After the rod control failure has been addressed, the 1B RCP shaft will fail. RCS flow in the 1B loop will drop until a reactor trip is required due to low RCS loop flow. The auto Rx trip function will fail requiring a manual reactor trip. The 1B RCP will dislodge components into the RCS, followed shortly by a large break LOCA in RCS loop 1B due to the dislodged RCP components. The crew will take actions per 1BwEP-0, REACTOR TRIP OR SAFETY INJECTION. 1B RH pump will trip when starting. The crew must manually start 1A RH pump to establish low head ECCS flow. The crew will transition to 1BwEP-1 after determining that the RCS is not intact. SR NIs N31 & N32 will fail low due to the HELB inside containment. PANMs will be utilized to monitor SR level.

Scenario Cert 09-2 had a slow RCP impeller degradation. NSO had time to diagnose and manually trip. This is instant RCP rotor break. Both failures are set ups to a large break LOCA.

When the RWST level reaches the low-2 setpoint the crew will transition to 1BwEP ES-1.3, TRANSFER TO COLD LEG RECIRCULATION. Upon transition to 1BwEP ES-1.3, 1SI8811A will not automatically open due failure of relay K648. The crew will align the 1A RH pump for cold leg recirculation per attachment A of 1BwEP ES-1.3 to ensure long term core cooling.

Cert 09-2 had 1SI8811A mechanically stuck closed and it would not open, causing entry into 1BwCA 1.1 where alternate RCS cooling is established.

Success path of this scenario is 1BwEP-ES 1.3 Attach. A

Completion criteria is performance of 1BwEP ES-1.3, step 8.

Critical Tasks

1. Manually trip reactor prior to completion of step 1 of 1BwEP-0.
(ERG Critical Task number - E-0--A) (K/A number – 000007EA1.06 importance - 4.4/4.5)
2. Manually start 1A RH pump prior to completion of step 6 of 1BwEP-0.
(ERG Critical Task number - E-0--H) (K/A number – 000011EA1.13 importance - 4.1/4.2)
3. Align 1A RH Pump suction to the containment sump prior to completion of step 3 of 1BwEP ES-1.3.
(ERG Critical Task number – ES-1.3--A) (K/A 011000EA1.11 Importance 4.2/4.2)

Simulation Facility BraidwoodScenario Operating Test No.: **2009-1**

No.:

NRC 09-2

Examiners: _____

Applicant _____ SRO

:

_____ RO

_____ BOP

Initial Conditions: IC-18

Turnover : Unit 1 is at 75% power, steady state, equilibrium xenon, MOL. Online risk is green. 1B Heater Drain Pump is OOS for motor replacement for the past 3 days. Expected back in service in 7 days. 1CV8149C was returned to service last shift following maintenance to replace its fuse block. Following completion of turnover, the shift manager requests the BOP swap 75 gpm letdown orifices from 1B to 1C per BwOP CV-9 for an upcoming clearance order on 1CV8149B to replace its fuse block while the RO monitors reactor power.

Event No.	Malf. No.	Event Type*	Event Description
	IOR ZDI1HD01PB PTL IMF CV32B TRGSET 1 ZLO1SI01PA(3) = = 1 IMF CV01A (1 0) TRGSET 2 ZAO1PI524A < 600 IMF TH03B (2 10) 600 60		1B HD pump OOS 1B CV pump auto start failure 1A CV pump trip 1B SGTR when SG pressure drops to 600 PSIG
1	None	N-BOP, US	Swap Letdown orifices
2	IMF PB2411 ON IMF PB2412 ON IOR ZDI1MS018B CLS	TS-US	SG PORV 1MS018B inoperable
3	IMF RX10A 0 15	I-RO, US TS-US	Turbine Impulse Pressure channel 1PT-505 failed low
4	IMF FW35A	C-BOP, US R-RO, US	1A Heater Drain Pump trip requiring turbine runback
5	IMF MS03B (1 0) 100 0 IMF MS03F (1 0) 100 0 IMF MS03J (1 0) 100 0	M-ALL	1B SG safety valves stuck open during turbine runback
6	Preload	C-RO	1A CV pump trips/1B CV pump fails to auto start
7	Preload	M-ALL	1B SGTR (600 gpm)

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

SCENARIO OVERVIEW

Unit 1 is at 100% power, steady state, equilibrium xenon, MOL. Online risk is green. 1B Heater Drain Pump is OOS for motor replacement for the past 3 days. Expected back in service in 7 days. 1CV8149C was returned to service last shift following maintenance to replace its fuse block. Following completion of turnover, the shift manager requests the BOP swap 75 gpm letdown orifices from 1B to 1C per BwOP CV-9 for an upcoming clearance order on 1CV8149B to replace its fuse block while the RO monitors reactor power.

After completing shift turnover and relief, the crew will swap letdown orifices. The BOP will manually lower letdown pressure, remove 1B letdown orifice from operation and place 1C letdown orifice on-line. The BOP will then restore letdown line pressure and restore letdown to automatic operation

Nothing similar used on Cert exam.

After completing the letdown orifice swap, Steam Generator 1B atmospheric relief valve 1MS018B, will develop a hydraulic leak. The Unit Supervisor will enter Tech Spec 3.7.4, Condition A and Tech Spec 3.6.3, Condition C. The crew will dispatch an operator to close 1MS019B to comply with TS 3.6.3, condition C. 1MS018B will remain unavailable for the remainder of the scenario.

Nothing similar used on Cert exam.

NRC scenario 09-4 has a SG PORV failing open at power.

After the 1MS018A failure has been addressed, First Stage Turbine Impulse Pressure channel 1PT-505 will fail low. The RO will diagnose the failure of 1PT-505 and take manual control of rods after verifying turbine load stable. 1BWOA INST 2, OPERATION WITH A FAILED INSTRUMENT CHANNEL-Attachment D will be entered. TS 3.3.1 conditions A and P will be entered. The RO will return rod control to automatic after verifying Tave and Tref are within 1°F.

1PT-505 failed high on Cert scenario 09-1.

After the 1PT-505 failure has been addressed, 1A Heater Drain Pump will trip. 1BWOA SEC-1, SECONDARY PUMP TRIP-Attachment C will be entered. The BOP will initiate a turbine load reduction to 780 MW at 20 MW/minute. The RO will borate the RCS as necessary to stabilize RCS temperature.

Nothing similar used on Cert exam.

After the 1A HD pump trip has been addressed, the secondary pressure transient causes three safety valves on the 1A SG to stick open, causing a faulted SG. SG pressures will drop and a manual reactor trip will be required. The crew will implement 1BwEP-0, REACTOR TRIP OR SAFETY INJECTION. When safety injection is actuated, the 1A CV pump will trip. The 1B CV pump must be manually started to establish high head ECCS flow. After determining 1B SG secondary pressure boundary is not intact the crew will transition to 1BwEP-2, FAULTED STEAM GENERATOR ISOLATION. When 1B SG pressure drops to 600 psig, a 600 gpm SGTR will occur on the 1B SG, causing a faulted/ruptured SG. The crew will complete isolation of 1B SG and transition to 1BwEP-3, STEAM GENERATOR TUBE RUPTURE, based on secondary radiation trends on the 1B SG (if the SGTR occurs prior to closing the 1B MSIV). Otherwise, the crew will recognize 1B SG pressure does not drop to zero and lowering pressurizer level/pressure will indicate a SGTR (alternate indications). After determining ruptured SG pressure is less than 320 psig the crew will transition 1BwCA-3.1, SGTR WITH LOSS OF REACTOR COOLANT – SUBCOOLED RECOVERY DESIRED.

Did not have ruptured/faulted SG scenario on Cert exam.

Completion criteria is completion of step 6 of 1BwCA-3.1

Critical Tasks

1. Manually start the 1B CV pump prior to completion step 6 of 1BwEP-0.
(ERG Critical Task number - E-0--I) (K/A number - 013000A4.01 importance – 4.5/4.8)
2. Isolate 1A Steam Generator prior to completing step 4 of 1BwEP-2.
(ERG Critical Task number - E-2--A) (K/A number - 000040AA1.10 importance - 4.1/4.1)

Simulation Facility BraidwoodScenario Operating Test No.: **2009-1**

No.:

NRC 09-3

Examiners: _____

Applicant _____ SRO

:

_____ RO

_____ BOP

Initial Conditions: IC-21

Turnover : The unit is operating at 100% power, steady state, equilibrium xenon, Boron concentration is 800 ppm. U-0 Boric Acid Transfer pump is OOS. Rods are in manual due to rod control summing amplifier malfunction last shift. 1B HD pump has been OOS for the last 3 days for breaker refurbishment. Expected back in 6 days. Online risk is green.

Event No.	Malf. No.	Event Type*	Event Description
Preload	IMF RP14A IMF RP14B IMF MS01A 100 IMF MS01B 100 IMF MS01C 100 IMF MS01D 100 IMF CS01B MRF RP37 OUT TRGSET 1 ZDISIA1 == 1 TRG 1 DMF RP14A TRGSET 2 ZDISIA1 == 1 TRG 2 DMF RP14B TRGSET 3 ZDISIA2 == 1 TRG 3 DMF RP14A TRGSET 4 ZDISIA2 == 1 TRG 4 DMF RP14B IOR ZDI1HD01PB PTL IMF RX17 3.5		SI auto actuation failure (Train A) SI auto actuation failure (Train B) MSIV fail to close MSIV fail to close MSIV fail to close MSIV fail to close 1B CS pp failure K643 CS Trn A actuation relay failure 1B HD pp OOS Rod control failure
1	IMF RX01J 0 300	I-BOP, US TS-US	1D SG steam pressure channel fails low
2	IMF CV10 0 30	I-RO, US	1CV121 controller failure
3	IMF TH08 0.01	R-RO, US TS-US	High RCS activity requiring plant shutdown
4	IMF CV03	C-RO, US	Boric acid transfer pump trip
5	MS07C 4 0	M-ALL	Uncontrolled depressurization of all SGs
6	Preload	C-RO, US	Failure of SI to automatically actuate
7	Preload	C-BOP, US	Failure of both trains of CS to automatically actuate
8	DMF MS01D	C-ALL	1D MSIV closes

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

SCENARIO OVERVIEW

The unit is operating at 100% power, steady state, equilibrium xenon, Boron concentration is 800 ppm. Online risk is yellow. 1B HD pump has been OOS for the last 3 days for breaker refurbishment. Expected back in 6 days. Rods are in manual due to rod control summing amplifier malfunction last shift.

About 2 minutes into the scenario, 1D SG steam pressure channel, 1PT-544, fails low. The crew should take actions to stabilize the plant per 1BWOA INST-2. Technical Specifications 3.3.2 and 3.3.4 apply. On-line risk remains green.

Similar to a steam flow transmitter failing high on Cert scenario 09-3, however, no tech spec entry was required for the steam flow transmitter failure.

After the 1D SG steam pressure failure has been addressed, 1CV121 Charging pump flow control valve controller 1FK-121 will fail to 0% demand. The 1CV121 valve will close and pressurizer level will drop. The crew will take actions to stabilize the plant by taking manual control of the 1FK-121 controller.

Nothing similar used on Cert exam.

After the 1FK-121 failure has been addressed, a fuel element failure will be indicated by the VCT Cubicle and Gross Failed Fuel radiation monitors. The crew will implement 1BWOA PRI-4, and take actions accordingly. Technical Specification 3.4.16 applies. Technical Specification 3.4.15 applies if 1PR11J reaches the high alarm limit and isolates. A unit shutdown will be required. The crew should commence a power reduction.

Nothing similar used on Cert exam.

During the second (or any subsequent) boric acid addition, the Unit 1 Boric Acid pump motor bearing will seize while the pump is running. MCC 133X3, cubicle A4 will open, causing a trip of the Unit 1 Boric Acid Transfer Pump. The crew will stop the load reduction. The U-0 Boric Acid Transfer pump is OOS, and the crew will need to re-commence the ramp on using rods only.

Nothing similar used on Cert exam.

After a measurable change in power, a large fault will occur on the 1C MS line. While performing the actions of 1BwEP-0, the crew should note the failure of SI to automatically actuate. The crew should manually actuate SI. When containment pressure reaches 20 psig, Phase B actuates but the CS pumps do not start. The crew should manually realign train A CS valves which will start the 1A CS pump. Operators should transition to 1BwEP-2 and recognize that the MSIVs have failed to close and that an uncontrolled depressurization of all SGs is in progress. The crew should transition to 1BwCA-2.1 where they will throttle AF flow to the SGs. Entry into 1BwFR-H.1 will be required when the crew throttles AF flow to 45 gpm per SG, however note in 1BwFR-H.1 directs the procedure not to be performed. The crew will continue in BwCA-2.1 until prior to SI termination when the 1D MSIV will close and the crew should transition back to 1BwEP-2 because one SG is now isolated. The crew will then isolate AF to the 1A, B & C SGs.

Cert scenario 09-spare (if used) also has 4 faulted SGs and entry into CA 2.1 and ends when 45 gpm AF flow is established to each SG.

This scenario is different because MSIV closes after 45 gpm AF flow is established and crew transitions back to EP-2 and isolates AF to the other 3 SGs.

Completion criteria is isolation of Aux. Feed to the 1A, 1B and 1C SGs in 1BwEP-2.

Critical Tasks

1. Manually actuate Safety Injection prior to transition to 1BwEP-2 or past step 7.a of 1BwEP ES-0.1.
(ERG Critical Task number - E-0--D) (K/A number – 000040AA1.01 importance - 4.6/4.6)
2. Manually actuate one train of containment spray prior to transition out of 1BwEP-0.
(ERG Critical Task number - E-0--E) (K/A number - 013000A4.01 importance - 4.5/4.8)
3. Manually control AF flowrate to no less than 45 gpm for each SG before orange path for integrity occurs.
(ERG Critical Task number - ECA-2.1--A) (K/A number – 0WE12EA1.3 importance – 3.4/3.9)

Simulation Facility Braidwood

Scenario

Operating Test No.: **2009-1**

No.:

NRC 09-4

Examiners: _____

Applicant _____

SRO

:

RO

BOP

Initial Conditions: IC-16

Turnover Unit 1 is operating at 51% power, steady state, equilibrium xenon, Boron concentration is 736 ppm. Online risk is yellow. 1B RH pump has been OOS for breaker work for the past 10 hours. LCO 3.5.2 has been entered. Expect 1B RH pump back in 48 hours. Following completion of turnover, the crew is to perform 1BwOS MS-Q1, UNIT 1 MAIN STEAM DUMP VALVE STROKE SURVEILLANCE. Power Team has requested Unit 1 be prepared to raise power to 880 MW at 0.6 MW/min due to grid demand following completion of 1BwOS MS-Q1. 1CV111B BORIC ACID BLNDR TO VCT VLV is OOS for solenoid replacement.

Event No.	Malf. No.	Event Type*	Event Description
Preload	IOR ZDI1RH01PB PTL IMF RP01 IOR ZDIRT2 NORMAL IMF RD05G13 15 IMF RD05H12 15 IMF RD05H14 8 IMF RD05J13 25 IMF EG08B IOR ZDI1CV111B CLS IOR ZDO1CV111B(1) OFF IOR ZDO1CV111B(2) OFF		1B RH pump OOS Failure of Rx to auto trip Failure of Rx Trip switch on 1PM05J stuck rod stuck rod stuck rod stuck rod 1B DG failure 1CV111B OOS
1	None	N-BOP, US	Steam Dump Valve Stroke Surv.
2	None	R-RO, US	Raise power at 0.6 Mw/Min, Alt. Dilute only
3	IOR ZAI1TK130 100 5	I-RO, US	1TK-130 output fails high
4	IMF RX18H, 650 IMF RX18L, 650	I-RO, US TS-US	Loop 4 Thot RTD fails high
5	IMF MS04D, 100 IOR ZDI1MS018D AUTO	C-BOP TS-US	1D SG PORV Fails open
6	IOR ZDI1HSTG010 TRIP Preload	C-RO, US	Inadvertent turbine trip, failure of auto Rx trip
7	Preload	C-RO, US	four stuck rods
8	IMF ED15C		Loss of Offsite Power
9	IMF EG08A 90	M-ALL	EDG1A fails 90 sec after start resulting in a loss of all AC power

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

SCENARIO OVERVIEW

Unit 1 is operating at 51% power, steady state, equilibrium xenon, Boron concentration is 736 ppm. Online risk is yellow. 1B RH pump has been OOS for breaker work for the past 10 hours. LCO 3.5.2 has been entered. Expect 1B RH pump back in 48 hours. Following completion of turnover, the crew is to perform 1BwOS MS-Q1, UNIT 1 MAIN STEAM DUMP VALVE STROKE SURVEILLANCE using the step 2, full stroke test method. The Field Supervisor and Equipment Operators have been briefed and are standing by at the steam dump isolation valves. Power Team has requested Unit 1 be prepared to raise power to 880 MW at 0.6 MW/min due to grid demand following completion of 1BwOS MS-Q1. 1CV111B BORIC ACID BLNDR TO VCT VLV is OOS for solenoid replacement.

After completing shift turnover and relief, the BOP will perform 1BwOS MS-Q1, UNIT 1 MAIN STEAM DUMP VALVE STROKE SURVEILLANCE.

Nothing similar used on Cert exam.

After completing 1BwOS MS-Q1, Transmission Systems Operations will request Unit 1 raise power to 880 MW @ 0.6 MW/min due to grid demand.

Cert scenarios 09-1 and 09-2 had raising power. However, this scenarios ramp will be done with Alt dilute only.

After a measurable change in power, 1TK-130 output, Letdown Heat Exchanger Outlet Temperature Controller, will fail high. The BwAR should be referenced and the RO should take manual control to restore letdown temperature to normal. The crew may elect to isolate letdown due to high temperature. Letdown should be restored per BwOP CV-17.

Nothing similar used on Cert exam.

After the 1TK130 Controller has been addressed, Loop 4 Thot fails high, resulting in demanded rod inward motion. The crew should take actions to stabilize the plant per 1BwOA INST-2. Technical Specifications 3.3.1 applies.

Nothing similar used on Cert exam.

After the RTD failure has been addressed, the 1D SG PORV will fail in the open position. The failure will result in a rise in reactor power, rise in stm flow on the 1D SG and open indication of the PORV, however no alarms will come in. If the changing parameters are not recognized by the crew within a few minutes, a report from a security officer will alert the crew that a large amount of steam is coming from the 1A-D MSIV room. The crew will analyze the failure and take actions to isolate the failed PORV by closing its associated manual isolation valve. Tech Specs 3.7.4 and 3.6.3 are applicable.

Nothing similar used on Cert exam. NRC scenario 09-2 has a SG PORV that becomes inoperable due to a hydraulic leak.

Once the above actions have been taken, a trip of the main turbine will occur. The reactor does not automatically trip and the manual trip switch at 1PM05J is disabled. The crew should trip the reactor from 1PM06J and complete immediate actions of 1BwEP-0. When the reactor trips, one control bank rod and three shutdown bank rods will not fully insert. The crew will transition to 1BwEP ES-0.1 and initiate emergency boration for the stuck rods. Once the crew has initiated emergency boration, a loss of all offsite power will occur. The 1B DG will not start. The 1A DG will start and energize ESF Bus 141. Approximately 90 seconds later, the 1A DG will trip resulting in a loss of all AC power to the unit. Transition will be made to 1BwCA-0.0. **The crew must restore power to Unit 1 within 10 minutes.** After power is restored to Bus 141, a transition will be made to either 1BwCA-0.1 or 1BwCA-0.2.

Cert scenario 09-1 was also a station blackout scenario where ESF power was lost immediately after the reactor trip and recovery path was limited electrical cross tie (step 14) and SX cross tie in Attach. C (Unit 2 had also lost off site power).

This scenario differs because initially 1A DG energizes bus 141 (the LOOP is delayed) and Unit 2 does not lose off site power. Therefore the recovery is standard electrical cross-tie (step 8).

Completion criteria The scenario ends following restoration of charging flow.

Critical Tasks

1. Perform a manual reactor trip at 1PM06J before transition out of 1BwEP-0.
(ERG Critical Task number - E-0--A) (K/A number - 000029EA1.08 importance - 4.5/4.5)
2. Cross-tie an ESF bus to opposite unit within 10 minutes of Loss of All AC.
(10CFR50.63 section (c)(2)) (K/A number - 000055EA2.03 importance – 3.9/4.7)
3. Isolate RCP seal injection before a CV pump is started.
(ERG Critical Task number - ECA-0.0--H) (K/A number - 003000A4.01 importance - 3.3/3.2)

Simulation Braidwood

Scenario No.:

Operating Test No.: **2009-1**

Facility

NRC 09-5

Examiners:

Applicant:

SRO
RO
BOP

Initial Conditions: IC-21

Turnover: Unit 1 is at 100% power, steady state, equilibrium xenon, MOL. RCS boron concentration in 800 ppm. On line risk is green. Following completion of turnover, the crew is to perform 1BwOS EH-M1, UNIT 1 EH PUMP OPERABILITY MONTHLY SURVEILLANCE using the preferred method of depressing and holding the MCB pushbutton. The Field Supervisor and Equipment Operators have been briefed and are standing by at the Unit 1 EH skid. Power Team has requested Unit 1 be prepared to lower power 125 MW at 3 MW/min due to grid demand following completion of 1BwOS EH-M1.

Event No.	Malf. No.	Event Type	Event Description
Preload	IMF RP15R MRF RP89 OPEN IMF PN1143 OFF IMF PN1144 OFF		1B SX pump fail to automatically start Prevent inadvertent EH Sys. Trouble alarm
1	None	N-BOP, US	Perform 1BwOS EH-M1
2	None	R-RO, US	Lower power at 3 MW/Min
3	IMF ED11C	TS-US	Loss of DC to inverter 113
4	IMF RX21A 1700 10	C-RO, US TS-US	Pressurizer pressure channel 1PT-455 fails low
5	IMF EG03 100 10	C-BOP, US	Generator voltage regulator failure
6	IMF ED07A		Loss of bus 141, Rx trip and SI
7	IMF TH03D 450	M-ALL	1D SGTR
8	Preload	C-BOP, US	1B SX pump fail to automatically start

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

SCENARIO OVERVIEW

Unit 1 is at 100% power, steady state, equilibrium xenon, MOL. RCS boron concentration in 820 ppm. On line risk is green. Following completion of turnover, the crew is to perform 1BwOS EH-M1, UNIT 1 EH PUMP OPERABILITY MONTHLY SURVEILLANCE using the preferred method of depressing and holding the MCB pushbutton. The Field Supervisor and Equipment Operators have been briefed and are standing by at the Unit 1 EH skid. Power Team has requested Unit 1 be prepared to lower power 125 MW at 3 MW/min due to grid demand following completion of 1BwOS EH-M1.

After completing shift turnover and relief, the BOP will perform 1BwOS EH-M1, UNIT 1 EH PUMP OPERABILITY MONTHLY SURVEILLANCE.

Nothing similar used on Cert exam.

After completing 1BwOS EH-M1, Power Team will request Unit 1 lower power 125 MW at 3 MW/min due to grid demand. The crew will commence a power reduction at 3 MW/min.

This is a normal load follow ramp down. NRC scenario 09-3 was a tech spec action ramp down on rods only.

After a measurable change in power, a loss of DC to instrument inverter 113 will occur. The crew will follow the annunciator response BwAR 1-4-C5. The crew will determine from field report that the instrument inverter DC input has failed. Technical Specification 3.8.7, condition A applies. On line risk becomes yellow.

Nothing similar used on Cert exam.

Following completion of inverter 113 actions, the controlling pressurizer pressure channel will fail low. The RO will identify the failure and take manual control of the PZR pressure master controller and restore pressurizer pressure. The US will enter 1BwOA INST 2, OPERATION WITH A FAILED INSTRUMENT CHANNEL-Attachment B. Tech Specs 3.3.1 conditions A, E, and K, 3.3.2 conditions A and D, and 3.3.4 condition A will be entered.

Cert scenario 09-5 has controlling Prz pressure channel failing high.

After the pressurizer pressure channel failure has been addressed, the generator voltage regulator output will fail high, causing the main generator to be overexcited. The BOP will turn the voltage regulator off and manually lower main generator excitation using the base adjuster.

Nothing similar used on Cert exam.

After the voltage regulator failure is addressed, a ground fault will occur on bus 141. The loss of bus 141 will cause a loss of instrument bus 113 due to the previous DC power supply failure. The loss of instrument bus 113 in conjunction with the previously tripped pressurizer bistables will generate a reactor trip and safety injection actuation. The 1B SX pump must be manually started due to a failure of its actuation relay. The SI initiation will cause a 1D SGTR. The crew will perform 1BwEP-0, REACTOR TRIP OR SAFETY INJECTION, and transition to 1BwEP-3, STEAM GENERATOR TUBE RUPTURE, at step 22 of 1BwEP-0.

The scenario is complete when the crew has terminated high head injection and established normal charging flow in 1BwEP-3.

NRC scenario 09-2 has a faulted/ruptured SG which causes the crew to transition out of 1BwEP-3 at step 5 to 1BwCA 3.1 and terminates prior to RCS cooldown and depressurization.

This scenario requires the crew to cooldown and depressurize the RCS in 1BwEP-3 to stop the break flow.

Critical Tasks

1. Manually start the 1B SX pump before transition out of 1BwEP-0
(ERG Critical Task number - E-0--L) (K/A number 076000A4.01 2.9/2.9)
2. Identify the 1D SG as the ruptured SG and isolate prior to a transition to 1BwCA-3.1 is required.
(ERG Critical Task number – E-3--A) (K/A number EPE038EA1.32 importance 4.6/4.7)
3. Depressurize RCS to restore RCS inventory prior to 1D SG PORV or safety valve water release.
(ERG Critical Task number – E-3--C) (K/A number EPE038EA1.09 importance 3.2/3.3)

Simulation Facility Braidwood

Scenario Operating Test No.:2009-1

No.:
NRC 09-
spare

Examiners: _____

Applicant: _____ SRO
_____ RO
_____ BOP

Initial Conditions: IC-21

Turnover:

Unit 1 is operating at 100% power, steady state, equilibrium xenon, Boron concentration is 800 ppm. Online risk is green. Following completion of turnover, the shift manager requests the BOP to start the 0B WS pump in accordance with BwOP WS-1, STARTUP AND OPERATION OF THE NON-ESSENTIAL SERVICE WATER SYSTEM, and secure the 0C WS pump in accordance with BwOP WS-3, SHUTDOWN OF A NON-ESSENTIAL SERVICE WATER PUMP, for an upcoming clearance order on the 0C WS pump. Align the 0C WS pump for standby after it is secured. Operators have been briefed and are standing by at the Lake Screen House to support WS pump swap.

Event No.	Malf. No.	Event Type*	Event Description
Preload	IMF FW44 IMF FW48A IMF RP02A IMF RP02B		1B AF Pump fails to start 1A AF Pump auto start failure Reactor trip breaker A fails to open Reactor trip breaker B fails to open
1	None	N-BOP, US	Swap WS pumps
2	None	R-RO, US	Emergency load drop of 100MW
3	IMF RX03G 0 20	I-BOP, US	Steam Flow channel 1FT542 fails low
4	IMF CV01A	C-RO, US TS, US	1A CV pump trip
5	IMF RH05A 0 5	TS, US	RWST level channel failure
6	IMF TH16C	M-ALL	1C RCP Trip/ATWS
7	IOR ZDIRMIO NEUTRAL IOR ZDIBKSEL MAN	C-RO, US	Control rods will not insert
8	Preload	C-BOP, US	1A AF pump auto start failure/1B AF fail to start

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

SCENARIO OVERVIEW

Unit 1 is operating at 100% power, steady state, equilibrium xenon, Boron concentration is 800 ppm. Online risk is green. Following completion of turnover, the shift manager requests the BOP to start the 0B WS pump in accordance with BwOP WS-1, STARTUP AND OPERATION OF THE NON-ESSENTIAL SERVICE WATER SYSTEM, and secure the 0C WS pump in accordance with BwOP WS-3, SHUTDOWN OF A NON-ESSENTIAL SERVICE WATER PUMP, for an upcoming clearance order on the 0C WS pump. Align the 0C WS for standby after it is secured. Operators have been briefed and are standing by at the Lake Screen House to support WS pump swap.

After completing shift turnover and relief, the BOP will swap WS pumps in accordance with BwOP WS-1 and BwOP WS-3.

Nothing similar used on Cert exam.

After swapping WS pumps, Unit 1 will be contacted on the TSO phone by Bill Collins and directed to complete an emergency load reduction of 100 MW within 30 minutes due to an overload condition on grid transmission lines. Unit 2 has also been contacted and Unit 2 is also initiating a 100 MW load drop in response to the grid emergency.

Cert scenario 09-spare (if used) had same emergency load drop.

After a measurable change in power, steam flow channel 1FT-542 will fail low. The crew will enter 1BwOA INST-2 and perform appropriate actions. The crew should swap to an operable steam flow channel. No Technical Specification applies. On-line risk remains green. If reactor power exceeds 100% due to the secondary transient, the crew will implement 1BwOA PRI-16, RESPONSE TO REACTOR OVERPOWER CONDITION to restore reactor power below 100%.

Cert scenario 09-3 has steam flow channel failing high.

Following completion of 1BwOA INST - 2 actions, 1A CV pump will trip. The crew will implement 1BwOA PRI-15, LOSS OF NORMAL CHARGING. The crew will start the 1B CV pump to restore normal charging. Technical specifications 3.5.2 condition A and TRM 3.1.d, condition A apply.

Nothing similar used on Cert exam.

After the 1A CV pump is addressed, RWST level channel 1LT930 will fail low. The crew will enter 1BwOA INST-2 Attachment S. Technical specifications 3.5.2 condition A and K apply.

Nothing similar used on Cert exam.

After the RWST level channel failure is addressed, 1C RCP will trip. The reactor will not automatically trip and when a manual reactor trip is attempted, the reactor will not trip, resulting in an ATWS. The crew will implement 1BwFR-S.1, RESPONSE TO NUCLEAR GENERATION/ATWS. The control rods will not insert in either automatic or manual. The RO will initiate emergency boration to add negative reactivity to the core. The 1B AF pump will not start and the 1A AF pump will have to be manually started. After completing actions of 1BwFR-S.1, the crew will transition to 1BwEP-0, REACTOR TRIP OR SAFETY INJECTION.

The scenario is complete when the crew completes step 4 of 1BwEP-0.

Cert scenario 09-5 had an ATWS (with manual rod control available) that was combined with a FW line break in containment.

This scenario differs because rods will not insert (in auto or manual) and there is no other major event simultaneous to the ATWS.

Critical Tasks

1. Start 1A AF pump prior to completion of step 3 of 1BwFR-S.1
(ERG Critical Task number – FR-S.1--B) (K/A number –061000A2.04 importance – 3.4/3.8)
2. Insert negative reactivity into the core by establishing emergency boration flow to the RCS prior to completion of step 4 of 1BwFR-S.1.
(ERG Critical Task number – FR-S.1--C) (K/A number – 029000 2.2.44 importance – 4.2/4.4)