

**OUTLINE SUBMITTAL WITH NRC COMMENTS**

**FOR THE QUAD CITIES EXAMINATION - DEC 2002**

QUAD CITIES 2002 INITIAL EXAM  
OUTLINE REVIEW COMMENTS

General Review of Audit topics to NRC topics:

Appeared to have similar topics between NRC and Licensee's Audit Exams.

- \* SDC and RHR (diff modes) - found to be OK due to different locations
- \* AC electrical transfer / supply buses - OK due to different actions
- \* Bypass RPS and bypass reactor bldg. vent - OK similar in bypass but different effect
- \* RCIC starting - RCIC manual start

SRO Admin JPM:

General Note: ensure admin JPMs are task related and not a simple look-up type questions written in a JPM format.

Ensure A2, clearance authorization is for something safety related (significant equipment)

Ensure A4, challenges applicants and not a simple look up or follow flowchart

Note: A.1.b, is similar in intent, i.e., K/A, knowledge of shift staffing/manning, as that of licensees audit exam - licensee ensured different actions

Note: A4 must be careful, audit exam is to fill out NARS form for General Emergency which is part of the E plan actions which would include PARS. Ensure NRC exam is different then audit.

RO Admin JPM:

General Note: ensure the tasks are more than just one simple step or one simple critical step, or that is based on just a simple look up. Ensure there is some diagnosis and decision making tasks (steps).

A2, tagout - ensure it is on safety related (significant equipment)

A3, ensure it is not just a simple dose calculation, make it operationally oriented

Systems JPM:

B.1.b, make it significantly different from the audit test. There was similarity and needed correction. Instead of just the failure of the push button (too easy as an alternate path) rather have it initially start, but with failure with auto flow or control and other auto lineup, which requires alternate path to manually fix/align and ensure tech spec flow requirements.

B.1.e, what's the success path for the alternate JPM?

B.1.g, what is the safety significance, even if an applicant does not correctly pressurize main steam line - check K/A designation? Suggest scrambled PCIS and now restore steam lines.

B.1.e, similar to audit simulator scenario normal evolution, i.e., perform CS surveillance. Found to be OK, NRC exam has alternate path.

QUAD CITIES 2002 INITIAL EXAM  
OUTLINE REVIEW COMMENTS

Simulator Scenarios:

Scenario # 1

Event 3 - B FWRV lockup appears to be similar to audit exam scenario normal evolution, i.e., manual control of B FWRV - consider replacing. Apparently different controls due to new electronic feed control system.

Need malfunction after major malfunction and after entry into EOPs.

Event 6, rod drift out, seems similar to JPM B.1.d. Found OK, actions different.

Seems not too challenging, major malfunction only an ATWS, no challenge in controlling level when all ECCS are available.

Appears no containment or reactor level challenges.

Appears to concentrate on one leg of EOPs - no challenge to others?

Recommended Additions and Changes:

Ensure rod drift and JPM actions are different.\

Have a small break LOCA with no high pressure ECCS injection, which will require ADS with ATWS (ATWS - power/level control for power, with level decrease, but will require decision to use alternate injection sources for maintaining level control) Plus challenges to containment atmosphere, temperature/pressure, require torus spray/cooling and drywell spray

Scenario # 2

Initial condition give 1B SW pump OOS, but event 3 has a SW pump trip. Narrative notes A SW (2B) pump trip requiring a standby pump to be manually started. B is already OOS, is there a third SW pump? Noted that they must start 2A and not the 1 / 2 pump?

Event 4, a rod drift one notch, not really significant malfunction? If no action no consequence, it appears within Tech Spec limits. Found must take action to restore, and address Tech Specs.

Scenario # 3

Event 3, IRM failure, seems too simplistic only require bypassing, OK, it still needs panel manipulation

Event 4, reactor bldg radiation monitor failure - questionable with a rad monitor failure in the audit exam. Suggest different time of event, i.e., after the fuel failure, with vent isolation failure, this requires alertness and immediate action or release of radiation outside. Also, malfunction similar to system relating to JPM B.1.a, bypass reactor bldg vent isolation. See similarity with system affected?? Suggest this malfunction as supporting malfunction after the reactor trip/fuel failure with reactor bldg vent fails to isolate (significant action to isolate), also have challenges to SBTG.

QUAD CITIES 2002 INITIAL EXAM  
OUTLINE REVIEW COMMENTS

Event 5, CRD pump trip similar as audit scenario, may need to change in NRC exam. Found to be different actions, in audit requires them to scram.

Event 8, fuel failure causing high rad and eventual emergency depressurization due to high rad - seems similar to audit scenario, fuel failure causing rad levels to increase, possibly replace. With changes to reactor vent isolation actions, will be significantly different. Also, audit was independently developed.

Scenario # 4 (initially noted by licensee as spare)

I like the spare scenario rather than scenario # 1, due to limited actions as written.

Written Exam Outline:

Noted that the licensee's outline incorrectly indicates in Note # 1, that to select at least one (1) topic from every K/A category within each tier. The Rev 8, Supplement 1, specifically notes "To ensure that at least two topics from every K/A category are sampled within each tier." Discrepancy identified to licensee. Licensee used their old outline format. Outline submitted with written exam material specifically used the Supplement 1 form.

Appeared to sample multiple similar systems, which reduces the ability to select a wide and broad sampling of systems. However, appears to meet minimum requirements, and selection done randomly and systematically.

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SVP-02-067

August 15, 2002

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Region III  
U.S. Nuclear Regulatory Commission  
801 Warrenville Road  
Lisle, IL 60532-4351

Quad Cities Station, Units 1 and 2  
Facility Operating License Nos. DPR-29 and DPR-30  
NRC Docket Nos. 50-254 and 50-265

Subject: Submittal of Integrated Initial License Training Examination Outline

Enclosed are the examination outlines, supporting the Initial License Examination scheduled for the weeks of December 2, 2002, through December 13, 2002, at Quad Cities Station.

This submittal includes all appropriate Examination Standard forms and outlines in accordance with NUREG-1021, "Operator Licensing Examination Standards", Revision 8, Supplement 1.

In accordance with NUREG 1021, Revision 8, Supplement 1, 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. W. J. Beck, Regulatory Assurance Manager, at (309)-227-2800. For questions concerning examination outlines, please contact Ken Moreland at (309) 227-4030.

Respectfully,



Timothy J. Tulon  
Site Vice President  
Quad Cities Nuclear Power Station

AUG 21 2002

Examination Outline  
Quality Checklist

Facility: <u>Quad Cities</u>		Date of Examination: <u>12/3-12/02</u>		
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 per ES-401.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	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.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	c. Assess whether the outline over-emphasizes any systems, evolutions, or generic topics.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	d. Assess whether the justification for deselected or rejected K/A statements are appropriate.	<u>LM</u>	<u>MS</u>	<u>AD</u>
2. S I M	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.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	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 over successive days.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	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.	<u>LM</u>	<u>MS</u>	<u>AD</u>
3. W /	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. ✓	<u>LM</u>	<u>MS</u>	<u>AD</u>
	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) 40% 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.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	c. Verify that the required administrative topics are covered, with emphasis on performance-based activities.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	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 successive days.	<u>LM</u>	<u>MS</u>	<u>AD</u>
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.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	b. Assess whether the 10 CFR 55.41/43 and 55.45 sampling is appropriate.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	c. Ensure that K/A importance ratings (except for plant-specific priorities) are at least 2.5.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	d. Check for duplication and overlap among exam sections.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	e. Check the entire exam for balance of coverage.	<u>LM</u>	<u>MS</u>	<u>AD</u>
	f. Assess whether the exam fits the appropriate job level (RO or SRO).	<u>LM</u>	<u>MS</u>	<u>AD</u>
a. Author <u>Ken Moreland / R. C. Moreland</u>		Printed Name / Signature		
b. Facility Reviewer (*) <u>Michael Srecki / Michael Srecki</u>		Date <u>8-15-02</u>		
c. NRC Chief Examiner (#) <u>Hironori Peterson / Hironori Peterson</u>		<u>8-15-02</u>		
d. NRC Supervisor <u>Debbie R. Allen / Debbie R. Allen for SP</u>		<u>8-27-02</u> * (Rec'd on 8/21/02)		
		<u>9/4/02</u>		
NOTE: * Not applicable for NRC-developed examinations. # Independent NRC Reviewer initial items in Column "c" chief examiner concurrence required.				

Facility: Quad CitiesDate of Examination: 12-02-02

Examination Level (circle one): SRO

Operating Test Number: 1

	Administrative Topic/Subject Description	Describe method of evaluation: 1. ONE Administrative JPM, OR 2. TWO Administrative Questions
A.1	Ability to recognize indications for systems which are entry-level conditions for tech specs. 2.1.33 – 4.0	Verify readings for APRM Flow Biased High Flux (Heat Balance) Calibration Test – QCOS 0700-06, partial for step H.4.
	Knowledge of shift staffing requirements. 2.1.4 – 3.4	Evaluate operator working hours to determine if they have exceeded 82-12 requirements.
A.2	Knowledge of tagging and clearance procedures. 2.2.13 – 3.8	Authorize a clearance order.
A.3	Knowledge of the requirements for reviewing and approving discharge permits. 2.3.6 – 3.1	Review a discharge permit.
A.4	Knowledge of emergency plan protective action requirements. 2.4.44 – 4.0	Determine PARS.

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Facility: Quad CitiesDate of Examination: 12-02-02

Examination Level (circle one): RO

Operating Test Number: 1

Administrative Topic/Subject Description	Describe method of evaluation: 1. ONE Administrative JPM, OR 2. TWO Administrative Questions
A.1 Ability to perform procedures during all modes of plant operation. 2.1.23 – 3.9	Perform APRM Flow Biased High Flux (Heat Balance) Calibration Test – QCOS 0700-06, partial for step H.4.
Knowledge of operator responsibilities during all modes of plant operation. 2.1.2 – 3.0	Evaluate license maintenance requirements.
A.2 Knowledge of tagging and clearance procedures. 2.2.13 – 3.6	Generate an equipment status tag.
A.3 Ability to perform procedures to guard against personnel exposure. 2.3.10 – 2.9	Determine Radiation Exposure.
A.4 Knowledge of emergency communications systems and techniques. 2.4.43 – 2.8	Activate ERDS.

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Facility: Quad CitiesDate of Examination: 12-02-02

Exam Level (circle one): RO/SRO (I)

Operating Test Number: 1

## B.1 Control Room Systems

System / JPM Title	Type Code*	Safety Function
a. Reactor Building Ventilation / Bypass Reactor Building Ventilation Isolations. 286000 A4.01 3.3/3.2	D, S	9
b. RCIC / RCIC Manual Initiation (Hardcard) with failure of the manual initiation pushbutton. 290003 A4.01 3.2/3.2	N, A, S, L	4
c. A.C. Electrical Distribution / Supply Bus 14-1 from Bus 24-1. 262001 A4.01 3.4/3.7	N, S	6
d. Reactor Protection System / Perform a manual scram functional test with rod drifts requiring a reactor scram. 212000 A4.01 4.6/4.6	M, A, S	7
e. Core Spray / Monthly Core Spray surveillance with failure of the minimum flow valve. 209001 A4.04 2.9/2.9	D, A, S	2
f. Containment / Vent primary Containment due to high H <sub>2</sub> with a failure of the Torus 2" vent to open. 500000 EA1.03 3.4/3.2	N, A, S	5
g. Main Steam / Pressurize main Steam Lines. 293001 A4.01 4.2/4.0	D, S, L	3

## B.2 Facility Walk-Through

a. Service Water / Align SSMP Room Cooler to Fire Header APE 295018 AA1.01 3.3/3.4	D, R, L	8
b. Control Rod Hydraulic / Depressurize the Scram Air Header EPE 295037 EA1.05 3.9/4.0	D, R	1
c. Residual Heat Removal Shutdown Cooling / Perform the Auxiliary Electric Room actions to start SDC. APE 295021 AA1.02 3.5/3.5	D, L	4

\* 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: Quad CitiesDate of Examination: 12-02-02

Exam Level (circle one): SRO (U)

Operating Test Number: 1

## B.1 Control Room Systems

System / JPM Title	Type Code*	Safety Function
a.		
b.		
c.		
d. Reactor Protection System / Perform a manual scram functional test with rod drifts requiring a reactor scram. 212000 A4.01 4.6/4.6	M, A, S	7
e.		
f. Containment / Vent primary Containment due to high H2 with a failure of the Torus 2" vent to open. 500000 EA1.03 3.4/3.2	N, A, S	5
g. Main Steam / Pressurize Main Steam Lines. 293001 A4.01 4.2/4.0	D, S, L	3

## B.2 Facility Walk-Through

a. Service Water / Align SSMP Room Cooler to Fire Header APE 295018 AA1.01 3.3/3.4	D, R, L	8
b.		
c. Residual Heat Removal Shutdown Cooling / Perform the Auxiliary Electric Room actions to start SDC. APE 295021 AA1.02 3.5/3.5	D, L	4

\* 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

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## OPERATING TEST NO.: 1

Applicant Type	Evolution Type	Minimum Number	Scenario Number			
			1	2	3	4 Spare
RO/BOP	Reactivity	1	1/-	6/-	2/-	2/-
	Normal	1	-/4	-/1	-/1	-/1
	Instrument / Component	4	3,6 /2,5	2,4 /3,5	3,5 /4,6	3,6 /4,5
	Major	1	7,8	7,8	7,8	7,8

As RO	Reactivity	1	1	6	2	2
	Normal	0	-	-	-	-
	Instrument / Component	2	3,6	2,4	3,5	3,6
	Major	1	7,8	7,8	7,8	7,8
SRO-I	Reactivity	0	-	-	-	-
	Normal	1	4	1	1	1
	Instrument / Component	2	2,3,5 .6	2-5	3-6	3-6
	Major	1	7,8	7,8	7,8	7,8

SRO-U	Reactivity	0	-	-	-	-
	Normal	1	4	1	1	1
	Instrument / Component	2	2,3,5 .6	2-5	3-6	3-6
	Major	1	7,8	7,8	7,8	7,8

- 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.4.d) but must be significant per Section C.2.a of Appendix D.
  - (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:

NRC Reviewer:

COPY #1

FACILITY: QUAD CITIES

SCENARIO NO: 1

OP-TEST NO: 1

EXAMINERS: \_\_\_\_\_ OPERATORS: \_\_\_\_\_

INITIAL CONDITIONS: ~ 35% power, 1B Service Water Pump OOS, power ascension in progress.

TURNOVER: ~ 310 MWe. The following equipment is out of service: 1B Service Water Pump. Plant startup in progress IAW QCGP 1-1, step F.9.t. QNE directions are to increase power with recircs to ~ 4.5 MLBM/hr feedwater flow and place the 2<sup>nd</sup> FWRV in service.

Event No.	Malfunction Number	Event Type*	Event Description
1	N/A	R – R, S	Increase power using recirc pumps
2	SW11b	C – B, S	TBCCW pump trip
3	FW07	I – R, S	B FWRV lockup
4	N/A	N – B, S	Place 2 <sup>nd</sup> FWRV in service.
5	RP04b	C – B, S	Trip of RPS-B
6	RD04r	C – R, S	Rod drift out
7	TC01	M – All	Turbine Trip
8	RD13	M – All	Hydraulic ATWS (PSA identified event)

\* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor  
 (S) – SRO/US  
 (R) – RO  
 (B) – BOP/ANSO

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Facility: Quad CitiesScenario No: 1Op-Test No: 1Summary:

- The crew will take the shift at ~ 35% power. The RO will increase reactor power using Recirc pumps. (Reactivity Manipulation – RO, SRO) The A TBCCW pump will trip, requiring manual start of the B TBCCW pump. (Component – BOP, SRO) During the power increase the B FWRV will lockup, requiring reset. (Instrument – RO, SRO) When Feedwater flow is approximately 4.5 MLBM/hr the BOP will place the 2<sup>nd</sup> FWRV in service. (Normal Evolution – BOP, SRO) Next a loss of “B” RPS will occur, requiring restoration of power and resetting of isolations and equipment. (Instrument, TS – BOP, SRO) A rod will drift out of the core, requiring it to be manually inserted, scrammed and isolated. (Component, TS – RO, SRO) The turbine will trip, rods will not insert – Hydraulic ATWS, requiring entry into QGA 101. (Major – All) The scenario is complete when the crew is controlling RPV water level IAW QGA 101 Power/Level Control leg and have worked through QCOP 0300-28 to the point of attempting individual rod insertion.

CT #1 - During an ATWS with conditions met to perform power/level control, TERMINATE AND PREVENT INJECTION, with the exception of boron, CRD and RCIC into the RPV until conditions are met to re-establish injection. (BWROG RPV- 6.3 PWR/LVL TERM/PREVENT)

CT #2 - When conditions are met to re-establish injection, use available injection systems to MAINTAIN RPV water level above the Minimum Steam Cooling RPV Water Level (-166"). (BWROG RPV-6.4 ATWS PWR/LVL RESTORE RPV LVL)

CT #3 (Contingent on water level) - With a reactor scram required, reactor not shutdown, and conditions for ADS blowdown are met, INHIBIT ADS to prevent an uncontrolled RPV depressurization, to prevent causing a significant power excursion. (BWROG RPV-6.2 ATWS PWR/LVL INHIBIT ADS)

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FACILITY: QUAD CITIES

SCENARIO NO: 2

OP-TEST NO: 1

EXAMINERS: \_\_\_\_\_ OPERATORS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_INITIAL CONDITIONS: IC-21, 100% Power, 1B Service Water Pump OOS For Motor Winding Ground.TURNOVER: 912 MWe. The Following Equipment Is Out Of Service: 1B Service Water Pump OOS For Motor Winding Ground. Currently Holding Power Constant.

Event No.	Malfunction Number	Event Type*	Event Description
1	N/A	N – B, S	SSMP Valve Timing (QCOS 2900-03)
2	NM08/ RP02	I – R, S	APRM failure with failure of automatic ½ scram.
3	SW01	C – B, S	Service Water Pump Trip.
4	RD03	C – R, S	Rod drift in 1 notch.
5	Ior dihs110021c close	I – B, S	RHR Pump inadvertent start
6	MC08	R – R, S	Main Condenser air in leakage that requires a power reduction. (PSA identified event)
7	RR10A	M – All	Recirc suction line rupture.
8	Batflowlow HP01	M – All	Loss of all RFPs and failure of HPCI leads to RPV Blowdown at TAF and low pressure system injection. (PSA identified event)

\* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor  
(S) – SRO/US  
(R) – RO  
(B) – BOP/ANSO

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Facility: Quad CitiesScenario No: 2Op-Test No: 1Summary:

- The crew will take the shift at 100% power and perform QCOS 2900-03 - SSMP Valve Timing Surveillance. (Normal – BOP, SRO) An APRM will fail upscale with a failure of the automatic ½ scram, requiring a manual ½ scram and bypassing of the failed APRM. (Instrument, TS – RO, SRO) A Service Water pump will trip, requiring a standby pump to be manually started. (Component – BOP, SRO) A control rod will drift in from 48 to 46, requiring it to be withdrawn back to 48. (Component – RO, SRO) An RHR pump will inadvertently start, requiring it to be manually tripped and Tech Specs to be addressed. (Instrument, TS - ANSO, SRO) Air in-leakage will develop in the Main Condenser Boot due to a rupture, requiring power reduction and a reactor scram. (Component, Reactivity – NSO, SRO) A Recirc Suction line will rupture along with a loss of all RFPs and a failure of HPCI, which will result in level reaching TAF and RPV blowdown. (Major – ALL) The scenario ends when the crew has performed an RPV Blowdown and reestablished core cooling with low pressure systems.

CT #1 - When Torus pressure exceeds 5 psig, INITIATE drywell sprays, while in the safe region of the drywell spray initiation limit (DSIL). (BWROG PC-5.1 INIT DW SPRAY)

CT #2 - With Reactor pressure greater than shutoff head of the Low pressure system(s) before RPV water level drops to -166", INITIATE emergency depressurization. (BWROG RPV-1.1 LOSS HP INJ E/D TAF)

CT #3 - Action is taken to restore RPV water level above TAF, by OPERATING available low pressure system(s) when RPV pressure decreases below the shut off head of the low pressure system(s). (BWROG RPV-1.2 LOSS HP IND RESTORE RPV LVL).

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FACILITY: QUAD CITIESSCENARIO NO: 3OP-TEST NO: 1

EXAMINERS: \_\_\_\_\_ OPERATORS: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

INITIAL CONDITIONS: ~3% Power, Reactor Start-Up In Progress, Mode Switch In Startup/Hot-Standby.

TURNOVER: Reactor Startup In Progress IAW QCGP 1-1 Step F.6. ad and ae. RWCU reject is ready to be secured and continue pulling rods for startup.

Event No.	Malfunction Number	Event Type*	Event Description
1	N/A	N – B, S	Secure RWCU Blowdown
2	N/A	R – R, S	Pull rods to increase power
3	NM05	I – R, S	IRM failure
4	RM02k/HV01	I – B, S	Reactor Building Vent Rad Monitor fails upscale with failure of Rx Building vents to isolate.
5	RD07	C – R, S	CRD Pump trip
6	SW06/SW07	C – All	Loss of RBCCW/Trip of Recirc Pumps
7	RP05	M – All	Reactor Scram with inadvertent Group 1.
8	RD14/CR01	M - All	SDV Volume Rupture/Fuel Failure/QGA 300 RPV Blowdown

\* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor  
(S) – SRO/US  
(R) – RO  
(B) – BOP/ANSO

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Facility: Quad CitiesScenario No: 3Op-Test No: 1Summary:

- The crew will take the shift with the plant at ~ 3% power and secure RWCU reject blowdown. (Normal – BOP, SRO) The RO will then pull rods to increase power. (Reactivity – RO, SRO) An IRM will fail while the NSO is pulling rods, requiring it to be bypassed. (Instrument, TS – RO, SRO) A Rx Building Vent Rad Monitor will fail upscale with a failure of the RB Vents to isolate, requiring them to be manually isolated. (Instrument, TS – BOP, SRO) A CRD pump will trip, requiring the standby CRD pump to be started. (Component – RO, SRO) A total loss of RBCCW will occur, requiring the Recirc pumps to be tripped (Component – All) and a Rx scram to be inserted. When the scram is inserted, an inadvertent Group 1 isolation will occur. (Major – All) A fuel failure and Scram Discharge Volume rupture that cannot be isolated will occur on the Rx Scram that leads to an RPV Blowdown on 2 areas above max safe rads. (Major – All) The scenario will be complete when the crew has completed the RPV blowdown.

CT #1 - The crew will recognize a failure of the Reactor Building Vents to isolate and manually isolate them using the control switch on the 912-1 Pnl.

CT #2 - The crew will recognize a trip of both recirc pumps and insert a manual reactor scram.

CT #3 - With a primary system discharging into the secondary containment and area radiation/temperature/water levels exceed maximum safe levels in more than one area of the same parameter, INITIATE an emergency depressurization. (BWROG SC-1.2 LOCA SC E/D)

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Facility: Quad Cities

Scenario No: 4

Op-Test No: 1

Examiners: \_\_\_\_\_ Operators: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Initial Conditions: ~ 700 MWe, 75% power, 1A RHR Loop OOS, B SBTG running for monthly surveillance.

Turnover: The following equipment is out of service: 1A RHR loop. B SBTG was running for the monthly surveillance per QCOS 7500-05 and is ready to be shutdown per step H.2.p.

Event No.	Malfunction Number	Event Type*	Event Description
1	N/A	N – B, S	Shutdown SBTG
2	RR01	R – R, S	Insert Control Rods to exit the instability region due to recirc drive motor breaker trip.
3	RD02	C – R, S	Stuck control rod.
4	EG05	C – B, S	Stator Cooling Pump Trip with failure of the Standby to auto start.
5	AD01	I – B, S	ADS valve fails open due to setpoint drift – Rx scram
6	RP02/RP03	I – R, S	Control rods fail to insert on manual scram – initiate ARI. (PSA identified event)
7	MS05/RP05	M – All	Steamline break in Drywell with a Group I.
8	lor zdish11001S 17(B)1 Bat DWCLRTRIP	M – All	Failure of Drywell Sprays and Cooling leads to RPV blowdown and flooding. (PSA identified event)

\* (N)ormal, (R)eactivity, (I)nstrument, (C)omponent, (M)ajor  
 (S) – SRO/US  
 (R) – RO  
 (B) – BOP/ANSO

Copy #1

Facility: Quad CitiesScenario No: 4Op-Test No: 1Summary:

- The crew will take the shift with SBTG running. The surveillance is complete and needs to be shutdown. (Normal – BOP, SRO) After this, a Recirc Pump drive motor breaker will trip, requiring the RO to insert cram rods. (Reactivity manipulation, TS – RO, SRO) While inserting cram rods, one of the rods will stick, requiring drive water pressure to be raised in order to drive it. (Component – RO, SRO) When they have inserted cram rods/exited the instability region, the running Stator Water Cooling Pump will trip and the standby will fail to auto start, requiring it to be manually started. (Component – BOP, SRO). An ADS valve will fail open and will not close when attempted manually, (Instrument, TS – BOP, SRO) requiring a manual scram to be inserted. When the manual scram pushbuttons are depressed, no rod movement will occur, requiring initiation of ARI to insert the rods. (Instrument – RO, SRO) After the rods are inserted, a steamline break will occur in the Drywell with an inadvertent Group 1 isolation. Coupled with a failure of Drywell Sprays and Cooling, this will lead to an RPV Blowdown and RPV Flooding. (Major – All) The scenario will be completed when the crew has identified the requirements to determine the Main Steam Lines are flooded.

CT #1 - Crew will recognize instabilities region has been entered and insert control rods to exit instabilities.

CT #2 - When Torus Pressure cannot be maintained below PSP curve and/or drywell temperature cannot be restored or held below 280°F, INITIATE emergency depressurization. below 280°F, INITIATE emergency depressurization.

CT #3 - When RPV level cannot be determined, INJECT into the RPV to maintain RPV flooded to the Main Steam Lines. (BWROG RPV-2.2 LOSS LVL INST MRPVFP)

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Facility: Quad Cities

Form ES-401-1

Exam Date: 12/02/2002Exam Level: SRO

Tier	Group	K/A Category Points											Point Total
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	
1. Emergency & Abnormal Plant Evolutions	1	4	4	5				4	5			4	26
	2	3	3	3				1	4			3	17
	Tier Totals	7	7	8				5	9			7	43
2. Plant Systems	1	3	2	2	2	2	2	2	2	2	1	3	23
	2	1	1	1	1	2	1	1	1	1	1	2	13
	3	1	0	0	1	0	0	1	0	0	0	1	4
	Tier Totals	5	3	3	4	4	3	4	3	3	2	6	40
3. Generic Knowledge And Abilities					Cat 1		Cat 2		Cat 3		Cat 4		
					4		4		4		5		17

**Note:**

1. Attempt to distribute topics among all K/A Categories; select at least one topic from every K/A category within each tier.
2. Actual point totals must match those specified in the table.
3. Select topics from many systems; avoid selecting more than two or three K/A topics from a given system unless they relate to plant-specific priorities.
4. Systems/evolutions within each group are identified on the associated outline.
5. The shaded areas are not applicable to the category tier.

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ES - 401

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

Form ES-401-1

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
295003	Partial or Complete Loss of A.C. Power / 6						X	2.1.14 - Knowledge of system status criteria which require the notification of plant personnel.	3.3	1
295003	Partial or Complete Loss of A.C. Power / 6	X						AK1.05 - Failsafe component design	2.7	1
295006	SCRAM / 1					X		AA2.05 - Whether a reactor SCRAM has occurred	4.6*	1
295007	High Reactor Pressure / 3				X			AA1.04 - Safety/relief valve operation: Plant-Specific	4.1*	1
295009	Low Reactor Water Level / 2					X		AA2.03 - Reactor water cleanup blowdown rate	2.9	1
295009	Low Reactor Water Level / 2		X					AK2.03 - Recirculation system	3.2	1
295010	High Drywell Pressure / 5	X						AK1.03 - Temperature increases	3.4	1
295010	High Drywell Pressure / 5			X				AK3.05 - Temperature monitoring	3.4	1
295013	High Suppression Pool Temperature / 5	X						AK1.01 - Pool stratification	2.6	1
295013	High Suppression Pool Temperature / 5						X	2.4.4 - Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.	4.3	1
295015	Incomplete SCRAM / 1		X					AK2.01 - CRD hydraulics	3.9	1
295015	Incomplete SCRAM / 1						X	2.2.22 - Knowledge of limiting conditions for operations and safety limits.	4.1	1
295016	Control Room Abandonment / 7		X					AK2.02 - Local control stations: Plant-Specific	4.1*	1

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ES - 401

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

Form ES-401-1

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
295023	Refueling Accidents / 8	X						AK1.03 - Inadvertent criticality	4.0	1
295023	Refueling Accidents / 8					X		AA2.02 - Fuel pool level	3.7	1
295024	High Drywell Pressure / 5			X				EK3.02 - Suppression pool spray operation: Plant-Specific	3.8	1
295025	High Reactor Pressure / 3				X			EA1.04 - HPCI: Plant-Specific	3.9	1
295026	Suppression Pool High Water Temperature / 5		X					EK2.04 - SPDS/ERIS/CRIDS/GDS: Plant-Specific	2.8	1
295026	Suppression Pool High Water Temperature / 5			X				EK3.01 - Emergency/normal depressurization	4.1	1
295030	Low Suppression Pool Water Level / 5						X	2.1.33 - Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	4.0	1
295030	Low Suppression Pool Water Level / 5					X		EA2.04 - Drywell/ suppression chamber differential pressure: Mark-I&II	3.7	1
295031	Reactor Low Water Level / 2			X				EK3.04 - Steam cooling	4.3*	1
295037	SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1				X			EA1.11 - PCIS/NSSSS	3.6	1
295038	High Off-Site Release Rate / 9					X		EA2.01 - †Off-site	4.3*	1
295038	High Off-Site Release Rate / 9				X			EA1.03 - Process liquid radiation monitoring system	3.9	1
500000	High Containment Hydrogen Concentration / 5			X				EK3.06 - Operation of wet well vent	3.7	1

Cell #1

**Facility:** Quana Cities

## BWR SRO Elimination Outline

Printed: 08/15/7

**ES - 401**

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

Form ES-401-1

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Facility: Quana Cities

# BWR SRO Examination Outline

Printed: 08/15/2017

ES - 401

## Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-1

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
295001	Partial or Complete Loss of Forced Core Flow Circulation / 1		X					AK2.03 - Reactor water level	3.7	1
295002	Loss of Main Condenser Vacuum / 3				X			AA1.07 - Condenser circulating water system	2.9	1
295004	Partial or Complete Loss of D.C. Power / 6						X	2.2.22 - Knowledge of limiting conditions for operations and safety limits.	4.1	1
295004	Partial or Complete Loss of D.C. Power / 6			X				AK3.01 - †Load shedding: Plant-Specific	3.1	1
295005	Main Turbine Generator Trip / 3			X				AK3.05 - Extraction steam/moisture separator isolations	2.6	1
295012	High Drywell Temperature / 5					X		AA2.02 - Drywell pressure	4.1	1
295012	High Drywell Temperature / 5			X				AK3.01 - Increased drywell cooling	3.6	1
295020	Inadvertent Containment Isolation / 5		X					AK2.12 - Instrument air/nitrogen: Plant-Specific	3.2	1
295021	Loss of Shutdown Cooling / 4						X	2.2.25 - Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	3.7	1
295021	Loss of Shutdown Cooling / 4	X						AK1.04 - Natural circulation	3.7	1
295022	Loss of CRD Pumps / 1	X						AK1.01 - Reactor pressure vs. rod insertion capability	3.4	1
295028	High Drywell Temperature / 5					X		EA2.05 - Torus/suppression chamber pressure: Plant-Specific	3.8	1
295028	High Drywell Temperature / 5	X						EK1.02 - Equipment environmental qualification	3.1	1

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Facility: Quak Cities

# BWR SRO Examination Outline

Printed: 08/15/20

ES - 401

## Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-1

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
295029	High Suppression Pool Water Level / 5					X		EA2.03 - Drywell/containment water level	3.5	1
295032	High Secondary Containment Area Temperature / 5		X					EK2.02 - Secondary containment ventilation	3.7	1
295034	Secondary Containment Ventilation High Radiation / 9					X		EA2.02 - Cause of high radiation levels	4.2*	1
600000	Plant Fire On Site / 8						X	2.2.25 - Knowledge of bases in technical specifications for limiting conditions for operations and safety limits.	3.7	1

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

Group Point Total: 17

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Facility: Quad Cities

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-1

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
203000	RHR/LPCI: Injection Mode (Plant Specific) / 2		X										K2.01 - Pumps	3.5*	1
206000	High Pressure Coolant Injection System / 2		X										K2.04 - Turbine control circuits: BWR-2, 3, 4	2.7*	1
209001	Low Pressure Core Spray System / 2								X				A2.04 - D.C. failures	3.0	1
212000	Reactor Protection System / 7					X							K5.02 - Specific logic arrangements	3.4	1
215004	Source Range Monitor (SRM) System / 7				X								K4.02 - Reactor SCRAM signals	3.5	1
215004	Source Range Monitor (SRM) System / 7					X							K5.01 - Detector operation	2.6	1
215005	Average Power Range Monitor/Local Power Range Monitor System / 7									X			A3.06 - Maximum disagreement between flow comparator channels: Plant-Specific	3.1	1
216000	Nuclear Boiler Instrumentation / 7						X						K6.02 - D.C. electrical distribution	3.0	1
216000	Nuclear Boiler Instrumentation / 7								X				A2.10 - Rapid vessel depressurizations	3.5	1
217000	Reactor Core Isolation Cooling System (RCIC) / 2			X									K3.01 - Reactor water level	3.7	1

223001 Primary Containment System and Auxiliaries / 5

X 2.1.33 - Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.

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Cell #1

Facility: Quad Cities

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-1

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
223001	Primary Containment System and Auxiliaries / 5	X											K1.09 - SBGT/FRVS: Plant-Specific	3.6	1
223002	Primary Containment Isolation System/Nuclear Steam Supply Shut-Off / 5											X	2.2.22 - Knowledge of limiting conditions for operations and safety limits.	4.1	1
239002	Relief/Safety Valves / 3			X									K3.02 - Reactor over pressurization	4.4*	1
239002	Relief/Safety Valves / 3							X					A1.03 - Air supply: Plant-Specific	2.9	1
259002	Reactor Water Level Control System / 2	X											K1.15 - Recirculation flow control system	3.2	1
261000	Standby Gas Treatment System / 9							X					A1.01 - System flow	3.1	1
262001	A.C. Electrical Distribution / 6											X	2.1.33 - Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	4.0	1
262001	A.C. Electrical Distribution / 6	X											K1.04 - Uninterruptible power supply	3.4	1
264000	Emergency Generators (Diesel/Jet) / 6				X								K4.06 - Governor control	2.7	1
264000	Emergency Generators (Diesel/Jet) / 6										X		A4.02 - Synchroscope	3.4	1

290001 Secondary Containment / 5

X

K6.04 - Primary containment system

4.1

1

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# BWR SRO Examination Outline

Printed: 08/15/02

Facility: Quad Cities

ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-1

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
290001	Secondary Containment / 5									X			A3.02 - Normal building differential pressure: Plant-Specific	3.5	1

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

Group Point Total: 23

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Facility: Quad Cities

ES - 401

Plant Systems - Tier 2 / Group 2

Form ES-401-1

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
201006	Rod Worth Minimizer System (RWM) (Plant Specific) / 7							X					A1.03 - Latched group indication: P-Spec(Not-BWR6)	3.0	1
201006	Rod Worth Minimizer System (RWM) (Plant Specific) / 7									X			A3.02 - Verification of proper functioning/ operability: P-Spec(Not-BWR6)	3.4	1
202001	Recirculation System / 1		X										K2.02 - MG sets: Plant-Specific	3.3	1
214000	Rod Position Information System / 7			X									K3.01 - RWM: Plant-Specific	3.2	1
214000	Rod Position Information System / 7										X		A4.02 - Control rod position	3.8*	1
215002	Rod Block Monitor System / 7						X						K6.05 - LPRM detectors: BWR-3, 4, 5	3.1	1
230000	RHR/LPCI: Torus/Suppression Pool Spray Mode / 5					X							K5.06 - Heat exchanger operation	2.6	1
245000	Main Turbine Generator and Auxiliary Systems / 4											X	2.1.33 - Ability to recognize indications for system operating parameters which are entry-level conditions for technical specifications.	4.0	1
286000	Fire Protection System / 8					X							K5.02 - Effect of Halon on fires: Plant-Specific	2.6	1
290003	Control Room HVAC / 9											X	2.4.30 - Knowledge of which events related to system operations/status should be reported to outside agencies.	3.6	1
290003	Control Room HVAC / 9	X											K1.05 - Component cooling water systems	3.0	1

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# BWR SRO Examination Outline

Printed: 08/17/02

Facility: Quad Cities

ES - 401

Plant Systems - Tier 2 / Group 2

Form ES-401-1

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
300000	Instrument Air System (IAS) / 8				X								K4.03 - Securing of IAS upon loss of cooling water	2.8	1
300000	Instrument Air System (IAS) / 8								X				A2.01 - Air dryer and filter malfunctions	2.8	1

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

Group Point Total: 13

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# BWR SRO Examination Outline

Printed: 08/15/92

Facility: Quad Cities

ES - 401

Plant Systems - Tier 2 / Group 3

Form ES-401-1

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
201003	Control Rod and Drive Mechanism / 1							X					A1.01 - Reactor power	3.8	1
215001	Traversing In-Core Probe / 7											X	2.4.6 - Knowledge symptom based EOP mitigation strategies.	4.0	1
215001	Traversing In-Core Probe / 7				X								K4.01 - Primary containment isolation: Mark-I&II(Not-BWR1)	3.5	1
288000	Plant Ventilation Systems / 9	X											K1.06 - Plant air systems	2.7	1

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

Group Point Total: 4

# Generic Knowledge and Abilities Outline (Tier 3)

Printed: 08/15/2002

## BWR SRO Examination Outline

Form ES-401-5

Facility: Quad Cities

Generic Category	KA	KA Topic	Imp.	Points
Conduct of Operations	2.1.25	Ability to obtain and interpret station reference materials such as graphs, monographs, and tables which contain performance data.	3.1	1
	2.1.22	Ability to determine Mode of Operation.	3.3	1
	2.1.17	Ability to make accurate, clear and concise verbal reports.	3.6	1
	2.1.27	Knowledge of system purpose and/or function.	2.9	1
Category Total:				4
Equipment Control	2.2.11	Knowledge of the process for controlling temporary changes.	3.4*	1
	2.2.27	Knowledge of the refueling process.	3.5	1
	2.2.1	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.	3.6	1
	2.2.3	(multi-unit) Knowledge of the design, procedural, and operational differences between units.	3.3	1
Category Total:				4
Radiation Control	2.3.1	Knowledge of 10 CFR 20 and related facility radiation control requirements.	3.0	1
	2.3.10	Ability to perform procedures to reduce excessive levels of radiation and guard against personnel exposure.	3.3	1
	2.3.11	Ability to control radiation releases.	3.2	1
	2.3.9	Knowledge of the process for performing a containment purge.	3.4	1
Category Total:				4

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# Generic Knowledge and Abilities Outline (Tier 3)

Printed: 08/15/2002

## BWR SRO Examination Outline

Form ES-401-5

Facility: Quad Cities

Generic Category	KA	KA Topic	Imp.	Points
Emergency Plan	2.4.34	Knowledge of RO tasks performed outside the main control room during emergency operations including system geography and system implications.	3.6	1
	2.4.32	Knowledge of operator response to loss of all annunciators.	3.5	1
	2.4.31	Knowledge of annunciators alarms and indications, and use of the response instructions.	3.4	1
	2.4.25	Knowledge of fire protection procedures.	3.4	1
	2.4.26	Knowledge of facility protection requirements including fire brigade and portable fire fighting equipment usage.	3.3	1

Category Total: 5

Generic Total: 17

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Facility: Quad Cities

Form ES-401-2

Exam Date: 12/02/2002Exam Level: RO

Tier	Group	K/A Category Points											Point Total
		K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	
1. Emergency & Abnormal Plant Evolutions	1	1	2	5				3	1			1	13
	2	4	4	3				3	4			1	19
	3	2	1	0				1	0			0	4
	Totals Tier	7	7	8				7	5			2	36
2. Plant Systems	1	2	2	3	2	3	3	2	3	2	3	3	28
	2	2	2	2	2	2	2	2	1	2	2	0	19
	3	1	0	1	1	0	0	0	1	0	0	0	4
	Tier Totals	5	4	6	5	5	5	4	5	4	5	3	51
3. Generic Knowledge And Abilities					Cat 1		Cat 2		Cat 3		Cat 4		
					3		3		3		4		13

## Note:

1. Attempt to distribute topics among all K/A Categories; select at least one topic from every K/A category within each tier.
2. Actual point totals must match those specified in the table.
3. Select topics from many systems; avoid selecting more than two or three K/A topics from a given system unless they relate to plant-specific priorities.
4. Systems/evolutions within each group are identified on the associated outline.
5. The shaded areas are not applicable to the category tier.

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Facility: Qu Cities

# BWR RO mination Outline

Printed: 08/15/2

ES - 401

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

Form ES-401-2

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
295005	Main Turbine Generator Trip / 3			X				AK3.05 - Extraction steam/moisture separator isolations	2.5	1
295006	SCRAM / 1					X		AA2.05 - Whether a reactor SCRAM has occurred	4.6*	1
295007	High Reactor Pressure / 3				X			AA1.04 - Safety/relief valve operation: Plant-Specific	3.9	1
295009	Low Reactor Water Level / 2		X					AK2.03 - Recirculation system	3.1	1
295010	High Drywell Pressure / 5	X						AK1.03 - Temperature increases	3.2	1
295010	High Drywell Pressure / 5			X				AK3.05 - Temperature monitoring	3.5	1
295015	Incomplete SCRAM / 1		X					AK2.01 - CRD hydraulics	3.8	1
295015	Incomplete SCRAM / 1						X	2.2.22 - Knowledge of limiting conditions for operations and safety limits.	3.4	1
295024	High Drywell Pressure / 5			X				EK3.02 - Suppression pool spray operation: Plant-Specific	3.5	1
295025	High Reactor Pressure / 3				X			EA1.04 - HPCI: Plant-Specific	3.8	1
295031	Reactor Low Water Level / 2			X				EK3.04 - Steam cooling	4.0	1
295037	SCRAM Condition Present and Reactor Power Above APRM Downscale or Unknown / 1				X			EA1.11 - PCIS/NSSSS	3.5	1
500000	High Containment Hydrogen Concentration / 5			X				EK3.06 - Operation of wet well vent	3.1	1

K/A Category Totals: 1 2 5 3 1 1

Group Point Total: 13

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ES - 401

## Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-2

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
295001	Partial or Complete Loss of Forced Core Flow Circulation / 1		X					AK2.03 - Reactor water level	3.6	1
295002	Loss of Main Condenser Vacuum / 3				X			AA1.07 - Condenser circulating water system	3.1	1
295003	Partial or Complete Loss of A.C. Power / 6	X						AK1.05 - Failsafe component design	2.6	1
295004	Partial or Complete Loss of D.C. Power / 6					X		AA2.02 - Extent of partial or complete loss of D.C. power	3.5	1
295004	Partial or Complete Loss of D.C. Power / 6			X				AK3.01 - †Load shedding: Plant-Specific	2.6	1
295008	High Reactor Water Level / 2				X			AA1.05 - RCIC: Plant-Specific	3.3	1
295012	High Drywell Temperature / 5			X				AK3.01 - Increased drywell cooling	3.5	1
295013	High Suppression Pool Temperature / 5	X						AK1.01 - Pool stratification	2.5	1
295013	High Suppression Pool Temperature / 5						X	2.4.4 - Ability to recognize abnormal indications for system operating parameters which are entry-level conditions for emergency and abnormal operating procedures.	4.0	1
295016	Control Room Abandonment / 7		X					AK2.02 - Local control stations: Plant-Specific	4.0*	1
295016	Control Room Abandonment / 7					X		AA2.02 - Reactor water level	4.2*	1
295020	Inadvertent Containment Isolation / 5		X					AK2.12 - Instrument air/nitrogen: Plant-Specific	3.1	1
295022	Loss of CRD Pumps / 1	X						AK1.01 - Reactor pressure vs. rod insertion capability	3.3	1

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Facility: Quilley

# BWR RO2 Minimization Outline

Printed: 08/15/2017

ES - 401

## Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2

Form ES-401-2

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
295026	Suppression Pool High Water Temperature / 5		X					EK2.04 - SPDS/ERIS/CRIDS/GDS: Plant-Specific	2.5	1
295026	Suppression Pool High Water Temperature / 5			X				EK3.01 - Emergency/normal depressurization	3.8	1
295028	High Drywell Temperature / 5	X						EK1.02 - Equipment environmental qualification	2.9	1
295034	Secondary Containment Ventilation High Radiation / 9					X		EA2.02 - Cause of high radiation levels	3.7	1
295038	High Off-Site Release Rate / 9				X			EA1.03 - Process liquid radiation monitoring system	3.7	1
600000	Plant Fire On Site / 8					X		AA2.10 - Time limit of long-term-breathing air system for control room	2.9	1

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

Group Point Total: 19

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Facility: Qu. Cities

# BWR RO F mination Outline

Printed: 08/15/20

ES - 401

## Emergency and Abnormal Plant Evolutions - Tier 1 / Group 3

Form ES-401-2

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
295021	Loss of Shutdown Cooling / 4	X						AK1.04 - Natural circulation	3.6	1
295023	Refueling Accidents / 8	X						AK1.03 - Inadvertent criticality	3.7	1
295032	High Secondary Containment Area Temperature / 5		X					EK2.02 - Secondary containment ventilation	3.6	1
295035	Secondary Containment High Differential Pressure / 5				X			EA1.02 - SBTG/FRVS	3.8	1

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

Group Point Total: 4

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ES - 401

Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
203000	RHR/LPCI: Injection Mode (Plant Specific) / 2		X										K2.01 - Pumps	3.5*	1
203000	RHR/LPCI: Injection Mode (Plant Specific) / 2			X									K3.03 - Automatic depressurization logic	4.2*	1
206000	High Pressure Coolant Injection System / 2		X										K2.04 - Turbine control circuits: BWR-2, 3, 4	2.5*	1
206000	High Pressure Coolant Injection System / 2											X	2.1.32 - Ability to explain and apply system limits and precautions.	3.4	1
209001	Low Pressure Core Spray System / 2								X				A2.04 - D.C. failures	2.9	1
209001	Low Pressure Core Spray System / 2										X		A4.05 - Manual initiation controls	3.8	1
211000	Standby Liquid Control System / 1						X						K6.03 - A.C. power	3.2	1
211000	Standby Liquid Control System / 1								X				A2.08 - Failure to SCRAM	4.1*	1
212000	Reactor Protection System / 7					X							K5.02 - Specific logic arrangements	3.3	1
215003	Intermediate Range Monitor (IRM) System / 7						X						K6.05 - Trip units	3.1	1
215003	Intermediate Range Monitor (IRM) System / 7											X	2.1.32 - Ability to explain and apply system limits and precautions.	3.4	1
215004	Source Range Monitor (SRM) System / 7				X								K4.02 - Reactor SCRAM signals	3.4	1

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Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
215004	Source Range Monitor (SRM) System / 7					X							K5.01 - Detector operation	2.6	1
215005	Average Power Range Monitor/Local Power Range Monitor System / 7									X			A3.06 - Maximum disagreement between flow comparator channels: Plant-Specific	3.0	1
216000	Nuclear Boiler Instrumentation / 7						X						K6.02 - D.C. electrical distribution	2.8	1
216000	Nuclear Boiler Instrumentation / 7								X				A2.10 - Rapid vessel depressurizations	3.3	1
217000	Reactor Core Isolation Cooling System (RCIC) / 2			X									K3.01 - Reactor water level	3.7	1
217000	Reactor Core Isolation Cooling System (RCIC) / 2											X	2.1.32 - Ability to explain and apply system limits and precautions.	3.4	1
218000	Automatic Depressurization System / 3					X							K5.01 - ADS logic operation	3.8	1
218000	Automatic Depressurization System / 3									X			A3.01 - ADS valve operation	4.2*	1
223001	Primary Containment System and Auxiliaries / 5	X											K1.09 - SBGT/FRVS: Plant-Specific	3.4	1
223002	Primary Containment Isolation System/Nuclear Steam Supply Shut-Off / 5										X		A4.04 - System indicating lights and alarms	3.5	1
239002	Relief/Safety Valves / 3			X									K3.02 - Reactor over pressurization	4.2*	1

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Plant Systems - Tier 2 / Group 1

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
239002	Relief/Safety Valves / 3							X					A1.03 - Air supply: Plant-Specific	2.8	1
259002	Reactor Water Level Control System / 2	X											K1.15 - Recirculation flow control system	3.2	1
261000	Standby Gas Treatment System / 9							X					A1.01 - System flow	2.9	1
264000	Emergency Generators (Diesel/Jet) / 6				X								K4.06 - Governor control	2.6	1
264000	Emergency Generators (Diesel/Jet) / 6										X		A4.02 - Synchroscope	3.4	1

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

Group Point Total: 28

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Plant Systems - Tier 2 / Group 2

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
201003	Control Rod and Drive Mechanism / 1							X					A1.01 - Reactor power	3.7	1
201006	Rod Worth Minimizer System (RWM) (Plant Specific) / 7							X					A1.03 - Latched group indication: P-Spec(Not-BWR6)	2.9	1
201006	Rod Worth Minimizer System (RWM) (Plant Specific) / 7									X			A3.02 - Verification of proper functioning/ operability: P-Spec(Not-BWR6)	3.5	1
202001	Recirculation System / 1		X										K2.02 - MG sets: Plant-Specific	3.2	1
214000	Rod Position Information System / 7			X									K3.01 - RWM: Plant-Specific	3.0	1
214000	Rod Position Information System / 7										X		A4.02 - Control rod position	3.8*	1
215002	Rod Block Monitor System / 7						X						K6.05 - LPRM detectors: BWR-3, 4, 5	2.8	1
226001	RHR/LPCI: Containment Spray System Mode / 5			X									K3.02 - Containment/drywell/suppression chamber temperature	3.5	1
230000	RHR/LPCI: Torus/Suppression Pool Spray Mode / 5					X							K5.06 - Heat exchanger operation	2.5*	1
262001	A.C. Electrical Distribution / 6	X											K1.04 - Uninterruptible power supply	3.1	1
262001	A.C. Electrical Distribution / 6		X										K2.01 - Off-site sources of power	3.3	1
263000	D.C. Electrical Distribution / 6										X		A4.02 - Battery voltage indicator: Plant-Specific	3.2	1

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# BWR RO Examination Outline

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Facility: Quad Cities

ES - 401

Plant Systems - Tier 2 / Group 2

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
272000	Radiation Monitoring System / 7				X								K4.01 - Redundancy	2.7	1
286000	Fire Protection System / 8					X							K5.02 - Effect of Halon on fires: Plant-Specific	2.6	1
290001	Secondary Containment / 5						X						K6.04 - Primary containment system	3.9	1
290001	Secondary Containment / 5									X			A3.02 - Normal building differential pressure: Plant-Specific	3.5	1
290003	Control Room HVAC / 9	X											K1.05 - Component cooling water systems	2.8	1
300000	Instrument Air System (IAS) / 8				X								K4.03 - Securing of IAS upon loss of cooling water	2.8	1
300000	Instrument Air System (IAS) / 8								X				A2.01 - Air dryer and filter malfunctions	2.9	1

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

Group Point Total: 19

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Facility: Quad Cities

ES - 401

Plant Systems - Tier 2 / Group 3

Form ES-401-2

Sys/Ev #	System / Evolution Name	K1	K2	K3	K4	K5	K6	A1	A2	A3	A4	G	KA Topic	Imp.	Points
215001	Traversing In-Core Probe / 7				X								K4.01 - Primary containment isolation: Mark-I&II(Not-BWR1)	3.4	1
234000	Fuel Handling Equipment / 8			X									K3.03 - †Fuel handling operations	3.1	1
288000	Plant Ventilation Systems / 9	X											K1.06 - Plant air systems	2.7	1
288000	Plant Ventilation Systems / 9								X				A2.04 - High radiation: Plant-Specific	3.7	1

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

Group Point Total: 4

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# Generic Knowledge and Abilities Outline (Tier 3)

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## BWR RO Examination Outline

Form ES-401-5

Facility: Quad Cities

Generic Category	KA	KA Topic	Imp.	Points
Conduct of Operations	2.1.17	Ability to make accurate, clear and concise verbal reports.	3.5	1
	2.1.27	Knowledge of system purpose and/or function.	2.8	1
	2.1.28	Knowledge of the purpose and function of major system components and controls.	3.2	1
Category Total:			3	
Equipment Control	2.2.1	Ability to perform pre-startup procedures for the facility, including operating those controls associated with plant equipment that could affect reactivity.	3.7	1
	2.2.3	(multi-unit) Knowledge of the design, procedural, and operational differences between units.	3.1	1
	2.2.34	Knowledge of the process for determining the internal and external effects on core reactivity.	2.8	1
Category Total:			3	
Radiation Control	2.3.11	Ability to control radiation releases.	2.7	1
	2.3.9	Knowledge of the process for performing a containment purge.	2.5	1
	2.3.4	Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	2.5	1
Category Total:			3	
Emergency Plan	2.4.32	Knowledge of operator response to loss of all annunciators.	3.3	1
	2.4.31	Knowledge of annunciators alarms and indications, and use of the response instructions.	3.3	1
	2.4.25	Knowledge of fire protection procedures.	2.9	1
	2.4.26	Knowledge of facility protection requirements including fire brigade and portable fire fighting equipment usage.	2.9	1
Category Total:			4	
Generic Total:			13	

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