INITIAL SUBMITTAL OF THE WRITTEN EXAMINATION

FOR THE QUAD CITIES EXAMINATION - DEC 2002 (Part 1 of 2)

QUAD CITIES 2002 NRC EXAM REFERENCES PROVIDED

RO/SRO

#7 – QCOA 1400-02

#16 – QCOP 0201-11

SRO

#78 (103) – T.S.3.3.6.1

#81 (106) – SAF 1.6, 1.7 (also includes 1.8)*

#83 (108) – QGA DETAIL A

#85 (110) – TS. 3.3.1.2

#86 (111) – SAF 1.5

#89 (114) – OP-AA-106-101, ATACHMENT A

#90 (115) – T.S. 3.8.4

#91 (116) – QGA 100

#92 (117) – QGA DETAIL K (DSIL)

#93 (118) – T.S. 3.4.7 & 3.4.8

#94 (119) – QGA 200

#95 (120) – QGA ~~200~~ 100

#98 (123) – ODCM, FIGURE 1

Facility: Quad Cities Date of Exam: 12-2-02 Exam Level: SRO

Tier	Group	K/A Category Points											Point Total
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	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		17
					4		4		4		5		

Note:
1. Ensure that at least two topics from every WA category are sampled within each tier (i.e., 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 exam must total 100 points.
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.
6.* The generic **K/As** in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system.
7. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings for the SRO license level, and the point totals for each system and category. **K/As** below 2.5 should be justified on the basis of plant-specific priorities. Enter the tier totals for each category in the table above.

Facility: Quad Cities

BWR SRO Examination Outline

Printed: 10/14/2

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
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

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Facility: Quad Cities **BWR SRO (.nination Outline** Printed: 10/14/2(

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
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

K/A Category Totals: 4 4 5 4 5 4 **Group Point Total:** 26

NRC CDP # KA

Facility: Quad Cities

BWR SRO (ination Outline

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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
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

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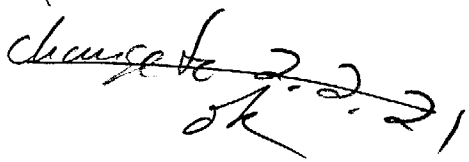
ES - 401 **Emergency and Abnormal Plant Evolutions - Tier 1 / Group 2** **Form ES-401-1**

E/APE #	E/APE Name / Safety Function	K1	K2	K3	A1	A2	G	KA Topic	Imp.	Points
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.	4.0	1

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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
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
290001	Secondary Containment / 5									X			A3.02 - Normal building differential pressure: Plant-Specific	3.5	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
	K/A Category Totals:	3	2	2	2	2	2	2	2	2	1	3	Group Point Total:		23

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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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**

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**	**1**		**Group Point Total:**	**4**

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Generic Knowledge and Abilities Outline (Tier 3)

Printed: 10/14/2002

BWR SRO Examination Outline

Facility: Quad Cities

Form ES-401-5

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: 10/14/2002

BWR SRO Examination Outline

Facility: Quad Cities

Form ES-401-5

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

Facility: Quad Cities Date of Exam: 12-02-02 Exam Level: RO

Tier	Group	K/A Category Points											Point Total
		K 1	K 2	K 3	K 4	K 5	K 6	A 1	A 2	A 3	A 4	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
	Tier Totals	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. Ensure that at least two topics from every K/A category are sampled within each tier (i.e., 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 exam must total 100 points.
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.
6.* The generic K/As in Tiers 1 and 2 shall be selected from Section 2 of the K/A Catalog, but the topics must be relevant to the applicable evolution or system.
7. On the following pages, enter the K/A numbers, a brief description of each topic, the topics' importance ratings for the SRO license level, and the point totals for each system and category. K/As below 2.5 should be justified on the basis of plant-specific priorities. Enter the tier totals for each category in the table above.

Facility: Quad Cities | BWR RO Examination Outline | Printed: 10/14/2

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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Facility: Quad Cities **BWR RO Examination Outline** Printed: 10/14/2

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

NRC 2007 PSA #2A

Facility: Quad Cities

BWR RO Examination Outline

Printed: 10/14/2

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: Quad Cities

BWR RO Examination Outline

Printed: 10/14/2

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 - SBGT/FRVS	3.8	1

K/A Category Totals: 2 1 0 1 0 0 **Group Point Total:** 4

NRC COPY #1A

Facility: Quad Cities

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

NRC COPY #1 A

Facility: Quad Cities

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
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
239002	Relief/Safety Valves / 3							X					A1.03 - Air supply: Plant-Specific	2.8	1

NRC COPY #1

Facility: Quad Cities

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
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

NRC COPY #1A

BWR RO Ex(iation Outline Printed: 10/1(

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
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
272000	Radiation Monitoring System / 7				X								K4.01 - Redundancy	2.7	1

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
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**	**1**	**2**	**2**	**0**	**Group Point Total:**		**19**

NRC COPY #1A

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)

BWR RO Examination Outline

Printed: 10/14/2002

Facility: Quad Cities

Form ES-401-5

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**

Tier / Group	Randomly Selected K/A	Reason for Rejection
SRO 1 / 1	500000 2.1.33	Not applicable at Quad Cities. Randomly replaced by 295023 A2.02
BOTH 1 / 2	295033 EA1.06	Performed by Radiation Protection at Quad Cities. Randomly replaced by 295034 A2.02
RO 2 / 3	233000 K2.02	Double Jeopardy with 203000 K2.01. Randomly replaced by 234000 K3.03
SRO 1 / 2	600000 2.2.25 2.2.21	Will use Administrative Technical Requirements (ATRs) instead of Technical Specifications (TS) since requirements were moved from TS to ATR. Another K/A

EXAMINATION ANSWER KEY

2002 Quad Cities NRC Exam

1	ID: SR-0302-K21	Points: 1.00

Reactor power is increased from 20 to 100%.
The CRD Flow Control Valve AO 1(2)-0302-06A is in manual.

In order to maintain CRD cooling water flow constant, the NSO will have to manually __________ the CRD Flow Control Valve (AO 1(2)-0301-06A) which will __________ CRD Drive Water differential Presssure.

implies needed to affect change ∴ part B is

A. CLOSE; ~~AFFECT~~ increase

B. CLOSE; ~~NOT AFFECT~~ decrease

C. OPEN; ~~NOT AFFECT~~ decrease

D. OPEN; ~~AFFECT~~ increase

of open or close valve to increase CRD pressure — appears too simplistic

Answer: D

Question 1 Details

Question Type:	Multiple Choice
Topic:	Question #1 (RO/SRO)
System ID:	6204
User ID:	SR-0302-K21
Status:	Active
Must Appear:	No
Difficulty:	4.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LF-0302 R3 pg 15, fig 4
User Text:	201003 A1.01
User Number 1:	3.70
User Number 2:	3.80
Comment:	New question Comprehension With the FCV in manual, it will have to be manually opened as Rx pressure increases to maintain the same Cooling water flow. As the FCV is opened, it will affect CRD drive water pressure because it taps off downstream of the FCV.

what part? ?

check valve prevents bleeding down accumulator pressure on a loss of a CRD pump.

5. A charging water vent valve is located in the Reactor Building for the purpose of filling the system during an initial start.

G. Flow Control Station

1. The flow control station is provided to automatically control the system flow (normally 60 gpm). Two flow control valves are arranged in parallel with manual isolation valves. One flow control valve in service while the other is in standby. Limit switches mounted on each flow control valve are connected to red and green position indicating lights on the 90X-5 panel.

SR-0302-K14
SR-0302-K15
SR-0302-K16
****SR-0302-K21**

2. The flow control valves are air operated valves which open against spring pressure by air from the instrument air system. The pneumatic control signal to the valve is selected by a three-way valve which is controlled locally at the flow control station panel. The three way valve can be positioned so the control signal will come from local or remote.

   a. LOCAL - In local the control pneumatic signal is controlled by a manual pressure regulator mounted on the flow control station panel.

   b. REMOTE - In remote the pneumatic signal comes from an E/P converter. The converter receives an electrical signal from the flow controller on the 90X-5 panel.

3. The flow indicating controller located on the 90X-5 panel has two modes of operation.

SR-0302-K14
SR-0302-K15
SR-0302-K16
****SR-0302-K21**

   a. Automatic

      1) Selected by pushing the "A" button just below the bargraph, the automatic mode maintains pump flow at a pre-selected setpoint, normally 60 gpm.

      2) When the CRD FIC is in the automatic mode, the FIC monitors system flow, using a venturi installed in the system upstream of the charging header, and compares it to what the FIC setpoint is adjusted to, then sends a signal to E/P converter to open or close the FCV.

3) The automatic flow control setpoint is displayed on the controller and can be changed by pushing the setpoint up/down pushbuttons.

b. Manual Mode

1) Selected by pushing the "M" button just below the bargraph.

2) ~~When the CRD FIC~~ is in the manual mode, the FIC maintains the same demand signal that was being maintained in the automatic mode when switching from Automatic to Manual mode.

3) In order to vary pump flow while in the manual mode, a slide lever is moved to the right (O) to increase flow or the left (C) to decrease flow. Two rate of change positions are available for both increasing and decreasing.

c. Fail Light

A red fail light in the upper right corner of the flow controller indicates when the controller has failed.

d. Alarm (ALM) Light

SR-0302-K14
SR-0302-K15
SR-0302-K16
****SR-0302-K21**

An amber alarm light is provided below the fail light to indicate one of the following:

1) The high or low limit alarm has actuated, or

2) The input/output signal line is open, or

3) The voltage of the internal data protect battery is low.

e. Additional Controls

Pushbuttons C and PF have no function in this application. Depressing them can confuse the controller's programming and should not be used.

4. Local Manual

a. In this mode the 3-way selector valve is in the LOCAL position.

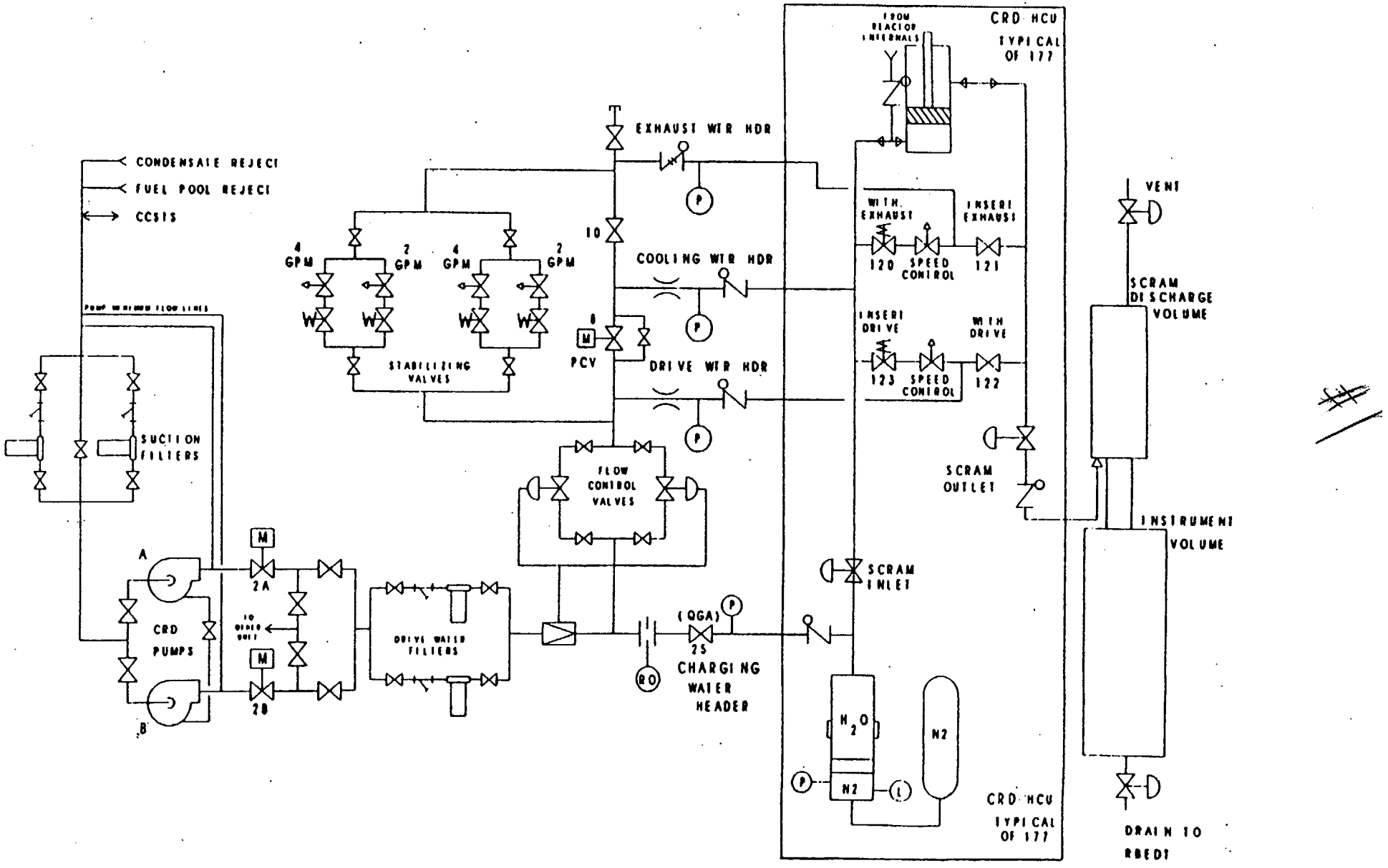


FIGURE 0302 - 4	REV. 0
CRDH SYSTEM	

2 **ID: SR-0207-K20** **Points: 1.00**

Rod step 20 has control rods H-10, F-8, H-6 and K-8 with a rod limit from position 08 to 12.

Control rod H-10 is withdrawn to position 12.
Control rod F-8 is withdrawn to position 10.

The NSO then selects control rod H-6, which is currently at position 08.

On the RWM display, control rod H-6 will indicate:

A. green.

B. white.

C. red.

D. cyan.

Answer: A

Question 2 Details

Question Type:	Multiple Choice
Topic:	Question #2 (RO/SRO)
System ID:	9714
User ID:	SR-0207-K20
Status:	Active
Must Appear:	No
Difficulty:	1.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOP 0207-01, R.9, pg. 5
User Text:	201006 A1.03
User Number 1:	2.90
User Number 2:	3.00
Comment:	New question. Higher. Control rods are in red when they are out of sequence, green when they are in the current latched step or selected for rod exercising, white if they are not the rod selected for exercising or not part of the in-sequence step. H-6 should remain green the entire time.

#7

F.4.a. (cont'd)

(3) The third line contains the correct position for the selected rod according to the current latched step of the RWM. If the selected rod is in the current latched step, a range of allowable positions will be displayed.

b. **Use** the lower left area of the Main Display Screen for the following information about the current latched step in the sequence:

(1) The first line contains the current latched step in the sequence.

(2) The second line contains the array designation that is to be moved in this step.

(3) The third line contains the range of movement allowed for the rods in this step.

c. **Use** the center portion of the Main Display Screen for the full core display showing all current rod positions.

(1) Rods that appear green are in the current latched step.

(2) Rods that appear red are rods that have withdraw errors.

(3) Rods that appear magenta are rods that have insert errors.

(4) Rods that appear light blue are rods that have been taken out of service with the RWM.

(5) Rods that appear yellow are rods that have had a substitute value entered for their position.

(6) All other rods will appear white on the Full Core Display.

(7) The selected rod will be displayed in inverse video to highlight it.

3 **ID: SR-0207-K20** **Points: 1.00**

All RWM blocks are enabled.
The NSO is performing QCGP 1-1, NORMAL UNIT STARTUP.
Rod step one contains control rods H-1, F-1, D-2, B-4, A-6, A-8, A-10, B-12, D-14, F-15, H-15, K-15, M-14, P-12, R-10, R-8, R-6, P-4, M-2, K-1.
Control rods H-1, F-1 and D-2 are fully withdrawn.

How would the RWM respond if B-5 pushbutton was depressed and attempted to be withdrawn?

A. RWM select block would prevent rod motion.

B. RWM would allow the rod to be moved until low power setpoint was reached.

C. RWM would prevent the rod from being selected.

D. RWM withdrawal block would prevent rod motion when the control rod reached position 02.

Answer: A

Question 3 Details

Question Type:	Multiple Choice
Topic:	Question #3 (RO/SRO)
System ID:	9715
User ID:	SR-0207-K20
Status:	Active
Must Appear:	No
Difficulty:	4.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCGP 1-1, R 43, pg. 38-40
User Text:	201006A3.02
User Number 1:	3.50
User Number 2:	3.40
Comment:	New question. Higher. When an incorrect rod is selected, the RWM will issue a select block. A withdrawal block will be issued when the OOS rod is withdrawn 1 notch. The Mode Switch cannot be in SHUTDOWN and moving rods. When in REFUEL, a rod block is issued when the 2nd rod is selected with a rod withdrawn.

F. PROCEDURE

NOTE

IF using this procedure for Turbine start up only, **THEN** proceed to step F.7. **Mark** steps F.1. through F.6 "N/A".

INITIALS

F.1. Begin Reactor start up as follows:

a. Prior to placing Mode Switch in START/HOT STBY, **verify** all applicable surveillances on Attachment D for MODE 3 or MODE 4 to MODE 2 Transition are current or within the 25% grace period. Unit Supervisor must EVALUATE all previous incomplete steps for Mode Change impact. _____

NOTE

It is permissible to enter MODE 2 to withdraw selected control rods for the purposes of determining the OPERABILITY of the RWM. The RWM must be determined OPERABLE within 1 hour after any control rod is withdrawn at ≤ 10% RTP. The following steps test the RWM by verifying proper indication of the selection error of at least one out-of-sequence control rod and by verifying the rod block function. This Channel Functional Test (F.1.c - F.1.g) need not be performed if it has been completed within the last 92 days. (H.1.n)

b. **Enter** MODE 2 by placing RX MODE SELECT switch in START/HOT STBY. _____

c. **Verify** the following for RWM testing:

(1) RWM Mode Switch in NORMAL position. _____

(2) NO Control Rod drifts present. _____

F.1. (cont'd)

INITIALS

d. **Select** the first Control Rod in selected Control Rod sequence. _____

(1) **Record** if the READY light is present for the respective RWM computer:

RWM "A" _____ RWM "B" _____

e. **IF** "A" RWM READY light is lit, **THEN**:

(1) **Place** selection switch to "A". _____

(2) **Depress** INITIALIZE button. _____

(3) **Verify** insert and withdraw blocks cleared. _____

(4) **Verify** NO alarm messages are present. _____

(5) **Depress** DIAGNOSTIC button. _____

(6) **Verify** diagnostic is completed with NO errors. _____

(7) **Verify** screen indicates BELOW 20% POWER with blocks enabled. _____

f. **IF** "B" RWM READY light is lit, **THEN**:

(1) **Place** selection switch to "B". _____

(2) **Depress** INITIALIZE button. _____

(3) **Verify** insert and withdraw blocks cleared. _____

(4) **Verify** NO alarm messages are present. _____

(5) **Depress** DIAGNOSTIC button. _____

(6) **Verify** diagnostic is completed with NO errors. _____

(7) **Verify** screen indicates BELOW 20% POWER with blocks enabled. _____

F.1. (cont'd)

INITIALS

g. **Select** an out-of-sequence Control Rod and **verify** that a Rod Block occurs: _____

(1) **Disable** RWM select blocks. _____

(2) **Verify** Rod Block resets. _____

(3) **Notch** withdraw the out-of-sequence Control Rod and **verify** ROD BLOCK occurs at position 02. _____

(4) **Return** Control Rod to position 00. _____

(5) **Select** an in-sequence Control Rod. _____

(6) **Enable** RWM select blocks. _____

(7) **Verify** blocks enabled to 100% power. _____

h. **IF** neither RWM is operable, **THEN notify**:

(1) Unit Supervisor. _____

(2) Qualified Nuclear Engineer. _____

F.2. **Verify** Nuclear Instrumentation and computer setup as follows:

a. For SRMs: (H.1.m, H.4.c.(2))

(1) **Verify all** operable SRMs are fully inserted in the core. _____

(a) The above required SRM channels may be reduced to three operable SRM channels with the concurrence of Operations Manager. (H.8.q)

_____
Operations Manager

(2) **Verify all** operable SRMs are indicating $\geq$ 3.0 cps **OR** 0.7 cps with a signal to noise ratio $\geq$ 20:1 in MODE 2 with IRMs on range 2 or below. _____

4 **ID: SR-0202-K19** **Points: 1.00**

Unit 2 is operating at 100% power in a normal electrical line-up when the reactor scrams and the auxiliary power transfer fails.

Which of the following components are de-energized?

A. 2A Recirculation Motor Generator Set

B. 2A Condensate/Condensate Booster Pump

C. 2B Recirculation Motor Generator Set

D. 2B Condensate/Condensate Booster Pump

Answer: A

what part of sys determ which mtr trips? i.e. which train? 21, 22, 23, 24?

Question 4 Details

Question Type:	Multiple Choice
Topic:	Question #4 (RO/SRO)
System ID:	9716
User ID:	SR-0202-K19
Status:	Active
Must Appear:	No
Difficulty:	2.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QOA 6500-01, r. 6, pg 1,2
User Text:	202001 K2.02
User Number 1:	3.20
User Number 2:	3.30
Comment:	New question. Higher. T-21 supplies Busses 21 and 24, which auto xfer to T-22 on Gen trip. 2A Recirc MG is power from bus 21, 2B from bus 22. 2A and 2B Cond/Cond Booster pumps are powered from Bus 23.

4 KV BUS 11(21) FAILURE

A. SYMPTOMS

1. Alarms.

   a. 4 KV MAIN FEED BREAKER TRIP.

   b. 4 KV BUS 11(21) MAIN/RES BKR AUTO CLOSE.

   c. 4 KV BUS 11 & 12(21 & 22) LOW VOLTAGE.

B. AUTOMATIC ACTIONS

1. The following equipment will auto-trip if the bus is de-energized:

   a. Reactor feed pump 1A(2A).

   b. Reactor feed pump 1C(2C) if it is being fed from Bus 11(21).

   c. Recirculation MG set 1A(2A).

2. **Unit 2 Only:** A Reactor recirc runback to approximately 70% of rated flow will occur if steam flow is greater than approximately 85% of rated and either of the following conditions are present:

   a. An RFP auto-trips after three RFP operations have been established AND Reactor water level drops below the low level alarm setpoint within 45 seconds after the RFP auto-trip.

   b. Less than four Condensate/Condensate Booster Pumps are running AND Total Feedwater Flow is greater than approximately 90% of rated.

C. IMMEDIATE OPERATOR ACTIONS

1. None.

D. SUBSEQUENT OPERATOR ACTIONS

1. Verify automatic bus transfer to opposite transformer occurred:

   a. IF automatic bus transfer did NOT occur, THEN attempt to close the reserve feed breaker manually unless alarm 901(2)-8 F-3, 4KV BUS OVERCURRENT, is up.

   b. IF breaker tripped, THEN determine the cause and reset trip at Bus 11(21).

d. **For Unit 2 only:** Check STATOR OUTPUT VOLT at Panel 902-8 AND verify nominal voltage of 18KV (green band).

CAUTION

Verifying main generator voltage is essential as ELMS study states 4KV buses will fall below 4000V during single transformer operation during full load conditions.

(1) IF main generator voltage is 17KV or less, THEN notify the Load Dispatcher to increase system voltage and concurrently, with US permission:

(a) Decrease main generator load and/or

(b) Increase main generator excitation by increasing VARS and/or

(c) Secure any large 4KV loads (Circulating Water Pump, RFP, etc.) as operation will allow.

3. Notify Shift Manager to classify the event as a possible E-Plan condition and initiate E-Plan as necessary.

4. IF Bus 14(24) is lost, THEN refer to Technical Specification 3.8.1 or 3.8.2 for loss of ability to supply Bus 14-1(24-1) from T12(22).

E. DISCUSSION

1. The normal feed for Bus 14(24) is Transformer 11(21). During shut down or start up, the feed is from Transformer 12(22).

2. WHEN the bus is de-energized, THEN the following equipment is affected:

a. Control Rod Drive Pump 1B(2B).

b. Residual Heat Removal System Service Water Pump 1C(2C).

c. Residual Heat Removal System Service Water Pump 1D(2D).

d. Condensate and Condensate Booster Pump 1C(2C).

e. Condensate and Condensate Booster Pump 1D(2D).

5 **ID: S/R-1000-K19** **Points: 1.00**

Unit 1 was operating at full power when a plant casualty occurred.
Unit 1 scrammed as a result of the transient.
The Unit NSO noted that U1 HPCI started automatically while U1 RCIC remained in a standby lineup as expected.
Both Unit 1 and the 1/2 Emergency Diesel Generators (EDGs) started automatically but the Unit 1 EDG TRIPPED on an overspeed condition.

ADD. Bus 13-1 Trip on Overcurrent.

Assuming all equipment was in a normal operating configuration prior to the transient, and that the remaining auto actions occurred, what is the expected status of Unit 1 RHR pumps?

	A & B	C & D
A.	RUNNING	OFF
B.	RUNNING	RUNNING
C.	OFF	OFF
→ D. | OFF | RUNNING |

! ADD A FAULT on one of the Buses (13-1 or 14-1) and with EDG Trips on over current how does the RHR pumps status.

Answer: B

Question 5 Details

Question Type:	Multiple Choice
Topic:	Question #5 (RO/SRO)
System ID:	9496
User ID:	S/R-1000-K19
Status:	Active
Must Appear:	No
Difficulty:	4.00
Time to Complete:	2
Point Value:	1.00
Cross Reference:	LF-1000, R.6, pg 62
User Text:	203000 K2.01
User Number 1:	3.50
User Number 2:	3.50
Comment:	Bank question. Comprehension. 1A and ~~1C~~ 1B RHR pumps are powered from Bus 13-1, which never lost power from Transformer 12. The EDGs auto started on 2.5 psig, but would not have loaded to busses 13-1 and 14-1. 1C and 1D RHR pumps are powered from bus 14-1, which never lost power from Transformer 11 then 12.

1/94 OK ✓ 6MT 11/14/02

with NO fault on the system pwr supplies don't need to remove anything about RHR pwr supplies just that no electrical bus problem. ALL RHR pumps running?

Also, w/o specific on plant casualty just a Rx scram would it normally start RHR pumps?

2. The RHR system supports the Primary Containment system by:

   a. Maintaining drywell temperature and pressure within design limits, during LOCA conditions, through the use of drywell and torus sprays.

   b. Maintaining the torus water temperature within its heat capacity limit.

C. Power Supplies

1. Bus 13-1 (23-1) supplies power to RHR Pumps A and B.
2. Bus 14-1 (24-1) supplies power to RHR Pumps C and D.
3. Bus 13 (23) supplies power to RHR SW Pumps A and B.
4. Bus 14 (24) supplies power to RHR SW Pumps C and D.
5. MCC 18-1B (28-1B) supplies power to:

   a. Valves MO-1001-7A and B (Torus Suction)
   b. Valves MO-1001-43A and B (Shutdown Cooling Suction)
   c. Valve MO-1001-16A (RHR Hx Bypass)
   d. Valve MO-1001-19A (RHR Loop Crosstie)
   e. Valve MO-1001-50 (Shutdown Cooling Suction)
   f. Valve MO-1001-23A (Outboard Drywell Spray)
   g. Valve MO-1001-26A (Inboard Drywell Spray)
   h. Valve MO-1001-34A (Torus Cooling & Test Line Isolation)
   i. Valve MO-1001-36A (Torus Cooling)
   j. Valve MO-1001-37A (Torus Spray)
   k. Valve MO-1001-5A (RHR Hx SW Discharge)
   l. Valve MO-1001-187A (RHR SW Flow Reversal [28-1B, Unit Two only])

6. MCC 19-4 (29-4) supplies power to:

   a. Valves MO-1001-7C and D (Torus Pool Suction)
   b. Valves MO-1001-43C and D (Shutdown Cooling Suction)
   c. Valves MO-1001-16B (RHR Hx Bypass)
   d. Valves MO-1001-19B (RHR Loop Crosstie)
   e. Valve MO-1001-50 (Shutdown Cooling Suction)
   f. Valve MO-1001-23B (Outboard Drywell Spray)

****SR-1000-K19**
SR-1000-K17

Q: With this arrangement of power supplies, which EDG will be feeding the 1A RHR pump during a loss of off-site power?

A: 1/2 EDG.

6 **ID: SR-2300-K19** **Points: 1.00**

The HPCI Flow Controller is powered from:

A. 125 VDC.

B. Instrument Bus.

C. Essential Service.

D. 250 VDC.

Answer: C

Question 6 Details

Question Type:	Multiple Choice
Topic:	Question #6 (RO/SRO)
System ID:	9717
User ID:	SR-2300-K19
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LN-2300, R. 10, pg. 56
User Text:	206000 K2.04
User Number 1:	2.50
User Number 2:	2.70
Comment:	New question. Memory. 125 VDC powers the initiation logic, 250 VDC powers the valves, Instrument Bus powers nothing on HPCI.

unit's HPCI is inop due to not having power to the valves and motors for the support pumps.

The new 2399-40 MOV receives 480V AC power from MCC 19-1(29-1).

4. The auxiliary oil pump and the emergency oil pump are 250V DC pumps powered from MCC 1A (2A).

5. The flow controller is fed from the Essential Service Bus. On a loss of essential service you lose power to the flow indicating controller. HPCI is inoperable with no power to the flow indicating controller. HPCI can still be used if speed is controlled manually at HPCI with the local handwheels or can be controlled from the Control Room using the MSC.

****SR-2300-K23d**
****N-2300-K23d**

6. The gland seal exhaust blower is 250V DC and is powered by MCC 1A (2A).

7. The gland seal hotwell pump is a 250V DC pump powered by MCC 1A (2A).

8. The gland seal cooling water pump is powered by MCC 19-1(29-1).

9. The turning gear motor is a 250V DC motor powered from MCC 1A (2A).

10. Slave trip units from the Analog Trip System provide level initiation instruments. These transmitters provide control room indicators and computer inputs.

DCP 9900377
Mechanical Yarways are being replaced by new slave units in the ATS panel.

11. Trip signals will be generated from the ATWS panels for turbine trips.

7 ID: SR-1400-K26 Points: 1.00

Annunciator 902-3 D-5, CORE SPRAY SYS 2 BUS/LOGIC PWR FAILURE is up on Unit 2.

A casualty occurs on Unit 2 resulting in the following conditions:

RPV water	-150 inches and lowering.
Reactor pressure	300 psig and lowering.
Drywell pressure	8 psig and rising.

At this point in this event, predict how the Unit 2 Core Spray system has responded and describe any actions required to restore it.

A. "B" loop will auto-initiate and inject, while "A" loop will NOT auto-initiate, but may be manually started locally.

Manually start the Unit 2 Diesel Generator, verify it energizes Bus 24-1, manually initiate Core Spray Subsystem 2B and restore Core Spray Subsystem 2B 125 VDC control power.

B. "A" loop will auto-initiate and inject, while "B" loop will NOT auto-initiate, and can not be manually started from the Control Room or locally.

Manually start the Unit 2 Diesel Generator, verify it energizes Bus 24-1, manually initiate Core Spray Subsystem 2B and restore Core Spray Subsystem 2B 125 VDC control power.

C. "A" loop will auto-initiate and inject, while "B" loop will NOT auto-initiate, but may be manually started locally.

Manually initiate Core Spray Subsystem 2B and restore Core Spray Subsystem 2B 125 VDC control power.

D. "B" loop will auto-initiate and inject, while "A" loop will NOT auto-initiate, but may be manually started locally.

Manually initiate Core Spray Subsystem 2A and restore Core Spray Subsystem 2B 125 VDC control power.

Answer: C

Ref provided in exam / with ref- a direct look

do not provide procedure

Question 7 Details

Question Type:	Multiple Choice
Topic:	Question #7 (RO/SRO)
System ID:	9718
User ID:	SR-1400-K26
Status:	Active
Must Appear:	No
Difficulty:	3.50
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOA 1400-02, R. 7
User Text:	209001 A2.04
User Number 1:	2.90
User Number 2:	3.00
Comment:	Modified question. Higher. With "2B" 125 VDC out, initiation logic for "B" loop is out but still has power to the pumps and components. "A" loop is unaffected. The EDG should auto start and load on the loss of Bus 24-1, so it should not need to be manually started.

CORE SPRAY LOSS OF 125 VDC AUTO INITIATION CONTROL POWER

A. SYMPTOMS

A.1. Possible alarms:

a. 901(2)-3 Panel:

(1) C-5, CORE SPRAY SYS 1 BUS/LOGIC PWR FAILURE

(2) D-5, CORE SPRAY SYS 2 BUS/LOGIC PWR FAILURE

B. AUTOMATIC ACTIONS

B.1. **IF** loss of 125 VDC Core Spray Subsystem 1(2)A **THEN**:

a. Core Spray Subsystem 1(2)A automatic initiation logic is inoperative and Core Spray Subsystem 1(2)A will **NOT** auto actuate regardless of the condition of Core Spray Subsystem 1(2)B initiation logic.

b. 1/2 Diesel Generator LOCA auto start signal for Unit 1(2) and output breaker auto transfer signal due to a LOCA signal on Unit 1(2) is inoperative.

c. ADS Channel 1(2)A logic and timer is inoperative.

d. ADS Channel 1(2)A LOCA signal to RHR Channel 1(2)A initiation logic is inoperative.

e. Core Spray Subsystem 1(2)A to CAM Division 1(2)A LOCA isolation signal is inoperative.

f. RCIC Channel 1(2)A initiation logic is inoperative.

g. Drywell Coolers 1(2)A, 1(2)B, 1(2)F and Drywell 1(2) Booster Fan LOCA auto trip signal is inoperative.

h. RBCCW Pump 1(2)A LOCA auto trip signal is inoperative.

D. SUBSEQUENT OPERATOR ACTIONS

NOTE

Restore power to the respective essential bus prior to restoration of control power to the affected core spray subsystem.

IF only Alarm C-5, CORE SPRAY SYS 1 BUS/LOGIC PWR FAILURE, is lit, **THEN** only Core Spray Subsystem 1(2)A automatic initiation logic is inoperable.

IF only Alarm D-5, CORE SPRAY SYS 2 BUS/LOGIC PWR FAILURE, is lit, **THEN** only Core Spray Subsystem 1(2)B automatic initiation logic is inoperable.

CAUTION

During loss of 125 VDC control power to Core Spray Subsystem 1(2)A/B, manual initiation of either subsystem is possible, however all valve protective interlocks except MO 1(2)-1402-38A/B, CS PMP MIN FLOW VLV, are inoperable.

D.1. **IF** Core Spray Subsystem 1(2)A/B is required for adequate core cooling, **THEN manually initiate** Core Spray Subsystem 1(2)A/B per QCOP 1400-02.

D.2. **IF** Alarm C-5, CORE SPRAY SYS 1 BUS/LOGIC PWR FAILURE, is lit **AND** power to Bus 13-1 (23-1) has been restored, **THEN restore** Core Spray Subsystem 1(2)A 125 VDC control power as follows:

a. At 125 VDC Turbine Building Dist. Panel 1(2)A-1, **verify closed** ckt. 05.

b. For Unit 2 only, at Bus 23-1 **verify** knife Test Switch (TS) located under black removable covers below protective relays on front of Bus 23-1 Cubicle 09, Component TS-SJ, left box, Test Switch H **closed**.

D.3. (cont'd)

NOTE

Alarm 901(2)-3 D-5, CORE SPRAY SYS 2 BUS/LOGIC PWR FAILURE, will **NOT** clear unless power to Bus 14-1 (24-1) **AND** 125 VDC control power to Core Spray Subsystem 1(2)B have been restored.

d. **WHEN** 125 VDC control power to Core Spray Subsystem 1(2)B has been restored, **THEN verify** Alarm 901(2)-3 D-5, CORE SPRAY SYS 2 BUS/LOGIC PWR FAILURE, clears.

D.4. **IF** Core Spray Subsystem 1(2)A/B can **NOT** be restored, **THEN**:

a. **Notify** Shift Manager to classify event as a possible GSEP condition and **initiate** GSEP as necessary.

b. **Perform** QCAP 0230-19.

c. **Initiate** corrective action.

E. DISCUSSION

This procedure covers the abnormal condition for loss of 125 VDC power to Core Spray Subsystem 1(2)A and Core System Subsystem 1(2)B. The main entry condition are the Alarms 901(2)-3 C-5, CORE SPRAY SYS 1 BUS/LOGIC PWR FAILURE, to indicate loss of Core Spray Subsystem 1(2)A or D-5, CORE SPRAY SYS 2 BUS/LOGIC PWR FAILURE, for Core Spray Subsystem 1(2)B. However, these alarms can also be entry conditions for the loss of Bus 13-1 (23-1) or Bus 14-1 (24-1) respectively. It is the intent of this procedure to restore power to the respective essential bus first (major abnormal condition) per QOA 6500-5/6, **THEN restore** control power to the affected Core Spray Subsystem (less severe abnormal condition).

Loss of 125 VDC control power to Core Spray Subsystem 1(2)A/B renders automatic initiation logic inoperative. Manual initiation and control of Core Spray Subsystem 1(2)A/B is still possible, however **WITHOUT** the protective valve interlocks except MO 1(2)-1402-38A/B, CS PMP MIN FLOW VLV.

G.2. P&IDs:

a. M-36 (M-78), Diagram of Core Spray Piping.

G.3. Drawings:

a. 4E-1345 (4E-2345), Schematic Control Diagram 4160 V. Bus 13-1 Stand By Diesel 1/2 Feed Bkrs Unit 1 (Unit 2).

b. 4E-1346 (4E-2346), Schematic Control Diagram 4160 V. Bus 14-1 Stand By Diesel 1(2) Feed Bkrs Unit 1 (Unit 2).

c. 4E-1430 sh 1 (4E-2430 sh 1), Schematic Diag Core Spray System I & II Unit 1 (Unit 2).

d. 4E-1430 sh 2 (4E-2430 sh 2), Schematic Diag Core Spray System I & II Unit 1 (Unit 2).

e. 4E-1461 sh 1,2, A (4E-2461 sh 1, 2 A) Schematic Control Diagram Auto Blowdown Part I Unit 1(2)

f. 4E-1462 sh 1,2, A (4E-2462 sh 1, 2 A) Schematic Control Diagram Auto Blowdown Part II Unit 1(2)

g. 4E-1655D (4E-2655K), 4160 V. Switchgear Bus 13-1 (23-1) Cubicle 2 (9) Internal Schematic & Device Location Diag.

h. 4E-1656G (4E-2656D), 4160 V. Switchgear Bus 14-1 (24-1) Cubicle 9 (2) Internal Schematic & Device Location Diag.

i. 4E-1757A (4E-2757A), Wiring Diagram Panel 901(2)-32 Part 1.

j. 4E-1758A (4E-2758A), Wiring Diagram Panel 901(2)-33 Part 1.

G.4. Manuals:

None.

G.5. Procedures:

a. QCOP 1400-02, Core Spray Manual Initiation.

b. QCAP 0230-19, Equipment Operability.

Original Exam Question #7

EXAMINATION ANSWER KEY

Modified ?

1 ID: 81181 Points: 1.00

Unit 1 has experienced a loss of 125 VDC bus 1B.
A casualty occurs on Unit 1 resulting in:
Reactor water is +19" and lowering.
Reactor pressure is 850 psig and lowering.
Drywell pressure is 4 psig and rising.

At this point in this event, predict how, if at all, the Unit 1 Core Spray system has responded.

A. "B" loop will auto-initiate and run on minimum flow, while "A" loop will not auto-initiate, but may be manually started locally.

B. "A" loop will auto-initiate and run on minimum flow, while "B" loop will not auto-initiate, but may be manually started locally.

C. "A" loop will auto-initiate and run on minimum flow, while "B" loop will not auto-initiate, and can not be manually started from the Control Room or locally.

D. "B" loop will auto-initiate and run on minimum flow, while "A" loop will not auto-initiate, and can not be manually started from the Control Room or locally.

Answer: B

NRC COPY #1

Associated objective(s):

SR-1400-K18 (Freq: LIC=I)
LIST the plant systems which are supported by the following systems and DESCRIBE the nature of support:
a. Core Spray 125vdc logic circuit
b. ECCS Keep Fill System

SR-1400-K23 (Freq: LIC=B)
Given a Core Spray System operating mode and various plant conditions, PREDICT how the Core Spray System will respond to the following support system failures:
a. Loss of 125vdc
b. Loss of 4160vac
c. Loss of 480vac
d. ECCS suction strainer clogging

SR-1400-K26 (Freq: LIC=B)
EVALUATE given Core Spray System key parameter indications and/or responses depicting a system specific abnormality/failure and DETERMINE a course of action to correct or mitigate the following abnormal conditions:
a. Loss of 125vdc power to Core Spray logic
b. 4 and 25 valves open simultaneously
c. Core Spray pump trip
d. Abnormal Core Spray discharge header pressure
e. Core Spray System fails to start automatically
f. Inadvertent Core Spray System start
g. ECCS suction strainer clogging

Question 1 Details

Question Type:	Multiple Choice
Topic:	ILT.11683
System ID:	6090
User ID:	81181
Status:	Active
Must Appear:	No
Difficulty:	0.00
Time to Complete:	2
Point Value:	1.00
Cross Reference:	
User Text:	209001K4.08
User Number 1:	3.80
User Number 2:	4.00
Comment:	With "1B" 125 VDC out, initiation logic for "B" loop is out but still has power to the pumps and components. "A" loop is uneffected.

Original Bank Question #1

EXAMINATION ANSWER KEY

Modified ?

1 ID: 81181 Points: 1.00

Unit 1 has experienced a loss of 125 VDC bus 1B.
A casualty occurs on Unit 1 resulting in:
Reactor water is +19" and lowering.
Reactor pressure is 850 psig and lowering.
Drywell pressure is 4 psig and rising.

At this point in this event, predict how, if at all, the Unit 1 Core Spray system has responded.

A. "B" loop will auto-initiate and run on minimum flow, while "A" loop will not auto-initiate, but may be manually started locally.

B. "A" loop will auto-initiate and run on minimum flow, while "B" loop will not auto-initiate, but may be manually started locally.

C. "A" loop will auto-initiate and run on minimum flow, while "B" loop will not auto-initiate, and can not be manually started from the Control Room or locally.

D. "B" loop will auto-initiate and run on minimum flow, while "A" loop will not auto-initiate, and can not be manually started from the Control Room or locally.

Answer: B

Associated objective(s):

SR-1400-K18 (Freq: LIC=I)
LIST the plant systems which are supported by the following systems and DESCRIBE the nature of support:
a. Core Spray 125vdc logic circuit
b. ECCS Keep Fill System

SR-1400-K23 (Freq: LIC=B)
Given a Core Spray System operating mode and various plant conditions, PREDICT how the Core Spray System will respond to the following support system failures:
a. Loss of 125vdc
b. Loss of 4160vac
c. Loss of 480vac
d. ECCS suction strainer clogging

SR-1400-K26 (Freq: LIC=B)
EVALUATE given Core Spray System key parameter indications and/or responses depicting a system specific abnormality/failure and DETERMINE a course of action to correct or mitigate the following abnormal conditions:
a. Loss of 125vdc power to Core Spray logic
b. 4 and 25 valves open simultaneously
c. Core Spray pump trip
d. Abnormal Core Spray discharge header pressure
e. Core Spray System fails to start automatically
f. Inadvertent Core Spray System start
g. ECCS suction strainer clogging

Question 1 Details

Question Type:	Multiple Choice
Topic:	ILT.11683
System ID:	6090
User ID:	81181
Status:	Active
Must Appear:	No
Difficulty:	0.00
Time to Complete:	2
Point Value:	1.00
Cross Reference:	
User Text:	209001K4.08
User Number 1:	3.80
User Number 2:	4.00
Comment:	With "1B" 125 VDC out, initiation logic for "B" loop is out but still has power to the pumps and components. "A" loop is uneffected.

8 **ID: SR-0500-K07** **Points: 1.00**

If the reactor mode switch is in RUN, which ONE of the following conditions will cause either a half scram or a full scram?

A. Reactor power is 45% , Main Steam Isolation Valves 1A & 1D are both closed.

B. Reactor power is 45% , Turbine Stop Valves 2 & 3 are both closed.

C. Reactor power is 10% , Main Steam Isolation Valves 1C & 2D are both closed.

D. Reactor power is 10% , Turbine Stop Valves 3 & 4 are both closed.

Answer: C

Question 8 Details

Question Type:	Multiple Choice
Topic:	Question #8 (RO/SRO)
System ID:	230
User ID:	SR-0500-K07
Status:	Active
Must Appear:	No
Difficulty:	3.25
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LF-0500, R. 6, pg 44-51
User Text:	212000 K5.02
User Number 1:	3.30
User Number 2:	3.40
Comment:	Bank question. Application. MSIVs A and D and TSV 2 and 3 and 1 and 4 meet the "5" alive requirement. MSIVs C and D do not meet this, so a 1/2 scram would result. At 10% power, Turbine Stop Valves would not cause a 1/2 scram.

? modified

During a scram condition or a condition where an alarm is received for a scram condition but the scram did not occur, the operator perform a visual inspection of Panels 901(2)-15 and 17 to determine the status of each RPS Trip Channel or Trip Logic relay. During normal operation all of the Trip Channel relays are energized. When the relays are energized, all of the relay contacts (fingers) are made up, or pulled in away from the operator, when facing the relay. When a trip condition exists, the relays are deenergized and the contacts will be released (separated). Some of the relays have "b" contacts that are open when the relay is energized and closed when the relay is deenergized. These will be identifiable because there is a contact point in front of the relay contact finger. Typically the "b" contacts control the associated annunciator and computer point. When an abnormal condition exists such as an expected annunciator or specific plant response is not observed, the operator can walkdown the panels and find the relay contact(s) that may be faulty.

A. Automatic RPS Operation

1. Turbine Stop Valve (10% Closure)

(Figure 0500-8, 0500-9, E.S. 4E-1465)

****SR-0500-K15**
****L-0500-K15**
SR-0500-K04
SR-0500-K07
SR-0500-K08
L-0500-K08
****S-0500-K25**

Show Figures 0500-8 and 9. Refer to print 4E-1465 as necessary to discuss the MSV trip circuitry.

a. Closure of the turbine main stop valves (MSVs) and subsequent failure of the bypass valves to open with the reactor at power can result in a significant addition of positive reactivity to the core as the pressure rise collapses steam voids. The MSV closure initiates a scram earlier than either the neutron flux or high reactor pressure scrams to provide a satisfactory margin below the core thermal hydraulic safety limit. This is considered an anticipatory scram. This means that this scram is to protect the reactor whenever it is sensed that its link to the heat sink is in the process of being removed

Q: What is the purpose of the MSV closure scram?
A: To anticipate the pressure, neutron flux, and fuel cladding surface heat flux increase caused by a rapid closure of the MSVs and failure of the bypass valves to open.

b. Each of the four MSVs are equipped with two position limit switches for a total of eight switches. There are two different MSV limit switches assigned to each Trip Logic (A1, A2, B1, & B2) The valve limit switches are set at $\leq$ 10% closure from full open, instead of < 100% of stroke, to provide for the effects of thermal expansion changing the valve/switch orientation. This setting maximizes the reliability of the valve closure signal.

f. An easy way to remember this logic is to substitute the letters A, B, C, D, for MSV numbers. A slight re-arrangement of the logic (physically, not functionally) then spells BADC & CADB from valve letter BA-DC & CA-DB, in Trip Logics A-2, A-1; B-2, B-1. Closing only one MSV in any Trip Channel pair of valves could not result in a half-scram.

Another way to remember the logic is "Add up to 5 and stay alive (i.e., 1 & 4, 2 & 3)

Q: When is the MSV closure scram bypassed?
A: < 45% power (325 psig first stage pressure).

g. This scram is bypassed when Reactor power is less than 45%, which corresponds to a pressure of 325 psig as sensed by the turbine first stage pressure. A closure at power levels less than this does not constitute a threat to the integrity of any barrier to the release of fission products and also allows system startup.

h. This is accomplished by a pressure switch (PS) off four pressure detectors for first stage pressure. PS-504A feeds Trip Logic A1, 504C feeds A2, 504B feeds B1, and 504D feeds B2. When first stage pressure reaches 325 psig decreasing, PS-504A opens a contact in RPS Trip Channel A1 which deenergizes relay 123A. This shuts two series contacts in the A1 Trip Logic that bypass the MSV closure contacts and the Turbine Control Valve Fast Closure contacts, preventing Trip Actuators 108A and C from deenergizing upon closure of these valves. This prevents a half-scram signal and ultimately a full scram signal from being initiated from valve closure.

2. Turbine Control Valve (CV) Fast Closure (Generator-Load Reject) (Figure 0500-8 & E.S. 4E-1465)

****SR-0500-K15**
****L-0500-K15**
SR-0500-K04
SR-0500-K07
SR-0500-K08
L-0500-K08
****S-0500-K25**

a. This scram anticipates the rapid increase in pressure and neutron flux which results from a fast closure of the CVs due to a load rejection and postulated subsequent failure of the bypass valves to open. Again it also serves to protect the reactor from an imminent loss of its heat sink.

b. Load Rejection is the condition where a greater than 40% mismatch exists between the generator stator amps and the turbine crossover pressure. This indicates a difference between the work energy into the turbine and the work energy removed from the generator.

3. SDV High Level (40 Gallons) (E.S. 4E-1464, Sh. 1, 1465 & 1467, Sh. 3) (Figure 0500-8)

****SR-0500-K15**
****L-0500-K15**
SR-0500-K04
SR-0500-K07
SR-0500-K08
L-0500-K08
****S-0500-K25**

Show Figure 0500-8. Refer to prints 4E-1464, Sh. 1, 1465, and 1467, Sh. 3, as necessary to discuss SDV High-High trip and Bypass function.

a. As discussed in Section III, the SDIV initiates a scram while an adequate volume is available to receive the scram discharge water, so as to ensure that all operable CRDs can be fully inserted. Each SDIV has six level sensors on it and two sensors that detect a failed instrument.

1) One thermal switch for hi level alarm.

2) One thermal switch for rod block.

3) Two thermal switches that detect a failed high level instrument.

4) Two thermal switches for scram.

5) Two Barton D/P cells for scram.

A thermal switch for a failed high instrument, a thermal switch for high level scram, and a D/P cell for high level scram feed each RPS Trip Channel leg.

b. Trip System operation is as follows:

Assume a high level condition is detected by thermal switch (SWPT2) 82AX2. This will open its associated contact in the A1 Trip Channel, deenergizing relay 100A which will open its associated contact in the A1 Trip Logic. This will deenergize the A1 Trip Actuators 108A and 108C.

4. Condenser Low Vacuum (21-inch Hg)
(E.S. 4E-1464, Sh. 1, and 1465) (Figure 0500-8)

a. Loss of condenser vacuum occurs when the condenser can no longer handle the heat input or a leak occurs. Loss of condenser vacuum initiates a closure of the MSVs and turbine bypass valves which eliminates the heat input to the condenser. This results in a rapid pressure transient on the reactor vessel, neutron flux rise and an increase in surface heat flux will occur. To prevent the cladding safety limit (MCPR) from being exceeded the low condenser vacuum scram was added to anticipate the MSV closure.

****SR-0500-K15**
****L-0500-K15**
SR-0500-K04
SR-0500-K07
SR-0500-K08
L-0500-K08
****S-0500-K25**

Show Figure 0500-8. Refer to prints 4E-1464, Sh. 1, and 1465 as necessary to discuss the low condenser vacuum trip.

b. With the reactor mode switch in the run position, the scram will occur at 21" Hg vacuum, the MSV closure at 20" Hg vacuum, and the turbine bypass valves close at 7" Hg vacuum.

c. Trip System operation is as follows:

Q: When will the main turbine trip on low vacuum?
A: 20" Hg vacuum.

Four vacuum switches are provided to monitor the condenser vacuum. Sections A and C of the condenser each have one switch. Two switches are provided for Section B. RPS Trip System A uses switches from condenser sections A and B. RPS Trip System B is controlled by the other switch on the B condenser section and the switch on Section C. Trip Channel A1 is fed by switch 503A, A2 from 503C, B1 from 503B, B2 from 503D. If a low vacuum condition is sensed by vacuum switch 503A, it opens a contact in the A1 Trip Channel which deenergizes relay 101A. The associated contact in the A1 Trip Logic opens, deenergizing Trip Actuators 108A and 108C.

Q: Why is the scram setpoint higher than the turbine trip setpoint?
A: To avoid the pressure and power transient that may occur when the turbine trips.

5 **ID: 124434** **Points: 1.00**

Which conditions will cause a Half Scram OR a Full Scram to be generated by the Reactor Protection System?

A. Mode switch is in STARTUP; Condenser Vacuum is 20.5 inches Hg; and CHANNEL A/B CONDENSER LOW VACUUM annunciator is ALARMED.

B. Mode switch in STARTUP; SDV High Water Level Bypass Keylock Switch is in BYPASS; and SDV HI-HI LEVEL annunciator is ALARMED.

C. Mode switch is in RUN; Main Steam Isolation Valves 1A and 2D are CLOSED; and reactor power is 20%

D. Mode switch is in RUN; Stop valve #2 and #3 are CLOSED; and reactor power is 30%.

Answer: B

Question 5 Details

Question Type:	Multiple Choice
Topic:	LORTB
System ID:	7821
User ID:	124434
Status:	Active
Must Appear:	No
Difficulty:	0.00
Time to Complete:	6
Point Value:	1.00
Cross Reference:	
User Text:	212000 A2.19
User Number 1:	3.80
User Number 2:	3.90
Comment:	

9 ID: SR-0280-K20 Points: 1.00

A reactor scram occured on Unit 2 approximately 1 minute ago.
The scram has NOT been reset.

The NSO can verify all rods in by noting that individual rod position is indicating:

A. an orange double dash.

B. a green double dash.

C. a green 00.

D. an orange 00.

Answer: B

Question 9 Details

Question Type:	Multiple Choice
Topic:	Question #9 (RO/SRO)
System ID:	9719
User ID:	SR-0280-K20
Status:	Active
Must Appear:	No
Difficulty:	2.25
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LIC-0280, R. 6, pg. 7
User Text:	214000 A4.02
User Number 1:	3.80
User Number 2:	3.80
Comment:	New Question. Memory. Post scram indication is a green double dash until the scram is reset, at which time the indication turns to an orange double 00 and then to a green 00.

2. Reed switches numbered S49 to S52 are used to provide information as follows:

   a. Reed switch S49 closes simultaneously with S48 to illuminate the red "full out" digital indication for a rod at the 48" position.

   b. Reed switch S50 is associated with the rod "overtravel" out annunciator. This switch should not be closed unless the control rod and CRD become uncoupled.

   c. Reed switch S51 picks up after a scram to illuminate the green "full in" digital indication for a rod at the overtravel in position.

   d. Reed switch S52 closes nearly simultaneously with S00 to illuminate the green "full in" digital indication for a rod at the "00" position.

3. Colored Digital Indications ****SR-0280-K14**

   Red (full out) and green (full in/overtravel in) digital indication show up on the rod position full core digital displays. Colored indications are not present on the four rod display, only on the full core display.

4. Translation Electronics ****SR-0280-K22** ****SR-0280-K05**

   a. Each position probe (i.e., each CRD) has a printed circuit card in the 90X-27 back panel located in the auxiliary electric room. This circuit card translates the reed switch closures to a numeric readout.

      If an electronic malfunction is detected, an "RPIS INOP" trip is generated, indicating that the RPIS data may not be correct. An INOP is caused by any of the following:

      (1) Invalid probe data;
      (2) Card pulled;
      (3) Loss of power supply;
      (4) Internal logic stall.

      An "RPIS INOP" trip causes a select block and an annunciator alarm on the 90X-5 panel.

10 **ID: SR-0280-K22** **Points: 1.00**

The operator is withdrawing a control rod which is part of the current latched step.
The limits of the step and the bounds of the control rod being withdrawn is 00 - 48.
The operator withdraws the rod one notch and notices that the selected rod indicates ?? on the RWM display.

Which of the following statements best describes the RWM system condition as it stands right now?

A. The RWM system will immediately block all movement of the rod that indicates ?? until a substitute position is entered. No other rods are effected by this event.

B. The RWM immediately declares the rod OOS and allows the operator to continue with rod movement on the next rod in the sequence.

C. The RWM will immediately initiate a full core scan and if proper position information is not obtained on the next scan, the RWM will consider itself failed and block all rod movements.

D. The rod is treated just like a withdraw error. Insert and withdrawal blocks are applied to all other rods and a withdrawal block is applied to the selected rod once it reaches a known position.

Answer: D

Question 10 Details

Question Type:	Multiple Choice
Topic:	Question #10 (RO/SRO)
System ID:	9720
User ID:	SR-0280-K22
Status:	Active
Must Appear:	No
Difficulty:	3.25
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LIC 0207-01, R.6, pg. 31
User Text:	214000 K3.01
User Number 1:	3.00
User Number 2:	3.20
Comment:	Bank question. Application. Dist #1 & 2 - You are still allowed to move the affected rod. Dist #3 - The RWM does not automatically put rods OOS. With a loss of RPIS for a given rod position, the RWM will display a ??.

(1) Rods in the latched group are colored green. All other rods will be colored white. All rods in the array are expected to be driven to the 00 or full in position prior to proceeding to any rod in the next array. A withdraw block will be issued if the operator attempts to withdraw a rod unless that rod is at an unknown position, indicated by '??'. A rod at unknown position will be allowed to be inserted or withdrawn until a valid position is reached, at which time the withdraw block will be issued. If the operator selects a rod in the next valid array, its rods will become the latched group. If any rods of prior arrays are at positions other than 00, they will be indicated as withdraw errors and colored red, but rod blocks will not be applied. If a rod, not in the next array, is selected, it will be treated as a select error and its movement blocked by both insert and withdraw blocks.

(2) When all rods in the current array have been position to 00, the function will change the latched group to the next array. When all of the arrays have been addressed by the operator the function will not allow any further rod movement of rods. The operator must then exit the function and resume operation using to normal sequence to reposition the rods to normal operating conditions. The operator may exit the Power Reduction mode at any time to return to normal operations.

SR-0207-K14

To exit from power reducing, select the "Exit Function" box and the primary menu will reappear.

11 **ID: SR-0704-K12** **Points: 1.00**

The plant is operating at 100% power and a Traversing In-Core Probe (TIP) trace is in progress. A spurious reactor scram occurs and reactor water level decreases to -10 inches and then recovers.

IDENTIFY the response of the TIP system.

A. The TIP system automatically withdraws and the ball valve shuts.

B. The TIP system automatically withdraws and the shear valve fires if the ball valve fails to shut.

C. The shear valve automatically fires.

D. The TIP system will continue the trace without interruption.

Answer: A

Question 11 Details

Question Type:	Multiple Choice
Topic:	Question #11 (RO/SRO)
System ID:	910
User ID:	SR-0704-K12
Status:	Active
Must Appear:	No
Difficulty:	2.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LIC-0704B, R. 6, pg. 14
User Text:	215001K4.01
User Number 1:	3.40
User Number 2:	3.50
Comment:	ILT.01885 (75987) Bank question. Higher. At 0", the TIPS auto withdraw and the Ball valve closes. Shear valves do not auto fire.

2. Control Room (cont)

Instrument/Location	Sensing Point/Device Type	Description/Function
5. Purge indicating light	Red indicating light illuminates when the purge system is activated.	
6. Cont. Isol. Light	White indicating light	Illuminated when Gp. II Isolation bus fuse is intact.

B. Automatic Functions

1. Initiation

NO auto initiation.

2. Trips and Isolations

Purpose	Device/Setpoint/ Logic	Bypass/Reset	Response
Isolate TIP ball valve to complete primary containment isolation (GP 2)	PCIS isolation logic, 1 out of two taken twice, RX lo water level (+8"), High Drywell pressure (2.5 psig) or High Drywell Radiation (100R/hr)	Reset when GP 2 PCIS isolation is reset	Shifts drive into reverse and retracts detector into shield chamber. The ball valve will attempt to close and will ride on the cable until the detector is withdrawn past the ball valve. It will then close completely.

SR-0704-K11
SR-0704-K12
SR-0704-K13

Show Figure 0704B-14

3. Interlocks

Purpose	Device/Setpoint/ Logic	Bypass/Reset	Response
Prevents damage to detector cable	Limit switch on ball valve prevents drive mechanism from inserting detector unless ball valve is open.	Open ball valve	If ball valve is not full open by position 0020, drive mechanism is deenergized.
Prevents more than one indexer from being in position 10 at the same time.	Indexer release limit switch on indexer mechanism.	None	Ensures only one indexer can align with channel 10 at any given time.
Prevents TIP insertion with bad in-shield limit switch.	Computer stops detector insertion just outside Rx end of shield chamber.	None	If in-shield limit switch does not pick up at position 0011 ± 1 drive mechanism is deenergized.

12 ID: SR-0705-K21 Points: 1.00

With Unit One at 50% power, the NSO selects rod D-9 for withdrawal.

The following indications are observed on the 4 Rod Display:

Two bypass lights are lit for "A" level selected LPRMs.
Two bypass lights are lit for "B" level selected LPRMs
One bypass light is lit for "C" level selected LPRMs.
Three bypass lights are lit for "D" level selected LPRMs.

Will the operator be able to withdraw control rod D-9 with the present plant conditions?

A. No, RBM 7 is INOP due to less than 50% of it's assigned inputs.

B. Yes, RBM 7 is automatically bypassed due to too few inputs.

C. No, RBM 8 is INOP due to less than 50% of it's assigned inputs.

D. Yes, RBM 8 is automatically bypassed due to too few inputs.

Answer: C

Question 12 Details

Question Type:	Multiple Choice
Topic:	Question #12 (RO/SRO)
System ID:	7386
User ID:	SR-0705-K21
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LIC-0700-5, R. 4, pg. 20
User Text:	215002K6.05
User Number 1:	2.80
User Number 2:	3.10
Comment:	LWQ.00082 (82500) Modified bank question. Higher. 50% of LPRM inputs to a RBM inop will inop the RBM. A and C LPRMs feed RBM 7, B and D LPRMs feed RBM 8. RBMs are not auto bypassed due to too few inputs, must be manually bypassed.

The input signals to the RBM averaging circuits come from the LPRM's surrounding the selected rod.

If the count circuit detects that less than half of the assigned LPRM inputs are operable for an RBM channel, an RBM "INOP" trip rod block will be generated.

B. Supported Systems

SR-0705-K18

Reactor Manual Control System

The RBM system also sends signals to the RMCS to generate rod blocks and initiate a rod withdrawal inhibit when needed.

C. Power Supplies

1. RBM channel 7 is powered from RPS bus A.
2. RBM channel 8 is powered from RPS bus B.
3. The alarm lights on the desk section of the 90X-5 panel are powered from the Instrument Bus.
4. The recorders on the 90X-5 panel are powered from the Essential Service Bus.

4 **ID: 75677** **Points: 1.00**

How many LPRM inputs are automatically routed to EACH RBM channel when a Rod with FOUR adjacent LPRM strings is selected? (ASSUME NO LPRM's are bypassed)

A. 8

B. 16

C. 2

D. 4

Answer: A

Question 4 Details

Question Type:	Multiple Choice
Topic:	ILT.01224 : LPRM strings to RBM
System ID:	605
User ID:	75677
Status:	Active
Must Appear:	No
Difficulty:	0.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	
User Text:	215002K1.02
User Number 1:	3.20
User Number 2:	3.10
Comment:	Complete Rev

13 ID: SR-0701-K22 Points: 1.00

A plant startup is in progress with all IRMs on Range 1 and the Mode Switch is in the Startup/Hot STBY position.

Which ONE of the following describes the operation of the SRM instruments with all of the shorting links **removed**?

A FULL Reactor Scram will occur if SRM...

A. 23 is WITHDRAWN from the core.

B. 22 goes less than 100 CPS.

C. 21 and 23 BOTH reach 1 X 10E5 CPS.

D. 24 reaches 5 X 10E5 CPS.

Answer: D

Question 13 Details

Question Type:	Multiple Choice
Topic:	Question #13 (RO/SRO)
System ID:	928
User ID:	SR-0701-K22
Status:	Active
Must Appear:	No
Difficulty:	2.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LIC-0701, R. 5, pg. 16
User Text:	215004K4.02
User Number 1:	3.40
User Number 2:	3.50
Comment:	ILT.01906 (76006) Bank question. Memory. The only scram signal for SRMs is one or more SRMs at 5 X 10E5 CPS with shorting links removed. The other distractors give SRM rod blocks.

B. Automatic Functions

1. Trips and Interlocks

Device/Setpoint	Device/Setpoint/ Logic	Bypass/Reset	Response
Retract Permit - prevents withdrawing control rods with neutron levels too low (maintains reliable indication).	If LCR output is 100 cps and the SRM detector is not fully inserted, a trip is produced. Logic is arranged such that any one trip will produce a rod block.	The trip is bypassed by any of the following: - SRM detector fully inserted. - All IRM range switches in the SRM's trip channel are on/above range 3. - The Mode Switch is in the "RUN" position.	If the trip conditions are met for any SRM, a rod block is generated. The trip can be cleared by inserting the SRM to the "Full In" position.
SRM HI - prevents withdrawing control rods with neutron levels too high (approaching meter off scale high). Maintains reliable indication.	If LCR output is 10^5 cps, a trip is produced. Logic is arranged in the same manner as the retract permit logic.	The trip is bypassed by either of the following: - All IRM range switches in the SRM's trip channel are on/above range 8. - The Mode Switch is in the "RUN" position.	If the trip conditions are met for any SRM, a rod block is generated.
INOP - prevents withdrawing control rods with the SRM circuitry malfunctioning.	If one of the following exist: - High voltage becomes low - An internal module is unplugged - The function switch is not in "OPERATE". a trip signal is initiated. Logic is arranged in the same manner as the retract permit logic.	The trip is bypassed by either of the following: - All IRM range switches in the SRM's trip channel are on/above range 8. - The Mode Switch is in the "RUN" position.	If the trip conditions are met for any SRM, a rod block is generated.
SRM HI-HI - prevents excessive power during initial fuel loading and startup.	If LCR output 5 x 10^5 cps, a trip is produced. Logic is arranged such that if any SRM trip is received, a full reactor scram occurs.	The trip is bypassed when shorting links are installed (the normal condition).	If any one of the SRM trips are received, a 1/2 scram is received with 2 shorting links are removed or a full reactor scram is received with all 4 shorting are removed.

C. Annunciators

SR-0701-K09
SR-0701-K13

NOTE: TRM requires that the setpoint for: Retract Permit shall be > 100 cps. SRM HI shall be < 2.8 x 10^5 cps.

14 **ID: SR-0701-K15** **Points: 1.00**

A Unit 1 startup is in progress.

SRM's are fully inserted and reading approximately 10,000 cps when annunciator 901-5, "SRM HIGH OR INOP", alarms and the associated rod block occurs.

The NSO observes that SRM 21 is now reading approximately 5,000 cps, while SRM's 22, 23 and 24 are still indicating 10,000 cps.

Which of the following operations / malfunctions could explain the observed indications?

A. SRM 21 is automatically withdrawing from the core.

B. SRM 21 High voltage power supply is low.

C. 24/48 VDC Bus A voltage is low.

D. SRM 21 "INOP INHIBIT" pushbutton on the 901-36 panel is depressed.

? what panel is this?

Answer: B

Question 14 Details

Question Type:	Multiple Choice
Topic:	Question #14 (RO/SRO)
System ID:	9822
User ID:	SR-0701-K15
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	1
Point Value:	1.00
Cross Reference:	LIC-0701, R. 5, pg. 3-5
User Text:	215004K6.04
User Number 1:	2.90
User Number 2:	2.90
Comment:	ILT.11627 : 81138 Bank question. Low High Voltage power supply voltage to an SRM will cause erratic operation. A loss of 24/48 VDC A will cause SRMs 21 and 22 to fail downscale. SRMs do not auto withdraw. INOP INHIBIT pushbutton bypasses the INOP trip while testing.

II. COMPONENT DESCRIPTION

A. In-Core Detector

SR-0701-K14
SR-0701-K15

The in-core detector is a "Fission Chamber" type detector that generates an electrical signal proportional to the neutron flux level in the core, for use by the electronics, to present a display of that flux level in the control room.

There are two types of fission chamber:

- Operational Chamber

  This chamber fits in the gaps between the fuel bundles on the opposite corner from the control rod. (Figure 0700-1-3) (The LPRM presentation defines the "gap" terminology.)

Show Figure 0700-1-3

NOTE: The fuel loading chamber was formerly used for refueling outages. It is no longer normally required due to less stringent Tech. Spec. requirements and exposed fuel providing adequate source neutrons.

- Fuel Loading (Dunking) Chamber

  This chamber is fitted into a stainless steel cylinder with a nitrogen purge on it to keep water out. The Dunking chamber has more U-235 than the operational chamber for added sensitivity.

SR-0701-K14

The surface of the outer electrode is coated with uranium oxide (Figure 0700-1-4). When a neutron penetrates the coating, it can cause a U-235 atom to fission. The fission products recoil into the chamber and strip the electrons from the argon gas in the chamber, causing the gas to ionize. The bias voltage on the electrodes (furnished by a high voltage power supply) causes the electrons and ions to be collected at the inner and outer electrodes, respectively. As the electrons strike the inner electrode, they cause a current pulse to be generated, as do the argon ions when they strike the outer electrode. Since the electrons are lighter and travel faster, they are collected faster. This makes the current pulse caused by electron collection faster and higher than the pulse caused by argon ion collection.

Show Figure 0700-1-4

The IRM and LPRM detectors operate in Region B of the Gas Conductivity curve, shown in Figure 0700-1-5. The SRM and Dunkers operate in Region C because higher voltage is required for their greater sensitivity.

Region A is characterized by a voltage difference (applied to the detector) too weak to attract the ion-pairs formed by the passage of the fission products. The ion pairs recombine; therefore, this region is termed the recombination region.

Region B (operating range of the IRM and LPRM detectors) is characterized by a relatively constant current output over a wide range of detector voltage values. Basically, the curve flattens in region B because the ion-pairs are moving so fast that recombination does not occur. Therefore, essentially every charged particle produced by the nuclear reaction reaches the electrode.

Show Figure 0700-1-5

Q: How does detector accuracy and sensitivity vary as you progress along the Gas Amplification Curve?

In region C, (operating range of the SRM operational and fuel loading chambers) the higher detector voltage causes the ions and electrons, traveling towards the electrodes, to gain enough energy to ionize additional argon atoms. This phenomenon is known as secondary ionization.

Secondary ionization increases the output from the detector and the current output correspondingly increases with a proportional increase in detector voltage (Figure 0700-1-5). In region C, any ionization initially produced results in a proportional amount of secondary ionization, hence the name. The ratio of initial ionizations to total ionizations is called the gas amplification factor. The gas amplification factor increases with increasing voltage. This is why the SRM's are more sensitive than the IRM's and LPRM's (other reasons include higher gas pressure and a thicker U-oxide coating).

A: As applied voltage increases, sensitivity increases while accuracy decreases. At higher voltages, the detector can produce an output from a single incident particle because it accelerates faster at the higher voltage. At the same time, the secondary ionizations and eventual detector tube flooding results in lower accuracies due to the dead time created.

Gammas are generated from both fission product decay and from the decay of materials that were activated by the neutron flux.

SR-0701-K14

A gamma entering the fission chamber can directly ionize the argon gas in the space between the electrodes. The argon ions and the electrons are collected and the pulses are generated, just as in the neutron event. The specific ionization (ions produced per unit track length) of the gamma is much less than for the fission products due to the large comparative size and charge of the fission product. Thus fewer ions are produced by the gamma than by the neutron event. Also, the gamma pulses are much smaller than the neutron pulses. This difference in pulse size allows the discriminator to eliminate the gamma pulses, while passing the neutron pulses.

Operational Chamber Specifications (Figure 0700-1-6)

NOTE

These specifications are nominal values, which may vary slightly from different model parts.

1. Dimensions:

   a. 1.6 in. overall length

   b. 1 in. sensitive length

   c. 0.160 in. diameter

2. The active coating is composed of 3.3 mg of uranium oxide. The uranium is 95% enriched in U-235. This coating is applied only to the inner surface of the outer electrode.

3. The chamber is argon filled to 14.5 atmospheres (213 psia).

4. The following sensitivities assume a properly calibrated discriminator, as they are actually quoted for the output from the discriminator rather than from the detector itself.

   a. Neutrons: 1.0×10^{-3} cps/nv.

   b. Gammas: Zero counts in 5×10^{6} R/hr. field.

5. The chamber operates at 600 VDC. This voltage is set high to provide optimum detector sensitivity.

Show Figure 0700-1-6

Q: How do the IRM detectors differ from the SRM's?
A: IRM detector voltage is lower because less sensitivity is required.

The thickness of the IRM detector Uranium coating is lower due to the higher flux levels experienced by the IRM's. Less Uranium is needed for detector operation.

The Argon gas pressure in the IRM's is lower which makes them less sensitive.

15 **ID: SR-0703-K09** **Points: 1.00**

Which of the following would constitute the MAXIMUM disagreement between APRM flow converter channels that would still allow control rod withdrawal?

A. 17%

B. 11%

C. 9%

D. 5%

Answer: C

Question 15 Details

Question Type:	Multiple Choice
Topic:	Question #15 (RO/SRO)
System ID:	286
User ID:	SR-0703-K09
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCAN 901-5 D-6, R. 2
User Text:	215005A3.06
User Number 1:	3.00
User Number 2:	3.10
Comment:	ILT.00877 (75358) New question. Lower. Alarm comes in at 10%, so 9% is the highest you can have without getting the rod block.

#15 #15

DESCRIPTION FLOW CONVERTER REFERENCE OFF NORMAL ROD BLOCK.

SETPOINT Actual: 1. 10% mismatch between channels.
2. 110% (increasing) channel output.
3. Flow converter inoperable.
   a. Flow converter mode switch NOT in OP (operate).
   b. Loss of ± 15 volt power supply.

NEUTRON MON
FLOW UNIT
OFF NORMAL

Tech Specs: None

SENSOR Relay 756-K1 or 756-K3 in Flow Unit.

A. AUTOMATIC ACTIONS

1. Rod out block in all modes of operation.

2. Half-scram when channel fails downscale.

B. OPERATOR ACTIONS

1. Stop all power changes in progress.

2. IF unit is operating in EGC, THEN trip EGC and return Recirculation flow control to MANUAL.

3. Contact QNE for assistance.

4. In Panel 901-37:

   a. Monitor flow units to determine if UPSCL/INOP or COMPARATOR lights are lit.

   b. Check APRM flow bias signal by placing the Flow Converter Power Supply in the CONVERTER OUTPUT position.

      (1) IF flow bias signal fails downscale or low (conservative), THEN a half-scram may occur in the corresponding RPS channel.

16 ID: SR-0263K22 Points: 1.00

Given:

- RVLIS backfill has been secured for 18 days.
- The RPV has rapidly depressurized from 1003 psig due to a steam leak in the drywell.
- Drywell temperature is 235 degrees F.
- RPV pressure is 275 psig and slowly lowering.

  - Pressure corrected lower wide range instruments indicate -10 inches and lowering.
  - Narrow range instruments indicate +10 inches and steady.

What is the status of Rx level instrumentation and which of the following conditions can be used to determine RPV water level is > -68 inches if the recirc pumps are off? Rx level inst... ✓

A. Will become inaccurate when pressure drops below 250 psig; read level directly on narrow range instruments to determine level > -68 and steady.

B. Became inaccurate when pressure dropped below 450 psig; indicated level is lowering on the narrow range instruments.

C. Became inaccurate when pressure dropped below 450 psig; indicated level is rising on the lower wide range instruments.

D. Will become inaccurate when pressure drops below 250 psig; determine level > -68 inches by indicated level rising on the upper wide range instrument.

Answer: B

? similar to SRO quest #108 for determining which level inst can & cannot be used!

Keep this question w/o giving the procedure - & change quest #108.

Why do we need to provide the procedure?

Question 16 Details

Question Type:	Multiple Choice
Topic:	Question #16 (RO/SRO)
System ID:	7530
User ID:	SR-0263K22
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOP 0201-11, R.4 pg. 1-3
User Text:	216000A2.10
User Number 1:	3.30
User Number 2:	3.50
Comment:	L.00637 (82648) New question. Higher Pressure at which gassing occurs is 450 psig not 250. Level is proved above -68" by a decreasing trend only, not increasing.

#16

QCOP 0201-11
UNIT 1(2)
REVISION 4
SAFETY-RELATED
ON-HAND

DETERMINING RPV LEVEL DURING RAPID DEPRESSURIZATION BELOW 450 PSIG

APPROVAL SIGNATURE	SHIFT OPERATIONS SUPVSR TITLE	9-21-99 EFFECTIVE DATE

A. PURPOSE

This procedure contains the direction on how to determine RPV water level during rapid depressurization of the RPV when RPV pressure is below 450 psig. It is implemented alone or concurrently with the QGAs and does **NOT** alter the RPV level instrument direction provided in the QGAs. This procedure is only applicable when RVLIS Backfill system flow has been outside the acceptable range for >14 days.

B. DISCUSSION

B.1. RPV level indication is affected by various plant parameters. The majority of these are defined in the QGA procedures and related specifically to post accident plant conditions. This procedure does **NOT** alter the QGA direction but does clarify the use of RPV level instruments for plant conditions that may or may **NOT** involve entry conditions into the QGAs.

B.2. The specific industry concern that created the need for this procedure is non-condensable gas accumulation in the RPV level instrument reference legs. During rapid RPV depressurization (i.e. $\geq$ 100 °F/hr.), gas in the reference legs can come out of solution and cause the instrument to indicate an RPV level that is higher than the actual RPV level. Therefore, there is a need to be able to determine the actual RPV level or else the QGA procedures will direct performance of RPV flooding. RPV flooding will insure that the core is adequately cooled but is a severe transient on the RPV. Use of this procedure provides an alternative to stating the RPV level is unknown for every rapid RPV depressurization.

Continuous Use

#16

E. LIMITATIONS AND ACTIONS

E.1. Since this procedure will be implemented during transient conditions, the SCRE is fulfilling the STA role. Due to this and other time constraints, verification of calculations is **NOT** documented as being performed but the evolution will be overviewed by the SCRE.

E.2. Attachments A and B are provided as aids to the crew to facilitate performance of repetitive, ongoing calculations by the crew. These Attachments may be used by the crew as deemed necessary.

E.3. **IF** Control Room Narrow Range instruments are **NOT** available, **THEN** local instrumentation may be used provided the low end of their range is **NOT** below -60".

F. PROCEDURE

NOTE

This procedure provides two methods of verifying that RPV level is "known".

Step F.1. verifies level is > -68", the level of the lower tap for the Narrow Range Level instruments **AND** the Upper 400 GeMac, by verifying the Level instruments are trending.

Step F.2. provides direction for calculating RPV level when the Narrow Range Level instruments **AND** the Upper 400 GeMac are **NOT** showing a trend.

F.1. **Verify RPV level to be > -68", by using either of the following two methods:**

a. **Verify** a decreasing trend on Panel 901(2)-5 Narrow Range level instrument **OR** on Panel 901(2)-4 Upper 400 GeMac.

b. **IF** RPV pressure is greater than or equal to the lowest value it reached, **THEN verify** an increasing OR decreasing trend on Panel 901(2)-5 Narrow Range level instrument **OR** on Panel 901(2)-4 Upper 400 GeMac.

17 ID: SRN-6800-K23 Points: 1.00

Unit One is operating at full power when a loss of Bus 18 occurs.
Shortly afterwords, a loss of the 250 VDC system occurs.

Predict the effect on the 901-5 panel reactor water level instrumentation.

A. Only Wide range level instrumentation will be available.

B. All Medium range level insturmentation will be downscale.

C. All level instruments will still be available.

D. All Narrow range level instrumentation will be downscale.

Answer: C

Question 17 Details

Question Type:	Multiple Choice
Topic:	Question #17 (RO/SRO)
System ID:	9777
User ID:	SRN-6800-K23
Status:	Active
Must Appear:	No
Difficulty:	3.25
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LN-6800 pg. 1, fig. 2
User Text:	216000K6.02
User Number 1:	2.80
User Number 2:	3.00
Comment:	New. Higher. Loss of Bus 18 removes 2 of the 4 power sources from the ESS system. Loss of 250 VDC removes one more source. ESS still receives power from the static switch without power interruption that keeps instrumentation on line without change.

(#17)

Content/Skills	Activities/Notes

I. INTRODUCTION – BRIEF DESCRIPTION

A. Purpose

The main function of the ESS UPS and Instrument Bus 120-V systems is to provide a reliable source of 120-V, 60 Hertz, single-phase power for plant controls and instrumentation.

****SRN-6800-K01**

B. Basic System Operation

1. Instrument Bus System

The instrument bus system supplies 120 VAC power for various control circuits, relays, solenoids, and instruments. The normal power supply to the instrument bus is from MCC 18-2 (28-2) via a 480 to 120/240V step down transformer located at MCC X8-2. The alternate power supply is from MCC 15-2 (25-2) which has its own step down transformer. On loss of the normal power supply, an automatic bus transfer (ABT) switch swaps power to MCC 15-2 and transfers it back upon restoration of normal power (normal seeking ABT). Note that ABT operation will cause a momentary loss of power. The instrument bus distribution panel is located in the Auxiliary Electric Room (Panel 901(2)-50). Bus voltage indication is available at the bus cabinet in this room.

****N-6800-K15**
SR-6800-K15

Present as a classroom lecture with overhead transparencies and slide show.

2. 120 VAC Essential Service Bus and Uninterruptable Power Supply System

The ESS bus supplies 120 VAC power to essential instruments and control circuits. Normal power to the ESS bus is supplied from the static (solid-state) uninterruptable power supply (UPS). The UPS transfers between its power sources without interruption in power to the load. The reserve power supply for the ESS bus is MCC 18-2 (28-2) via an ABT. Note that when power supplies are swapped via an ABT, momentary power loss is experienced. Power to the UPS is supplied, in order of preference, by Bus 18 (28), 250 V battery via 250 VDC MCC 1(2), and Bus 17 (26). The UPS is physically separated and electrically isolated by use of circuit breakers. The UPS and the essential service distribution panels are located in the Auxiliary Electric Room (UPS: 901(2)-63, ESS: 901(2)-49). The power supply from MCC X8-2 originates at the same step down transformer that feeds the instrument bus. The transformer at MCC X8-2 is supplied from compartment D4. The out put from the transformer is split and sent to compartment C6 to feed the instrument bus and to compartment D5 to feed the ESS service bus.

SOER 83-3, Inverter Failures

Show Figure 1

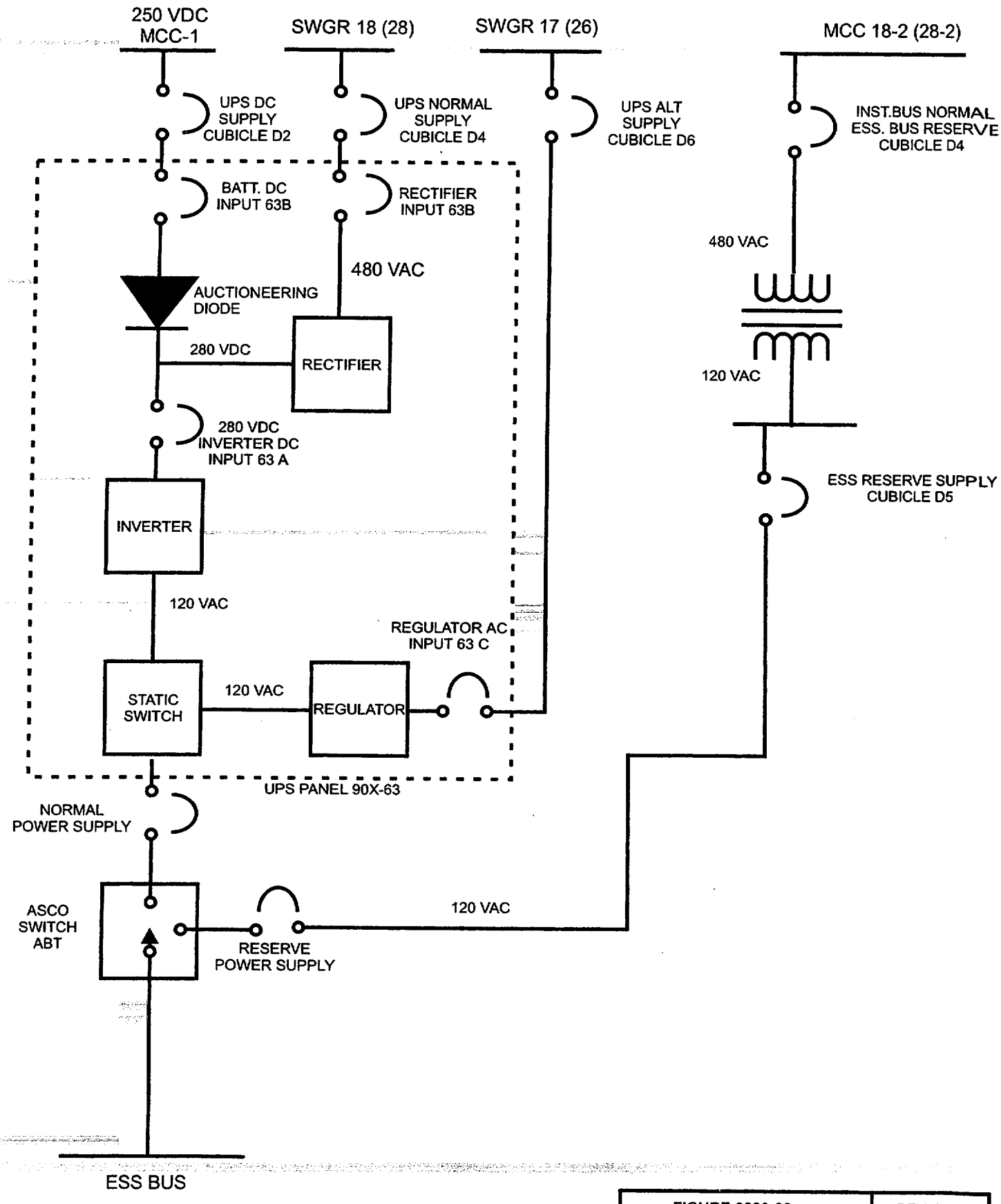


FIGURE 6800-02	REV. 0
ESSENTIAL SERVICE POWER SUPPLIES	

18 **ID: SR-1300-K22** **Points: 1.00**

RCIC automatically started and is maintaining reactor water level at -40 inches.
Annunciator 901-4 F-15 "RCIC TURBINE BEARING OIL PRESSURE LOW" is alarming.
The Unit One NLO reports that RCIC lube oil pressure is 3 psig decreasing despite efforts to restore pressure.
Oil levels are all normal.

Continued operation of RCIC in this condition will result in reactor water level:

A. maintaining due to the emergency oil pump auto starting.

B. decreasing due to ~~trip on high turbine bearing temperature~~.

C. maintaining due to all RCIC trips being bypassed on an autostart.

D. decreasing due to trip on overspeed from the governor valve failing open.

Answer: D

Question 18 Details

Question Type:	Multiple Choice
Topic:	Question #18 (RO/SRO)
System ID:	9801
User ID:	SR-1300-K22
Status:	Active
Must Appear:	No
Difficulty:	4.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOA 1300-04 R8
User Text:	217000K3.01
User Number 1:	3.70
User Number 2:	3.70
Comment:	Modified question. Higher Answer is correct due to governor valve failing open as oil pressure decreases will cause a turbine trip on overspeed. RCIC trips are never bypassed. Turbine bearing high temperature is not a trip. Unlike HPCI, RCIC does not have an emergency oil pump. References QCAN 901-4 F-15 rev 1, QCOA 1300-04 rev 8.

#16

RCIC TURBINE BEARING OIL LOW PRESSURE OR OIL HIGH TEMPERATURE

A. SYMPTOMS

1. Possible RCIC Trouble alarms:

   a. Panel 901(2)-4

      (1) D-15, RCIC TURBINE TRIP.

      (2) E-15, RCIC GOVERNOR END BEARING HIGH TEMP.

      (3) F-14, RCIC COUPLER END BEARING HIGH TEMP.

      (4) F-15, RCIC TURBINE BEARING OIL LOW PRESSURE.

B. DISCUSSION

The RCIC Turbine is equipped with an oil ring on both the outboard and the inboard bearings. These oil rings allow operation of the turbine even on loss of lube oil pressure IF the oil level in the bearing is maintained. However, the loss of oil pressure may make the governor valve inoperable. IF this occurs, THEN the RCIC Turbine may be manually operated by throttling the turbine trip and throttle valve.

The SUBSEQUENT OPERATOR ACTIONS of Section E assume that the RCIC System is required for continued operation to support either adequate Core Cooling OR Reactor pressure control. Recovery steps for a high lube oil temperature condition include checking operation of several relief valves. Adjustment to the lube oil cooling water relief valves MUST be done with care to prevent over pressurizing the lube oil cooler, Barometric Condenser and/or low pressure piping as well as prevent personnel injury.

C. AUTOMATIC ACTIONS

None.

D. IMMEDIATE OPERATOR ACTIONS

None.

[ ]

NOTE

High RCIC Barometric operating temperature or pressure is indicative of inadequate cooling water flow and/or RCIC exhaust high back pressure.

[ ]

8. IF lube oil temperature is high (i.e., > 180°F) as indicated by Alarm 901(2)-4 E-15, RCIC GOVERNOR END BEARING HIGH TEMP, or Alarm 901(2)-4 F-14, RCIC COUPLER END BEARING HIGH TEMP, THEN direct Operator in attendance to:

   a. Confirm bearing oil temperature > 180°F on local oil temperature indicators (outboard end of turbine).

   b. Check oil level/flow within RCIC Turbine Lube Oil System sight glasses (inboard end and outboard end of turbine).

      (1) IF oil level is low, THEN add oil to RCIC lube oil reservoir.

   c. Check RCIC Barometric Condenser pressure approximately 10 in. hg. on PI 1(2)-1360-8203 and temperature approximately 160°F on TI 1(2)-1360-8204.

   d. Check operation of RCIC Barometric Condenser Condensate and Vacuum Pumps.

   e. Check for cooling water flow through PCV 1(2)-1301-43, U-1(2) RCIC LUBE OIL COOLER PCV.

   f. Check for cooling water flow through RV 1(2)1301-42, U-1(2) RCIC PMP TO LUBE OIL CLR RV, on FG 1(2)1301-72.

9. IF lube oil pressure is low (i.e., < 3 psi) as indicated by Alarm 901(2)-4 F-15, RCIC TURBINE BEARING OIL LOW PRESSURE, THEN direct Operator in attendance to attempt to restore lube oil pressure by:

   a. Confirm bearing oil pressure < 3 psig on local oil pressure indicators (outboard end of turbine).

F. REFERENCES

1. TS 3.5.3, Reactor Core Isolation Cooling (RCIC) System.
2. M-50 (M-89), Diagram of RCIC Piping.
3. 4E-1484A,B,C (4E-2484A,B,C), Schematic Diagram RCIC System Parts 1, 2, 3.
4. 4E-1484D Sheet 1 (4E-2484D Sheet 1), Schematic Diagram RCIC System Part 4.
5. 4E-1484D Sheet 2 (4E-2484D Sheet 2), Schematic Diagram RCIC System Part 4.
6. 4E-1484E Sheet 1 (4E-2484E Sheet 1), Schematic Diagram RCIC System Part 5.
7. 4E-1484E Sheet 2 (4E-2484E Sheet 2), Schematic Diagram RCIC System Part 5.
8. 4E-1484F Sheet 1 (4E-2484F Sheet 1), Schematic Diagram RCIC System Part 6.
9. 4E-1484F Sheet 2 (4E-2484F Sheet 2), Schematic Diagram RCIC System Part 6.
10. 4E-1484G (4E-2484G), Schematic Diagram RCIC System Part 7.
11. C00396 (GEK-9546), Operation and Maintenance Instructions, Reactor Core Isolation Cooling System.
12. C00471 (GEK-27820A), Quad Cities 1/2 Process Instrument Subsystem of the Reactor Core Isolation Cooling System.
13. QCOA 1300-06, RCIC System Trouble Following an Auto-Start.
14. QCOP 1300-05, RCIC System Shutdown.
15. QCOP 1300-09, RCIC Local Manual Operation.
16. QCAP 0230-19, Equipment Operability.
17. UFSAR Section 5.4.6, Reactor Core Isolation Cooling System.
18. QCNPS Procedure Writer's Guide, Rev. 1, dated 1-31-90.

Alex L. Misak for APPROVAL SIGNATURE	SHIFT OPERATIONS SUPVSR TITLE	8/8/94 EFFECTIVE DATE

DESCRIPTION RCIC TURBINE BEARING OIL PRESSURE LOW

SETPOINT Actual: 1. RCIC Turbine bearing oil pressure low; 3 psig.

Tech Specs: None

RCIC TURBINE BRG OIL LOW PRESSURE

SENSOR 1. 1(2)-1303-PS1

A. AUTOMATIC ACTIONS

None.

B. OPERATOR ACTION

[

NOTE

]

IF lube oil pressure is lost, AND oil is still available in bearing reservoirs as indicated by oil sight glass, THEN RCIC Turbine operation can continue.

On loss of lube oil pressure, the Governor Valve fails open and control of RCIC Turbine can be performed by manually throttling the Trip Throttle Valve.

[

]

1. IF RCIC System is required for adequate Core Cooling OR Reactor pressure control, THEN continue to operate RCIC System AND attempt to correct cause of low bearing oil pressure as follows:

   a. Dispatch operator to perform the following:

      (1) Confirm bearing oil pressure < 3 psig at local oil pressure indicator 1(2)-1303-PI (outboard end of turbine).

      (2) Verify proper oil level/flow within RCIC Turbine Lube Oil System sightglasses.

3 ID: 76016 Points: 1.00

RCIC is running at full flow for a surveillance. Annunciator 901(2)-4 F-15, "RCIC Turbine Bearing Oil Lo Pressure," alarms. If the oil pressure continues to decrease slowly, and no operator actions are taken, what will happen to the running RCIC system?

A. The Turbine Steam Supply Valve, MO 1(2)-1301-61, will automatically close.

B. The Governor Valve, HO 1(2)-1303A, will drift closed.

C. The RCIC turbine will trip when Bearing Oil Pressure decreases below 1.0 psig.

D. The Governor Valve, HO 1(2)-1303A, will drift open and the turbine will trip on overspeed.

Answer: D

Question 3 Details

Question Type:	Multiple Choice
Topic:	ILT.01916 : NO TOPIC
System ID:	938
User ID:	76016
Status:	Active
Must Appear:	No
Difficulty:	0.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	
User Text:	217000A2.07
User Number 1:	3.10
User Number 2:	3.00
Comment:	

19 **ID: SR-1602-K11** **Points: 1.00**

A Group II isolation will occur if the Unit One Drywell reaches _____, and this may be bypassed to allow opening the 2" vent valve to SBGTS by _____.

A. 1.55 psig; a keylock switch on the 901-5 panel

B. 2.5 psig; a keylock switch on the 912-1 panel

C. 1.55 psig; a keylock switch on the 912-1 panel

D. 2.5 psig; a keylock switch on the 901-5 panel

Answer: D

Question 19 Details

Question Type:	Multiple Choice
Topic:	Question #19 (RO/SRO)
System ID:	2036
User ID:	SR-1602-K11
Status:	Active
Must Appear:	No
Difficulty:	2.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	901(2)-5 D-11, R. 7 pg. 1
User Text:	223001K1.09
User Number 1:	3.40
User Number 2:	3.60
Comment:	ILT.04298 (77115) Bank question. Memory. These are Gp 2 valves, the Gp 2 comes in at 2.5 psig. The keylock switch is on th 901-5 panel.

#19

DESCRIPTION HIGH DRYWELL PRESSURE

SETPOINT

Actual: High Drywell Pressure: 2.32 psig.

Tech Spec: ≤ 2.43 psig.

PRIMARY
CNMT
HIGH PRESS

SENSOR PS 1(2)-1001-88A/B/C/D.

A. AUTOMATIC ACTIONS

1. Reactor scrams, Group II isolation occurs, Control Room Vents isolate, Reactor Bldg Vents isolate, and SBGT initiates.

2. **IF** DW high pressure is also sensed by PS 1(2)-1001-89A/B/C/D, **THEN** HPCI initiation occurs.

3. **IF** DW high pressure is also sensed by PS 1(2)-1001-90A/B/C/D, **THEN** LPCI and Core Spray initiate, DGs auto start, DW Coolers trip, DW Vent Booster Fan trips, RBCCW Pumps trip, Recirc MG Set Vent Fan trips, A and B East Turb Bldg Supply Fans trip, C Turb Bldg Exhaust Fan trips, and Fuel Pool Cooling Pumps trip.

B. OPERATOR ACTIONS

1. **IF** High Drywell Pressure exists, **THEN**:

   a. **Verify** Reactor scram and **enter** QCGP 2-3.

   b. **Refer** to applicable QGAs.

2. **IF** a half-scram has occurred **AND** a high Drywell Pressure does **NOT** exist, **THEN determine** and **correct** cause of half scram:

   a. **Determine** if testing is being performed on Drywell Pressure channels **OR** Reactor Protection System.

   b. **Monitor** the following Unit 1 (Unit 2) computer points to determine which RPS channel is in trip condition:

      (1) Point ID W512 (W612), CONTAINMENT HIGH PRESSURE A.
      (2) Point ID W513 (W613), CONTAINMENT HIGH PRESSURE B.
      (3) Point ID W514 (W614), CONTAINMENT HIGH PRESSURE C.
      (4) Point ID W515 (W615), CONTAINMENT HIGH PRESSURE D.

20 **ID: S/R-1000-K22** **Points: 1.00**

Torus sprays are being tested on Unit One when a recirc system leak results in a Rx Scram and entry into the QGAs.
The ANSO has started Torus Sprays, Torus Cooling and RHR Service Water.
The MO-1-1001-16A, RHR Hx Bypass Valve is fully closed.
The NSO also notes that the maximum RHR service water flow with the MO-1-1001-5A, RHR Hx SW Disch Valve, full open is ~~ONLY~~ 2500 gpm at a discharge pressure of 275 psig.
with flow at

What action(s) should be taken?

A. Secure Torus sprays.

B. Cross connect the "A" and "B" RHR Service Water loops.

C. Start a 2nd RHR Service Water Pump. (wouldn't this restore flow & push out the clogging?

D. Stop the RHR Service Water pump and reverse heat exchanger flow.

Answer: D

Question 20 Details

Question Type:	Multiple Choice
Topic:	Question #20 (RO/SRO)
System ID:	9760
User ID:	S/R-1000-K22
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	2
Point Value:	1.00
Cross Reference:	QCOP 100-04, R. 14, D.1
User Text:	230000K5.06
User Number 1:	2.50
User Number 2:	2.60
Comment:	New question. Higher. Indications of HX fouling. RHRSW pump discharge pressure is higher than TS minimum, so do not suspect RHRSW pump failure. If Torus sprays are on the "A" loop, start them on the "B" loop. Cannot crossconnect "A" and "B" RHR SW loops.

#20

RHR SERVICE WATER SYSTEM OPERATION

A. PURPOSE

The purpose of this procedure is to provide the necessary steps for RHR Service Water System operation.

B. DISCUSSION

B.1. This procedure is divided into several different procedure sections:

a. Step F.1 is for operation of A Loop pumps.

b. Step F.2 is for operation of B Loop pumps.

c. Step F.3 is for HX Valve operation.

C. PREREQUISITES

None.

D. PRECAUTIONS

D.1. **IF** there appears to be inadequate heat transfer across the RHR Heat Exchanger or inadequate RHR Service Water Flow (< 3500 gpm and < 198 psig discharge pressure, refer to Technical Specification 3.7.1 and Technical Requirements Manual (TRM) section 3.7.a.), **THEN consider** taking the RHR Service Water Pumps off and reversing flow in the HX to flush it out (this is a possible sign of biofouling in the heat exchanger). (H.8.b.)

D.2. Motor Operated Valve Guidelines: (H.8.a.)

a. A maximum of five starts within a one minute period, followed by a 30 minute cooling off time.

b. The valve is operable during the cooling off period.

c. **WHEN** throttle valves are required to adjust flow or pressure, **THEN** it may be necessary to wait a few seconds to abide by this guideline.

21 **ID: SR-0203-K19a** **Points: 1.00**

A transient occured on Unit 1 resulting in a reactor scram and a Group 2 isolation.
The Inboard MSIVs are closed.
Drywell pneumatic receiver pressure is 75 psig.
The ANSO paices the Target Rock Relief Valve Control Switch to "MANUAL"

Which of the following supplies will provide motive force for Target Rock Relief Valve operation?

1. Drywell pneumatic compressors
2. Drywell pneumatic receiver
3. Target Rock Relief Valve accumulator
4. Nitrogen Makeup System

specific determiner (remove)

A. 2 and 4 ~~ONLY~~

B. 2, 3, and 4 ~~ONLY~~

C. 3 and 4 ~~ONLY~~

D. 1, 2, and 3 ~~ONLY~~

Answer: C

Question 21 Details

Question Type:	Multiple Choice
Topic:	Question #21 (RO/SRO)
System ID:	9769
User ID:	SR-0203-K19a
Status:	Active
Must Appear:	No
Difficulty:	3.50
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LF-46/4700,pg, 56, fig 15
User Text:	239002A1.03
User Number 1:	2.80
User Number 2:	2.90
Comment:	New question. Higher. The DW Pnuematic compressors will be isolated on the Gp 2. The N2 reciever makeup valve opens at 82 psig, which will cause the recievers to be out of the picture because of the higher pressure and the check valve. The accumulator will still be effective.

B. Automatic Functions

#1

1. Initiation

**S/R-4700-EK020

Device/Setpoint	Logic	Bypass/Reset	Responses
Valve PCV-1(2)-4723 will automatically open when DW pneumatic air pressure lowers to 82 psig.	DW pneumatic air header pressure switch (PS-1(2)-4741-12) sends a signal to open SO-1(2)-4723 which ports air to the PCV, opening it.	When header pressure increases to above 82 psig, the solenoid valve will reposition, venting air off of the PCV which causes it to close.	When PCV-1(2)-4723 opens it allows an alternate source (the N_2 or Instrument Air System) to supply the system loads.

2. Trips and Isolations

S/R-4700-EK006b
****S/R-4700-EK011**
****S/R-4700-EK012**

Purpose	Device/Setpoint/ Logic	Bypass/Reset	Response
Compressors 1 & 2 trip to prevent damage to the compressor and the system.	The following trips open contacts in the compressors operating circuitry: - High vacuum in the suction line @ 7.5" Hg PS-1(2)-4741-16. - High separator level LS-1(2)-4741-8222	To restart the compressor, the trip condition must be cleared, and the local "Reset Button" light must be pushed.	When the compressor trips, the backup supply valve PCV-1(2)-4723 will open @ 82 psig to supply the system loads from the Instrument Air System or the N_2 System.
DW Pneumatic suction valves PCV-1(2)-4720/4721 will shut upon receiving a PCIS GP-2 isolation in order to help maintain primary containment integrity.	The GP-2 isolation signals are a One-Out-Of-Two-Twice logic and isolate on the following signals: · 2.5 psig DW press · 100 R/hr in the DW · +8 " RPV water level	When the condition has cleared, and the PCIS has been reset, the valves will open provided their switch is not in the "Close" position.	When the suction valves close on a PCIS GP-2, the suction line will quickly lower to the 7.5" Hg compressor trip setpoint and the compressor will trip.
Dryer refrigeration compressor and fan will trip to prevent freezing of the refrigerant and damaging the dryer.	If refrigerant temperature lowers to 29° F, a contact in the operating logic will open to de-energize the refrigeration compressor and fan.	When temperature raises above 29° F, the contact will close and the compressor/fan will start.	When the refrigeration unit trips, air temperature will increase until the unit re-starts.

Q: Why does the refrigerant compressor shut off at 29°F?
A: Any moisture in the air stream would start to freeze.

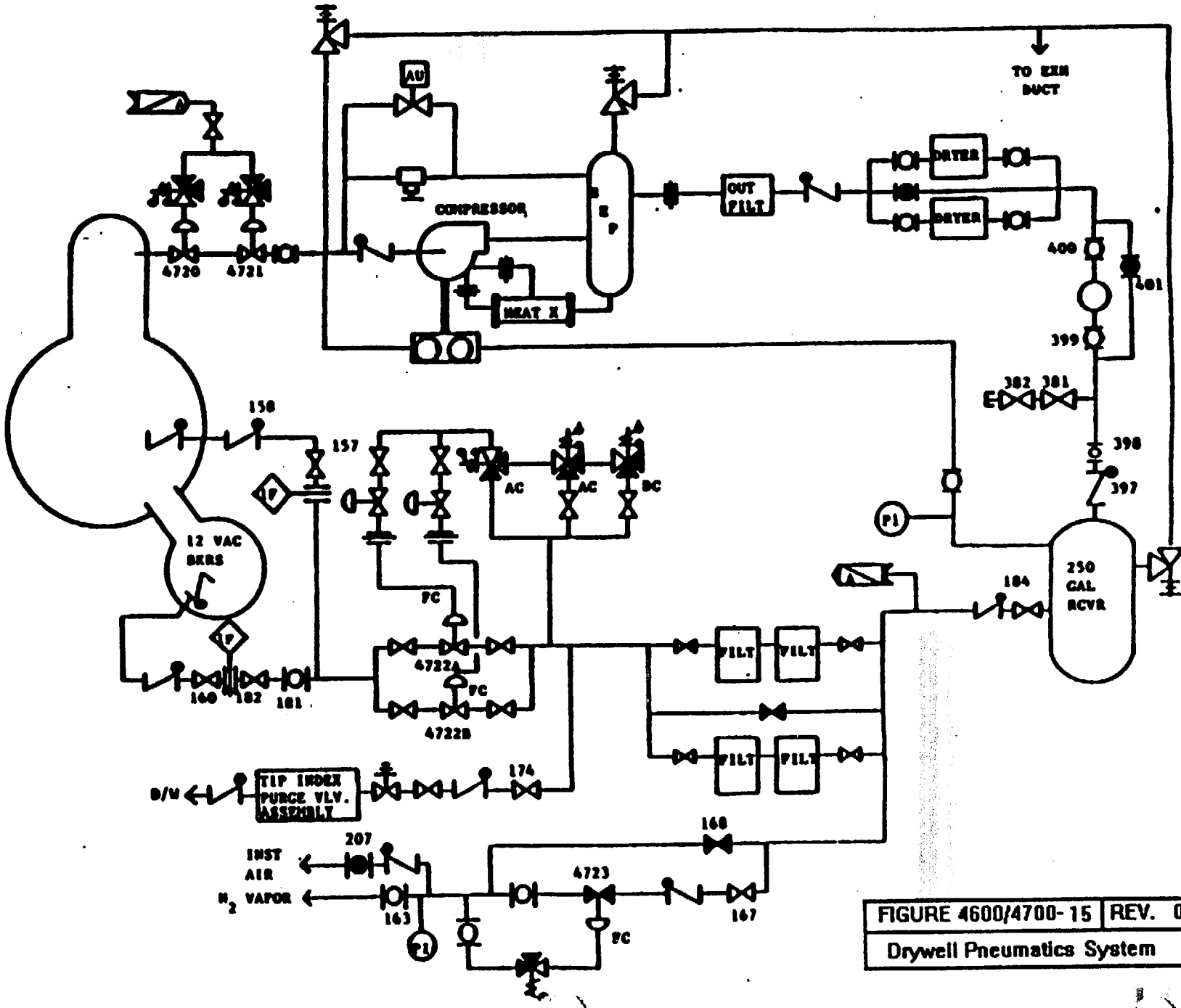


FIGURE 4600/4700-15	REV. 01
Drywell Pneumatics System	

NRC COPY #1

22 **ID: SR-0203-K23** **Points: 1.00**

Unit 2 has experienced a Group 1 isolation and reactor scram.

The ANSO reports that ALL relief valve indicating lights on the 902-3 panel are EXTINGUISHED.

Without operator action, Reactor pressure will increase until the: a. . .

A. ~~first two~~ Safety Valves open at 1250 psig.

B. ~~Target Rock~~ Relief valve opens at 1135 psig.

C. ~~first two~~ Safety Valves open at 1240 psig.

D. ~~Target Rock~~ Relief valve opens at 1115 psig.

memory of relief valve set pts.

Answer: B

Question 22 Details

Question Type:	Multiple Choice
Topic:	Question #22 (RO/SRO)
System ID:	9734
User ID:	SR-0203-K23
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	3
Point Value:	1.00
Cross Reference:	LIC 0203, pg, 3 & 8.
User Text:	239002K3.02
User Number 1:	4.20
User Number 2:	4.40
Comment:	New question. Higher. Target rock safety feature is set at 1135 psig.

(pressurizer ← pwr supply)

2

#22

II. COMPONENT DESCRIPTION

A. Electromatic Relief/Power Operated Relief Valves (PORVs on U-2)

1. The electromatic relief valves/PORVs are designed to prevent over-pressurizing the vessel or lifting the safety valves. They are also designed to relieve pressure rapidly to the pressure reset value or to allow the Low Pressure Coolant Injection (LPCI) System and the Core Spray System to function.

2. The relief valves are sized to prevent lifting the safety valves during a specific transient. The transient the relief valves are designed to protect against is:

   a. The turbine trips from full power, and

   b. The bypass valves fail to operate, and

   c. The reactor scrams from a closure of the turbine stop valves.

Q: The ERV's/PORVs are siz to prevent lifting the safety valves during a specific transient. What transient is this?

A: The turbine trips from full power, and the bypass valves f to operate, and the reactor scrams from the closure of the turbine stop valves.

3. Four electromatic relief valves/PORVs are located in the drywell, one each on Main Steam Lines C and D, and two on Main Steam Line B, upstream of the flow restrictors. The valves are actuated by energizing a 125 vdc solenoid assembly. Three methods of actuation are used:

S/R-0203-EK014
Q: Where are the relief valves physically located?

A: The 3B and 3E reliefs are located on MSL B, the 3C relie is located on MSL C, and the 3 relief is located on MSL D.

   a. Pressure switches (2201(2)-5 rack):

Valve	B	C	D	E
Opening Setpoint	1115	1115	1135	1135
Closing Setpoint	1070	1070	1090	1090

****S/R-0203-EK007a**

   b. A manual demand (keylock switch).

   c. An ADS initiation signal.

      1) High Drywell Pressure (2.5 psig), and

****S/R-0203-EK007b**

      2) Low-Low RWL (-59"), and

#22

3. The valve is self-actuated in the safety mode and air (pilot) actuated in the relief mode.

**S/R-0203-EK007a
**Q: What is the high reactor pressure setpoint for the targ rock?
**A: 1135 psig.

a. As a safety valve, the valve is set to open at 1135 psig.

b. In the relief mode, the pilot solenoid is actuated by the following (Figure 0203-3):

Show Figure 0203-3.

1) High pressure setpoint (1135 psig).

2) A manual demand (keylock switch).

3) An ADS initiation signal.

4. Target Rock Valve Operation (Safety Mode) (Figure 0203-4)

S/R-0203-EK015

Show Figure 0203-4.

a. The steam pressure is sensed at the pilot sensing port (2).

b. The bellows (6) is forced to the right if the setpoint of 1135 psig is reached.

Q: If the target rock bellows ruptures, what actions must b taken per Tech Specs?

A: Commence an orderly shutdown and reduce reactor coolant pressure and temperature below 90 psig and 320° F within 24 hours.

c. This opens the pilot valve disc (3).

d. This allows the pressure to be transferred to the second stage piston (8), which is forced down.

e. This vents the pressure from the top of the main valve piston (12).

f. Pressure is then vented via the second stage disc (10) and out of the main valve piston vent (15).

g. This unbalances pressure across the main valve piston (12).

h. A pressure differential is created because of the small size of the main valve piston orifice (13) compared with the main valve piston vent (15).

i. The reactor steam pressure then lifts the main valve piston (12) and the main valve disc (14).

j. The steam flows out and is piped to the suppression pool.

k. When the steam pressure is approximately 45 to 50 psig below the setpoint, the pilot setpoint adjust spring (4) forces the pilot valve disc (3) closed.

23 ID: SR-0202-K23 Points: 1.00

Unit 2 is operating at rated conditions.
An operating RFP trips.

Which of the following describes the plant response?

A. ~~If reactor water level reaches 26 inches within 45 seconds~~, the recirc pumps will runback to 70%.

B. ~~The recirc pumps will runback to minimum immediately.~~

C. ~~The recirc pumps will runback to 70% immediately.~~

D. ~~If reactor water level reaches 26 inches within 45 seconds~~, the recirc pumps will runback to minimum.

Answer: A

Question 23 Details

Question Type:	Multiple Choice
Topic:	Question #23 (RO/SRO)
System ID:	9823
User ID:	SR-0202-K23
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCAN 902-4 F-7 R1
User Text:	259002K1.15
User Number 1:	3.20
User Number 2:	3.20
Comment:	New question. Higher. The FWLC system will runback to 70% rated core flow if < 3 RFPs are running due to an auto-trip if RPV water level < 26 inches within 45 seconds and steam flow > 85%. At rated conditions, 3 RFPs are required and steam flow > 85%. QCAN 902-4 F-7 rev 1, QCOP 0600-21 rev 1

#23

DESCRIPTION RECIRCULATION LOOP FLOWS LIMITED BY FEEDWATER FLOW AND REACTOR VESSEL LEVEL

SETPOINT

Actual:

1. Steam flow is greater than approximately 85% of rated **AND** either of the following:

   a. Less than four Condensate/ Condensate Booster Pumps running **AND** total Feedwater flow greater than approximately 90% of rated.

   b. RPV low level alarm within 45 seconds of auto trip of an RFP after three pumps initially running.

RECIRC LOOPS LIMITED BY FW FLOW/RX LVL

Tech Spec: None.

SENSOR FWLC System Relay 2-0202-60-197/198.

A. AUTOMATIC ACTIONS

1. **IF** core flow is > 70%, **THEN** both Reactor Recirc Pumps will run back to a value equivalent to 70% rated core flow.

B. OPERATOR ACTIONS

1. **IF** required to control Reactor vessel level, **THEN perform** QCAN 902-5 E-8 or QCAN 902-5 F-8, as applicable, concurrently with this procedure.

2. **WHEN** the condition requiring Recirc pump runback has cleared, **THEN**:

   a. **Lock out** Scoop Tubes for MG A and MG B per QCOP 0202-12.

   b. **Place** the following in MAN:

      (1) 2-262-22, RECIRC MASTER FLOW CONTLR.

#23

ATTACHMENT A (Page 7 of 12)

OPERATIONAL CHARACTERISTICS

4.c. (cont'd)

(4) The level is >15" and the two scram signals have been active for >20 seconds.

(5) The level is >15" and the two scram signals are **NOT** active. This allows the FWLC to restore reactor water level in the event of a false scram signal that is quickly reset by the operator.

5. Automatic Reactor Recirculation Runback

a. A Reactor Recirculation pump runback will occur if feedwater flow drops to less than 20% of rated to protect the pump from cavitation. A less severe runback may be initiated to prevent a Reactor Low Water Level Scram upon loss of either an RFP **OR** condensate booster pump when operating at high power levels. The FWLC System will initiate a 70% recirc runback if less than three RFPs are running due to an auto-trip of a running feed pump, Reactor water level is less than approximately 26", and steam flow is > 85% - **OR** - if less than four condensate booster pumps are running, steam flow is > 85%, and feedwater flow is greater than 90% of rated.

6. RFP Low Suction Pressure Trips

a. Upon detection of a RFP low suction pressure condition, the control system will first attempt to restore suction pressure using a staggerred pump trip approach but will trip all pumps if suction pressure drops too low. The staggered pump trip logic will trip Pump C if suction pressure is less than 125 psig for 3-5 seconds, pump B if less than 125 psig for 7-12 seconds, and pump A only if suction pressure is less than 90 psig for 5 seconds. All pumps will trip if suction pressure is less than 90 psig for greater than 5 seconds. The 90 psig setpoint for tripping all pumps protects the pump from running any significant length of time near min. NPSH, and the time delay avoids unnecessary trips due to pressure spikes. Any Feed Pump trip on low suction pressure is considered a major and is annunciated as FWLC system trouble alarm on the 902-6 panel in addition to other annunciation for RFP auto-trip.

24 **ID: SR-7500-K21** **Points: 1.00**

Given the following conditions:

- 1/2B SBGT SELECT switch is in PRIM
- 1/2A SBGT SELECT switch is in STBY
- SBGT has received an initiation signal.

Which of the following conditions would result in 1/2A SBGT train flow increasing?

A. The inlet to B SBGT Train (1/2-7505B) fails to open.

B. A loss of Instrument Air to the flow control damper has occurred.

C. The SBGT failed to maintain Reactor Building to Outside DP more negative than -0.25 inches.

D. A failure of the heater for the 1/2B SBGT to start.

Answer: A

Question 24 Details

Question Type:	Multiple Choice
Topic:	Question #24 (RO/SRO)
System ID:	9746
User ID:	SR-7500-K21
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOA 7500-01, R. 14
User Text:	261000A1.01
User Number 1:	2.90
User Number 2:	3.10
Comment:	New question. Higher. With the failure of the Primary Train "B" inlet to open, the "B" SBGT train cannot develop adequate flow, so the "A" SBGT train will start. A loss of IA will cause the flow control damper to fail open, not closed. Reactor Building Delta-P is not directly controlled by SBGT. Heater ops do not affect SBGT flow.

STANDBY GAS TREATMENT SYSTEM AUTO START

A. SYMPTOMS

1. Possible alarms at panel 901(2)-3:

   a. G-3, RX BLDG VENT CHANNEL A HI HI RADIATION.

   b. H-3, RX BLDG VENT CHANNEL B HI HI RADIATION.

   c. E-3, RX BLDG VENT CHANNEL A DOWNSCALE.

   d. F-3, RX BLDG VENT CHANNEL B DOWNSCALE.

   e. G-16, FUEL POOL CHANNEL "A" HI RADIATION.

   f. H-16, FUEL POOL CHANNEL "B" HI RADIATION.

   g. C-16, FUEL POOL CHANNEL A DOWNSCALE.

   h. D-16, FUEL POOL CHANNEL B DOWNSCALE.

2. Possible alarms at panel 901(2)-5:

   a. A-8, GROUP 2 ISOL CH TRIP.

   b. B-13, CHANNEL A/B REACTOR LOW LEVEL.

   c. D-11, PRIMARY CONTAINMENT HIGH PRESSURE.

3. Possible alarm at panel 901(2)-55/56:

   a. A-1, DRYWELL HIGH RAD CONC.

B. AUTOMATIC ACTIONS

==========

[ ]

CAUTION

To ensure system performance, the 1/2 B SBGTS TRAIN MODE SELECTOR SWITCH should NOT be placed in the STBY position. (F-17)

[ ]

==========

1. For SBGTS selected to PRIM:

   a. IF the SBGTS initiation signal is from one unit only, THEN that unit's U-1(2)-7503 RB INLET DMPR TO SBGTS will open while the other unit inlet damper will close.

   b. 1/2-7504A(B), TURB BLDG CLG AIR DMPR is CLOSED.

25 **ID: SR-6800-K14** **Points: 1.00**

If the Unit Two ESS UPS fails an operator would verify that the ESS ASCO ABT has switched to _____.

A. MCC 28-2

B. MCC 25-2

C. Bus 28

D. Bus 27

Answer: A

Question 25 Details

Question Type:	Multiple Choice
Topic:	Question #25 (RO/SRO)
System ID:	2582
User ID:	SR-6800-K14
Status:	Active
Must Appear:	No
Difficulty:	2.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QOA 6800-03, R. 26
User Text:	262001K1.04
User Number 1:	3.10
User Number 2:	3.40
Comment:	ILT.05479 (77664) Bank question. Lower. MCC 28-2 is the backup for a failure of the UPS. Bus 28 is the normal power supply to the UPS. Bus 17 is the backup to the static switch, which is part of the UPS, so they may choose Bus 27, but on unit 2 it is Bus 26. MCC 25-2 is the backup to the Instrument Bus.

#85

120/240 VAC ESSENTIAL SERVICE BUS FAILURE

A. SYMPTOMS

1. Alarms.

   a. 901(2)-8 B-8, 120/240V AC ESS SERV BUS LOW VOLTAGE.

   b. 901(2)-8 E-8, ESS SERV UPS ON DC OR ALT AC.

   c. 901(2)-8 F-8, ESS SERV UPS TROUBLE.

   d. 901(2)-8 E-9, ESS SERV BUS ON EMERG SPLY.

   e. 901(2)-5 B-16, CHANNEL B MAIN STM LINE HI HI RADIATION.

   f. 902-5 B-7, GROUP I ISOL CH TRIP.

   g. 901(2)-5 B-6, RWCU GRP 3 PCIS VALVES ISOLATION.

   h. 902-5 D-15, CHANNEL B REACTOR SCRAM.

   i. 901(2)-4 A-1, RECIRC MG A SPEED SIGNAL FAILURE.

   j. 901(2)-4 A-5, RECIRC MG B SPEED SIGNAL FAILURE.

   k. Unit 2 only, 902-6 E-10, FW LEVEL CONT SYS TROUBLE.

2. Failure of the FW level control system. (FRV lockup)

3. Loss of Essential Service will disable RPIS and rod select. CRD flow control will be lost as will the recorders Panel 901(2)-5.

4. Unit 2 only, loss of Essential Service will disable Reactor Recirc Runback circuitry.

B. AUTOMATIC ACTIONS

1. 1/2 Group I Primary Containment isolation.

2. Automatic transfer of UPS from normal AC to U1(2) 250 V battery on loss of feed from Bus 18(28).

3. Automatic transfer of UPS from normal AC to alternate AC on failure of UPS inverter.

4. Automatic transfer of ESS feed from UPS to reserve supply MCC 18(28)-2 on failure of UPS.

5. RWCU isolation will occur on a momentary or complete loss of Essential Service.

#25

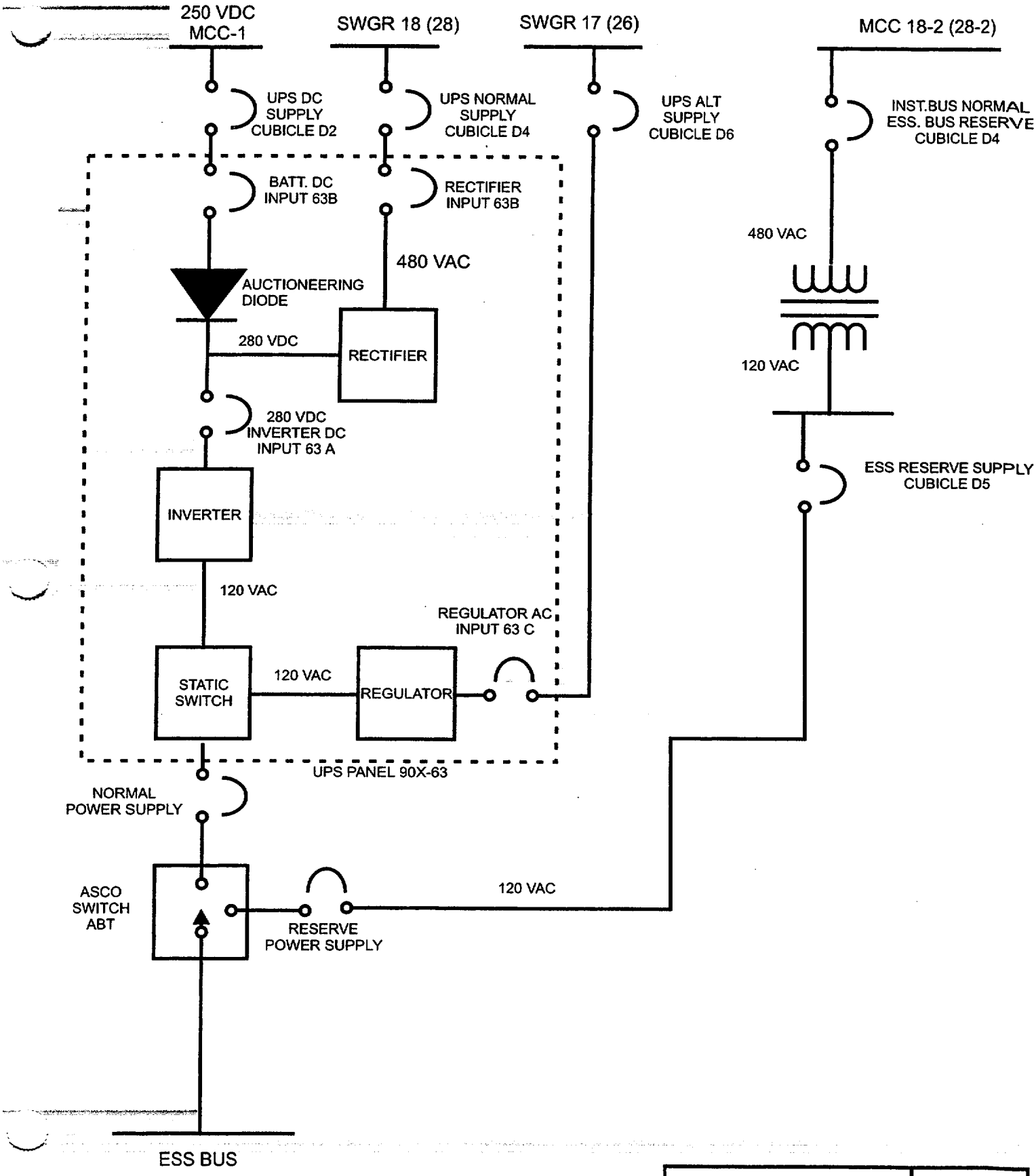


FIGURE 6800-02	REV. 0
ESSENTIAL SERVICE POWER SUPPLIES	

NRC COPY #1

26 **ID: SR-6600-K21** **Points: 1.00**

Prior to closing the ~~DIESEL GEN TO~~ BUS 24-1 breaker while synchronizing the Diesel Generator to Bus 24-1, the operator is to verify that the Diesel and Bus meet the requirements for synchronization.

This is done by verifying the synchroscope is:

A. rotating slowly in the slow direction with the synchroscope approaching the 1 o'clock position.

B. rotating slowly in the fast direction with the synchroscope approaching the 12 o'clock position.

C. rotating slowly in the fast direction with the synchroscope approaching the 1 o'clock position.

D. rotating slowly in the slow direction with the synchroscope approaching the 12 o'clock position.

Answer: ~~B~~ D

Question 26 Details

Question Type:	Multiple Choice
Topic:	Question #26 (RO/SRO)
System ID:	9733
User ID:	SR-6600-K21
Status:	Active
Must Appear:	No
Difficulty:	2.25
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOP 6600-02, R.21, pg 6
User Text:	264000A4.02
User Number 1:	3.40
User Number 2:	3.40
Comment:	New question. Lower. Per the procedure, synchronization is to occur when the synchroscope is rotating slowly in the fast direction and approaching the 12 O'clock position.

F.2. (cont'd)

h. **Adjust** DG voltage to approximately 4160 volts with 1(2) DG VOLT REGULATOR (VARS) switch at Panel 901(2)-8. ____

i. **Synchronize** across DIESEL GEN TO BUS 14-1(24-1) ACB:

(1) **Turn on** SYNCHROSCOPE for the 1(2) DG. ____

(2) **Adjust** 1(2) DG GOVERNOR **AND** VOLT REGULATOR (VARS) until the synchroscope is moving slowly in the FAST (clockwise) direction and INCOMING VOLTS is slightly higher than RUNNING VOLTS. ____

(3) **WHEN** synchroscope approaches twelve o'clock, **THEN close** DIESEL GEN TO BUS 14-1(24-1) GCB **AND apply** a small initial load of approximately 200 to 300 kw with DG GOVERNOR control switch. ____

(4) **Turn off** SYNCHROSCOPE switch. ____

j. **Gradually load** 1(2) DG over 2 to 4 minutes to $\geq$ 500 and $\leq$ 2600 KW with DG GOVERNOR control switch and **maintain** outgoing VARS approximately one-half the DG KW value using VOLT REGULATOR (VARS) control. ____

CAUTION

The following steps are provided to operate the 1(2) DG unloaded and with the Speed Droop set at 0 for circumstances that would require this type of operation (i.e., Tech Spec operability demonstration or other emergency situations as deemed necessary by the US).

F.3. **IF** DG will be manually started **AND NOT** loaded to the Electrical System, **THEN:**

a. **Dispatch** two Operators to DG Room to:

(1) **Verify** Governor SPEED DROOP set at 0. (upper left knob) ____

27 ID: SRN-6600-K15 Points: 1.00

How is the amount of fuel regulated to the cylinders for the diesel when it is at speed?

A. The load limit control automatically controls the fuel rack position which controls the amount of fuel injected into the cylinders which controls the speed of the engine.

B. As speed changes on the diesel the governor changes the speed of the fuel pump to send the proper amount of fuel.

C. The fuel injectors are set at a predetermined value which will maintain the amount of fuel constant therefore maintaining speed constant.

D. The governor positions the fuel racks which controls the amount of fuel injected into the cylinders which controls the speed of the diesel as load is added or removed.

Answer: D

Question 27 Details

Question Type:	Multiple Choice
Topic:	Question #27 (RO/SRO)
System ID:	595
User ID:	SRN-6600-K15
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LN-6600, pg. 11
User Text:	264000K4.06
User Number 1:	2.60
User Number 2:	2.70
Comment:	LN.01212 (75667) ILT.01212 replaced redundant NLO.00118 Bank question. Lower. The governor postions the fuel racks to control the amount of fuel of fuel injected.

7. Governor/Speed Control

**SRN-6600-K14(h)
**SRN-6600-K15(h)

#27

a. Purpose

The formula:

$$f = NP/120$$

where: f = freq.
P = # of poles
N = speed (RPM)

Shows that by changing the speed of a generator, its frequency changes also. Therefore, the diesel speed control is also the generator frequency control.

All of the emergency diesel generators at Quad Cities (including the security diesel) use a Woodward UG-8 Speed Governor to control diesel engine speed and, consequently, generator frequency.

The UG-8 Governor is a hydraulically operated unit and uses an oil booster pump to charge the governor accumulators on a start. It normally will maintain engine speed regardless of the generator load.

The governor controls engine speed by regulating the amount of fuel supplied to each of the engine cylinders by moving the fuel rack. There is a fuel rack on each side of the diesel. This rack is connected to each of the ten fuel injector pumps on the same side of the engine.

Lateral motion of the fuel racks rotates the plungers, which are located in the center of the fuel injectors. Rotation of the plungers controls the amount of fuel oil injected into each cylinder during each stroke.

b. Controls

The **synchronizer** is a manual speed adjustment, used to set the desired engine speed when paralleling the diesel generator to its bus. The synchronizer is also used to set the desired load after paralleling. Synchronizing is normally accomplished remotely using the governor switch, which energizes a synchronizer motor (mounted on top of the governor).

It is possible to energize the synchronizer motor when the diesel is idle; however, this would change the position of the governor and on subsequent starts could cause the diesel to start up and run at low RPM (< 800

28 ID: SR-4100-K15 Points: 1.00

Halon

An automatic actuation of the fire protection system for the New Computer Room has occurred.

Which of the following describes the operational implications?

Both air conditioning units trip closing the intake damper, the room exhaust damper:

A. closes and the process computer is susceptible to errors in data processing and calculations at 80 degrees F.

B. remains open and the process computer will automatically trip.

C. remains open and the process computer is susceptible to errors in data processing and calculations at 80 degrees F.

D. closes and the process computer will automatically trip.

Answer: A

Question 28 Details

Question Type:	Multiple Choice
Topic:	Question #28 (RO/SRO)
System ID:	9778
User ID:	SR-4100-K15
Status:	Active
Must Appear:	No
Difficulty:	3.25
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LN-5751, QOA 5750-12, R.6
User Text:	286000K5.02
User Number 1:	2.60
User Number 2:	2.60
Comment:	New. Higher. The room exhaust damper closes on a fire and the process computer is susceptible to errors in daa processing and calculations at 80 degrees F.

(fire with intake CO_2 or Halon-4 what effects on systems...

A/C trips on Halon Fire Protection Sys. + how HVAC sys responds i.e. damper ventilation fans ups etc.

- Build on this.

Rather than effect on the computer - which is obvious if there is reduced ventilation

28

LOSS OF COMPUTER ROOM VENTILATION

A. SYMPTOMS

1. Alarm.

   a. MAIN COMPTR RM HVAC SYSTEM TROUBLE.

2. Indicating light on local HVAC panel 2251-92, in main computer room indicates which unit has tripped.

B. AUTOMATIC ACTIONS

1. Standby HVAC unit will auto-start.

C. IMMEDIATE OPERATOR ACTIONS

1. None.

D. SUBSEQUENT OPERATOR ACTIONS

1. Verify standby HVAC unit auto-start.

2. WHEN problem is corrected, THEN push RESET button on the local control panel. The tripped unit will restart and standby unit will stop and be restored to standby mode.

3. IF ventilation can NOT be restored, THEN prior to reaching 85°F, shutdown the process computer and refer to QOA 9900-02, Loss of Plant Process Computer.

4. IF the process computer must be shutdown due to excessive room temperature, THEN turn off power to the process computer using the power switch on the front panel AND power supply toggle switches inside the cabinets.

E. DISCUSSION

1. Receipt of MAIN COMPTR RM HVAC SYSTEM TROUBLE alarm indicates that room temperature has reached 78°F. This high temperature is indicative of the operating unit malfunctioning. At this point, the standby unit will start and room temperature should decrease thereby turning off the alarm on the main control panel within 20 minutes. However, the indicating light at the local panel will remain on until the unit reset button is pressed.

XXXI. COMPONENT DESCRIPTION

A. Air Handling Units

1. There are two air conditioning units located on the north side of the Service Building outside Trackway One. Each A/C unit has its own heating and cooling units. Each A/C unit has a fan which is interlocked with the heater and condensing units. Normally the heating units do not operate even in the winter due to the heat load generated by the computers in the room. As a result if the heaters do become energized either manually or automatically a trip of the halon system may result due to accumulated dust on the heaters.

2. The A/C units are powered by 480 VAC MCCs 16-3 (Unit #1) and 25-2 (Unit #2).

3. Normally one A/C unit will be running with the other in standby. The running A/C unit is selected using a priority switch located in the new computer room. If the selected A/C unit fails the standby unit will auto start when room temperature reaches approximately 78°F to control temperature.

4. Room temperature is controlled by thermostats located in the computer room. There is one thermostat for each A/C unit. The thermostat are dual function and control heating and cooling.

5. The A/C units trip on an initiation of the Halon fire protection system.

B. Humidifier

1. The Armstrong Humidifier has an enclosed steam generator and blower to Control Room humidity.

2. The humidifier is located along the north wall of the new computer room.

3. The humidifier is controlled by a humidistat to maintain the humidity within the desired band.

4. Power to the humidifier is supplied by 480 VAC MCC 15-1 and the humidifier blower is powered from the 120 VAC distribution panel on MCC 15-1.

S-5751-K14
****N-5751-K14**

S-5751-K15
****N-5751-K15**

Show Figure 6, Computer Room HVAC Control Panel.

Q: What would be the result of a failure of the running HVAC unit?
A: S/B should auto start @ 78°F.

S-5751-K14
****N-5751-K14**

S-5751-K15
****N-5751-K15**

28

Content/Skills	Activities/Notes
C. Dampers	S-5751-K14 **N-5751-K14 S-5751-K15 **N-5751-K15
1. Dampers are located in the intake and exhaust ducts to allow air flow in only one direction.	
2. The room exhaust damper is interlocked to isolate the computer room in the event of an initiation of the Halon fire protection system. The intake damper will close when the A/C unit trips off.	

29 **ID: SR-5750-K23** **Points: 1.00**

Both units are operating at full power with the plant in a normal configuration.

On a complete loss of instrument air, the emergency isolation dampers will fail _____ and the fan dampers will fail _____.

A. OPEN; OPEN

B. CLOSED; CLOSED

C. CLOSED; OPEN

D. OPEN; CLOSED

Answer: C

Question 29 Details

Question Type:	Multiple Choice
Topic:	Question #29 (RO/SRO)
System ID:	4576
User ID:	SR-5750-K23
Status:	Active
Must Appear:	No
Difficulty:	3.50
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LNF-5750
User Text:	288000K1.06
User Number 1:	2.70
User Number 2:	2.70
Comment:	LN.08733 (79666) ILT.08733 replaced redundant NLO.02245 On a loss of IA, the Emergency dampers close due to an accumulator. The fan dampers fail open on a loss of IA. Lower

2. Cooling can be accomplished through the use of evaporative coolers, located downstream from the steam coil.

N-5750-K14a.(3)
SR-5750-K14a.(3)

a. Spray pumps associated with the system located in the duct work spray water for collecting trays into the air stream to provide cooling. Water not evaporated falls back into the collecting trays and is recycled.

b. Makeup water for the collecting trays is provided by clean demin.

The evaporative cooling system is not currently used due to system inefficiency, but the equipment is still in place.

The evaporative coolers work on the principle of evaporation. A small pump sprays water into the ventilation air flow humidifying & cooling the air in the ducts. The water that does not evaporate falls back onto a collection tray and flows back to the pump suction. This system is designed for about a 15°F dT intake to the building. Makeup water to the collection tray is automatically provided from the clean demin system.

C. Reactor Building Supply Fans

N-5750-K14a.(4)
SR-5750-K14a.(4)

1. Located on the Turbine Building 658'10" level above Buses X8 and X9. The supply system has three fans each with a capacity of 47,500 cfm. Normally two fans are operated for a full flow of 95,000 cfm, with the third fan in standby.

2. The supply fans are direct connected, axial flow fans.

3. The supply fans utilize a constant volume control system to regulate the air flow from the supply fans.

N-5750-K15c.
SR-5750-K15a.

a. Vanes on the intake side of the fans are controlled by air operators to adjust the air intake opening.

b. This controls the volume of air entering the system. The vanes are adjusted automatically by a pitot tube sensing downstream air velocity and static pressure.

c. The controllers are in manual set at full flow due to supply and discharge fans "fighting" each other.

4. An air operated damper in the supply fan discharge is operated in conjunction with the fan to open when the fan is started and close when the fan is shut off.

a. The discharge dampers are energize-to-close. When the supply fan breaker is closed, a "b" contact opens to de-energize the air solenoid allowing the damper to fail open.

5. Power supply to the supply fans are:

   a. 1A (2A) - Bus 19 (29)

   b. 1B (2B) - Bus 18 (28)

   c. 1C (2C) - Bus 18 (28)

D. Emergency Dampers

1. There are four emergency air operated dampers that shut during emergency conditions, to prevent the release of contaminants to the environment. There are two dampers on the supply fan discharge duct and two on the exhaust fan inlet duct. The dampers auto close on any one of the following conditions:

   a. High drywell pressure (+2.5 psig).

   b. Low reactor water level (0 inches).

   c. High drywell radiation (100 R/hr).

   d. High refuel floor radiation (100 mR/hr).

   e. High radiation level in the Reactor Building vent exhaust duct (10 mR/hr).

   f. Rx Bldg vent exhaust or Refuel floor radiation detectors downscale.

   g. Low instrument air pressure at the damper (65 psig).

2. These four (4) emergency air operated dampers may also be secured in the closed position by use of a manual handwheel operator. The Hand wheels are located below the individual dampers on the Turbine Building 658'10" level on each side of the supply duct.

3. The isolation dampers are energized to open, and require air to open and air to close.

   a. A 4-way solenoid valve will port air to the top of the air operator to open the damper, when the solenoid is energized, and allow the underside of the air operator to vent to atmosphere.

Refer to M-4-1(2)-85-47 (OTR 89-58). This modification installed inlet & outlet damper control switches and reset buttons on the 912-1 panel. Prior to this mod, these controls were only available on the 2251(2)-24X panel.

N-5750-K14a.(5)
SR-5750-K14a.(5)

N-5750-K15f.(2)
SR-5750-K15d.(2)

Refer to DVR 4-2-88-061, "Rx Bldg Vents Started Without Starting a Sample Pump" (OTR 89-112). This DVR is the result of an NSO starting a Reactor Building exhaust fan without having the particulate sampler turned on. The Unit NSO did not recognize the significance of having the "Rx Bldg Stack Monitor Low Flow" alarm up. This alarm is annunciated on the 90X-3 panel.

Prior to barrier fuel (when there were leakers). A typical release rate was 600 micro ci/sec, now a typical release rate for Unit One is 1 micro ci/sec and U-2 is not detecting any release.

Effluent air is also sampled to check for tritium. The air sample must be frozen and the frozen condensation is sampled for tritium. This must be done (frozen) because tritium emits a very low energy beta which would otherwise be undetectable.

Halogens are sampled weekly.

B. Automatic Functions

1. Initiation

Device/Setpoint	Response
Standby Supply Fan Auto Start. / Low air flow and control switch in normal after close or trip and all Rx Bldg isolation dampers are open, and Rx Bldg atmosphere is less than .6" H_2O above atmospheric pressure and the maintenance switch is in normal.	On sensed low air flow the standby Reactor Building supply fan will auto start if the limits are met.
Reactor Building vents interlock. / Rx Bldg vents system isolated.	On an isolation of the Rx Bldg vents the SBGT system auto starts.

2. Trips and Isolations

Purpose	Device/Setpoint	Bypass/Reset	Response	
Protect the fan from overheating.	Flow switch / Low air flow as sensed by a Dp cell between the fan suction and downstream of the outlet damper.	Bypassed on startup by holding control switch in closed position. / Automatically resets.	On low flow the fans associated Dp switch 5703 closes and energizes a control relay to close a contact in the fan breaker trip circuitry. On a fan start the C/S must be held closed for at least 5 seconds to prevent a trip due to low flow.	**N-5750-K15f.(1)** **SR-5750-K12** **LF-5750-K12** **SR-5750-K15d(1)**
Protect the fan from overheating due to sustained higher than normal current levels.	Undervoltage relay / 80% normal voltage.	No bypass. / Manually reset at the fan breaker.	Relay closes a contact in the fan breaker trip circuitry. Following reset, fan can be manually restarted or will start on low air flow provided C/S is in auto.	

V. SYSTEM INTERRELATIONS

A. Support Systems

1. 480 VAC

a. Power supplies to the supply fans are:

1) 1A (2A) - Bus 19 (29)

2) 1B (2B) - Bus 18 (28)

3) 1C (2C) - Bus 18 (28)

b. Power supplies the exhaust fans are:

1) 1A (2A) - Bus 18 (28)

2) 1B (2B) - Bus 19 (29)

3) 1C (2C) - Bus 19 (29)

N-5750-K19a.
SR-5750-K19

SRN-5750-K23a., b., c.

2. 125 VDC

a. Supplies control power to the fan breakers for remote start and trip functions.

b. Supplies power to the fan damper and the isolation damper air operator solenoids. On a loss of 125 VDC, the fan dampers will fail open while the isolation dampers will fail closed.

3. Instrument Air

Provides the motive force to operate fan and emergency isolation dampers. On a loss of instrument air, the discharge dampers will fail open and the isolation dampers will close due to an accumulator.

Q: Should instrument air fail, how could you close the Rx building ventilation isolation dampers?

A: Use the manual hand wheel to close them.

4. Process Radiation Monitoring System

a. Chimney Gas Radiation Monitoring

The Chimney Gas Radiation Monitoring System alarms when the radiation level of the effluent gases being discharged exceeds the prescribed limit.

b. Reactor Building Ventilation Radiation Monitoring System

30 **ID: SR-5750-K20** **Points: 1.00**

A storm front is approaching causing atmospheric pressure to drop.
How will this be indicated in the Control Room and what is the expected system response?

Reactor Building Delta-P will _____ and Rx Building Exhaust Fan Vortex dampers will _____ further.

A. ~~decrease (become less negative)~~; close

B. ~~increase (become more negative)~~; close

C. increase ~~(become more negative)~~; open

D. ~~decrease (become less negative)~~; open

Answer: D

Question 30 Details

Question Type:	Multiple Choice
Topic:	Question #30 (RO/SRO)
System ID:	9770
User ID:	SR-5750-K20
Status:	Active
Must Appear:	No
Difficulty:	3.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LNF-5750, pg 12 & 37
User Text:	290001A3.02
User Number 1:	3.50
User Number 2:	3.50
Comment:	New question. Higher. A drop in atmospheric pressure will cause the Delta-P to drop since the RX BLDG is at a vacuum. This will cause the exhaust dampers to open to restore the DP.

9) High Drywell radiation (100R/hr).

#30

10) Low reactor water level (0 inches).

11) Refuel floor or Rx Bldg radiation detectors downscale.

2. There are air operated adjustable vanes in the fan intake that operate to control flow by receiving inputs from a flow element downstream of the fan and repositioning the vanes accordingly.

3. There are air operated dampers in the fan discharge that provide isolation of the fan when it is not running.

   a. The dampers are interlocked with the fan to open when the fan starts and close when the fan stops.

   b. The damper air solenoid valves normally receive power from the fan 125 VDC control power circuitry.

   c. On an OOS when 125 VDC power is removed from the fan, a maintenance switch can be used to supply an alternate source of power to the damper to maintain it closed while the fan is being worked on.

C. Reactor Building Exhaust Ventilation

1. There are three 50% capacity fans located on the Turbine Building 658' 10" level above Buses X8 and X9.

   a. Normally two fans are running with one in standby.

   b. The standby fan will auto start on a low flow condition under the same conditions as a standby supply fan.

   c. The exhaust fans have all the same trips as the supply fans with the exception of the +1.0" H_2O supply fan trip. An extreme negative differential pressure, greater than -1.0" H_2O will cause the Reactor Building exhaust fans to trip.

2. There are air operated adjustable vanes in the exhaust fan intake that are repositional according to inputs from a Dp cell to maintain the Reactor Building to outside differential pressure.

3. Each fan has an air operated damper in the fan intake that provides isolation of the fan when it is not running.

b. This vacuum is maintained by a building differential pressure control system. (Shown on M-1531)

1) Differential Pressure Transmitters DPT-1-5741-2A, 2B, 2C & 2D which measure atmospheric pressure with respect to Refueling Floor pressure pass their lowest differential pressure thru selectors C-1A, B, C & D to Receiver Controller T3 which modulates both Units 1 & 2 Exhaust Fan Vortex Dampers to maintain a minimum building differential pressure.

N-5750-K15d.
SR-5750-K15b.

Q: How does Rx building ventilation maintain a negative pressure in the Rx building?

A: Supply fans run at full flow (not restricted). Exhaust fans, which are larger capacity, throttle flow based on building pressure as sensed from refuel floor.

2) This is with the Unit 1 Controller in control. If necessary, the Unit 2 Controller can be valved in and control ΔP. If both controllers are inoperative, they can be bypassed and D/P controlled manually via a PCV.

3) Differential pressure sensors (4) are located on each wall of the refuel floor (690' el.). The D/P controller, bypass valves, and pressure control valves are located at their respective local panel 2251(2)-24X (658'10" el.) near the exhaust fans. The D/P controller(s) may be bypassed and isolated and a manual PCV 1-5999-607 may be adjusted to vary the air supply pressure to the exhaust fan vortex dampers. The vortex damper operation controls Reactor building D/P.

Show Figure 3, Rx Building Differential Pressure Control System.

c. Assisting in the effort for pressure control are the exhaust fans themselves. The fans are identical to the supply fans but have a larger capacity than the supply fans. The exhaust system, has three fans, each with a capacity of 55,000 cfm. Normally two fans are operating for a full flow exhaust of 110,000 cfm, with the third fan in standby.

N-5750-K14a.(4)
SR-5750-K14a.(4)

N-5750-K15f.(1)
SR-5750-K15d.(1)

1) The standby exhaust fan will auto start on a low flow condition under the same conditions as a standby supply fan.

2) The exhaust fans have all the same trips as the supply fans with the exception of the +1.0" H2O supply fan trip. An extreme negative differential pressure, greater than -1.0" H2O will cause the Reactor Building exhaust fans to trip.

d. Power supply to the exhaust fans are:

1) 1A (2A) - Bus 18 (28)

31 ID: SRN-1601-K-2 **Points: 1.00**

Both units are operating at full power.
The Unit one Torus develops a leak on the ECCS suction header.

If no operator action is taken Rx building basement Torus area water levels:

A. and reactor building atmosphere will be unaffected.

B. will increase, but reactor building atmosphere will be unaffected.

C. will not be affected, but the reactor building will be uninhabitable due to oxygen deficient atmosphere.

D. will increase, followed by the reactor building being uninhabitable due to oxygen deficient atmosphere.

Answer: D

Question 31 Details

Question Type:	Multiple Choice
Topic:	Question #31 (RO/SRO)
System ID:	9820
User ID:	SRN-1601-K-2
Status:	Active
Must Appear:	No
Difficulty:	2.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOA 1600-05 R6
User Text:	290001K6.04
User Number 1:	3.90
User Number 2:	4.10
Comment:	New question. Higher. Answer is correct due to ECCS suction header location near the bottom of the torus and during normal plant operation the torus is inerted. QCOA 1600-05 rev 6

#31

LEAK IN TORUS

A. SYMPTOMS

A.1. For leak above Torus water line:

a. Unable to maintain Drywell/Torus Differential Pressure per the applicable procedure:

(1) QCOP 1600-14.

(2) QCOP 1600-21.

b. Loss of Torus Atmosphere if inerted, Alarm 912-7 A-4 (B-4), DRYWELL 1(2) O2 CONTENT HI.

A.2. For leak below Torus water line:

a. Decrease in Torus Level, Alarm 901(2)-3 A-14, TORUS HIGH/LOW LEVEL.

b. Reactor Building Sump Pump Flow abnormally high:

(1) Alarm 901(2)-4 C-18, RX BLD FLOOR DRAIN SUMP A HIGH LEVEL.

(2) Alarm 901(2)-4 D-18, RX BLD FLOOR DRAIN SUMP B HIGH LEVEL.

c. Reactor Building Basement ARM reached trip setpoint, Alarm 901(2)-3 A-1, RX BLDG HI RADIATION.

d. Auto Start of SBGT System if Reactor Building Vent Radiation $\geq$ 3 mr/hr.

e. Visual observation of a leak.

B. AUTOMATIC ACTIONS

None.

C. IMMEDIATE OPERATOR ACTIONS

None.

32 **ID: SR-5752-K23** **Points: 1.00**

During a loss of Service Water, which ONE of the following systems can supply cooling water to the CR HVAC "B" AHU air conditioning unit?

A. Circulating Water (CW)

B. Turbine Building Closed Cooling Water (TBCCW)

C. Reactor Building Closed Cooling Water (RBCCW)

D. Residual Heat Removal Service Water (RHRSW)

Answer: D

Question 32 Details

Question Type:	Multiple Choice
Topic:	Question #32 (RO/SRO)
System ID:	6686
User ID:	SR-5752-K23
Status:	Active
Must Appear:	No
Difficulty:	2.25
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOP 5750-9,R.26, pg. 6,7
User Text:	290003K1.05
User Number 1:	2.80
User Number 2:	3.00
Comment:	LWQ.00260 (81783) Bank question. Lower. RHRSW is the backup. TBCCW, RBCCW and Circ Water are not.

F.3. **IF** Control Room B Train HVAC is to be started, **THEN**:

NOTE

Steps F.3.A., F.3.b., and F.3.c. ensure the Air Handling Unit (AHU) will auto-start and remain operating during a degraded voltage condition, and further will **NOT** cause an undetectable voltage condition on Bus 18 or associated MCCs. (H.8.a.)

a. At Panel 1/2-9400-105, **verify**:

(1) AIR HANDLING UNIT "B" in AUTO. ____

(2) A/C UNIT "B" COMPRESSOR in AUTO. ____

b. At Panel 1/2-9400-102, **verify** the STOP/RESET-OFF-AUTO switch in OFF. ____

c. **IF** alarms 901(2)-5 B-10, CHANNEL A REACTOR LOW LOW LEVEL, and 901(2)-5 B-15, CHANNEL B REACTOR LOW LOW LEVEL, **OR** 901(2)-5 D-11, HIGH DRYWELL PRESSURE (a valid LOCA signal is present), **THEN** **open** breaker Bus 18 cubicle 5D, TURB & REACTOR BLDG LIGHTING 1B. ____

d. **IF** a DBA LOCA exists as evidenced by **NOT** being able to restore RPV water level to > -191", **THEN** **open** the following breakers: (H.8.d)

(1) Bus 19 cubicle 4D, REACTOR BUILDING LIGHTING 1B. ____

(2) Bus 28 cubicle 5D, TURB & REACTOR BLDG LIGHTING 2B. ____

(3) Bus 29 cubicle 4D, REACTOR BLDG LIGHTING 2. ____

e. **IF** Service Water is to be utilized for cooling water to the RCU, **THEN** at Panel 1/2-9400-105, **verify** the A/C UNIT "B" COOLING WATER SUPPLY SELECTOR switch in NORMAL. ____

F.3. (cont'd)

f. **IF** RHR Service Water System is to be utilized for cooling water to the RCU, **THEN**:

(1) **Verify** RCU is **NOT** operating.

(a) At Panel 1/2-9400-105, **place** A/C UNIT "B" COOLING WATER SUPPLY SELECTOR switch in EMERG. ____

NOTE

The valves listed in following 2 steps are located on the CRD level.

(2) **IF** 1(2)A **OR** 1(2)B RHR Service Water Pump is to be run, **THEN verify**:

(a) 1(2)-5799-385, CR HVAC TRAIN B RCU RHRSW SPLY FR PMPS 1(2)-1001-65A & 65B OUTBD SV, **open**. ____

(b) 1(2)-5799-384, CR HVAC TRAIN B RCU RHRSW SPLY FR PMPS (2)-1001-65C & 65D OUTBD SV, **closed**. ____

(c) 1(2)-5799-406, CR HVAC TRAIN B RCU RHRSW SPLY FR PMPS 1(2)-1001-65C & 65D INBD SV, **closed**. ____

(d) **IF** 2A **OR** 2B RHR Service Water Pump is to be run, **THEN verify** 2-5799-407, CR HVAC TRAIN B RCU RHRSW SPLY FR PMPS 1(2)-1001-65A & 65B INBD SV, **open**. ____

(3) **IF** 1(2)C **OR** 1(2)D RHR Service Water Pump is to be run, **THEN verify**:

(a) 1(2)-5799-385, CR HVAC TRAIN B RCU RHRSW SPLY FR PMPS 1(2)-1001-65A & 65B OUTBD SV, **closed**. ____

33 ID: SR-CROP-K04 Points: 1.00

Which of the following examples illustrates the proper format for 3-way communications using the plant radios per Operations expectations?

A. "Unit 1 EO, Unit 1NSO, perform prestart checks on the 1Bravo CRD pump".

"Unit 1 NSO, Unit 1 EO, Understand perform prestart checks on the 1Bravo CRD pump".

"Unit 1 EO, Unit 1 NSO, that is correct."

B. "Unit 1 EO, Perform prestart checks on the 1Bravo CRD Pump"

"Perform prestart checks on the 1Bravo CRD pump"

"Correct"

C. "Unit 1 EO, Unit 1NSO, perform prestart checks on the 1Bravo CRD pump".

"Unit 1NSO, Understand perform prestart checks on the 1Bravo CRD pump"

"That's correct"

D. "Unit 1 EO, Unit 1NSO, perform prestart checks on the 1Bravo CRD pump".

"Unit 1 NSO, Unit 1 EO, Understand perform prestart checks".

"Unit 1 EO, Unit 1 NSO, that is correct".

Answer: A C

Question 33 Details

Question Type:	Multiple Choice
Topic:	Question #33 (RO/SRO)
System ID:	7374
User ID:	SR-CROP-K04
Status:	Active
Must Appear:	No
Difficulty:	1.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	CREW-COM R. 4, pg. 8
User Text:	G 2.1.17
User Number 1:	3.50
User Number 2:	3.60
Comment:	LN.00064 (82488) New question. Lower. Answer is correct due to requirement of using directed 3-way communications with repeat backs and use of phonetic alphabet. Distractors do not contain all of these items.

S/R/A/B/FH/L/W

d. When using the radio or party-line communication systems, the sender and receiver identification should be included in each message.

e. Orders should be simple and not contain more than two actions. It is preferable to have the individual call back to receive additional instructions.

f. Complex instructions, may require written guidance to ensure important information is not forgotten. DO NOT rely on memory. When a complicated procedure is to be performed by a number of personnel at different locations, each working group should have the procedure/applicable checklist available to ensure proper work interaction, sequencing and communications take place.

2. Repeat-Backs

a. Oral communications shall be repeated back to the extent necessary to allow the sender to ensure the order is correctly understood. Complete verbatim (word for word) repeat-backs normally should not be necessary. For repetitive evolutions, the use of verbatim repeat backs shall not be required, provided the details of expected communications are discussed or written out in advance.

For example:

ORDER:	Unit 2 EA, Unit 2 NSO. Reset the Unit 2 Main generator 86 device.
REPEAT-BACK:	Unit 2 NSO, Unit 2 EA. Understand, reset the Unit 2 Main Generator 86 device.
CONFIRMATION:	Unit 2 EA, Unit 2 NSO. That is correct.

b. It is important to accomplish the confirmatory step because a lack of response by the originator will be interpreted as silent confirmation that the repeat-back was correct.

c. The person originating the order shall insure the receiver has properly understood the order. If the repeat-back indicates the receiver incorrectly understands the order, the sender shall state "Wrong" and repeat the order.

34 **ID: LIC-ECCS** **Points: 1.00**

Part of the overall ECCS design bases is to:

A. prevent fuel cladding melting for any mechanical failure of the primary system up to and including a break area equivalent to the largest primary system pipe.

B. prevent fuel cladding melting for any mechanical failure of the primary system with at least one source of offsite power.

C. provide a barrier which in the event of a loss of coolant accident will control the release of fission products to the secondary containment and limit the release of radioactive materials to the environment.

D. provide a means of alternate core cooling following a shutdown from 100% rated thermal power when the reactor is isolated from the condenser and shutdown mode of RHR is unavailable.

Answer: A

Question 34 Details

Question Type:	Multiple Choice
Topic:	Question #34 (RO/SRO)
System ID:	9779
User ID:	LIC-ECCS
Status:	Active
Must Appear:	No
Difficulty:	3.25
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LIC-ECCS pg. 2
User Text:	2.1.27
User Number 1:	2.80
User Number 2:	2.90
Comment:	New. Lower. ECCS is designed to prevent fuel clad melting on the largest primary system pipe break.

A. Content/Skills

Suggested
Instructor's

I. BRIEF DESCRIPTION

A. Purpose

The Emergency Core Cooling System (ECCS) is made up of the High Pressure Coolant Injection (HPCI) system, the Automatic Depressurization System (ADS), the Core Spray System, and the Low Pressure Coolant Injection (LPCI) System. The arrangement of these ECCS subsystems protects the reactor core against fuel cladding damage across the entire spectrum of line break accidents. Additionally the ECCS, in conjunction with the primary and secondary containments, limits th release of radioactive materials to the environs following a loss-of-coolant accide (LOCA), so that resulting radiation exposures are kept to a practical minimum an are within the guideline values given in published regulations.

B. Design Bases

The ECCS is designed to provide protection against the postulated LOCA caused ruptures in the primary system piping. During normal operation, when normal auxiliary power is available, heat is removed from the core through the steam-turbine-condenser cycle or through the use of the shutdown cooling mode o the RHR system. These are the normal provisions for core cooling. When the reactor is isolated from the main condenser and the shutdown mode of the RHR system is unavailable, or when electrical power is unavailable to pump cooling water to the condenser and heat exchangers, the core is cooled by relief valve action followed by use of the Reactor Core Isolation Cooling (RCIC) system. It i assumed that there is no loss of coolant from the primary system.

However, during postulated accident conditions, other means are needed to provid continuity of core cooling where it is assumed that mechanical failures occur in th primary system and coolant is either partially or completely lost from the reactor vessel, and (1) normal auxiliary power is unavailable to drive the feedwater pumps or (2) the loss of coolant occurs at a rate beyond the capability of the feedwater system. Under these circumstances, core cooling is accomplished by means of the ECCS.

Each of the ECCS subsystems was designed to specific design bases; however the overall ECCS design bases are:

1. The ECCS is designed to prevent fuel cladding melting for any mechanical failure of the primary system up to and including a break area equivalent to the largest primary system pipe.

35 ID: SR-0202-K28 Points: 1.00

Plant conditions are as follows:
- Unit Two is recovering from a scram.
- Preparations are underway to start-up the 2B recirc. pump.
- 2A recirculation pump is running at 32% speed.
- Reactor vessel dome pressure = 980 psig.
- A recirc loop temperature = 540 degrees F.
- B recirc loop temperature = 500 degrees F.
- Bottom head coolant temperature = 390 degrees F.

Which of the following describes the limitations, if any, imposed on starting the 2B recirc pump?

A. The pump should NOT be started because bottom head coolant temperature is too low.

B. The pump can be started immediately.

C. The pump should NOT be started because the 2A recirc pump is running too fast.

D. The pump should NOT be started because the loop differential temperature is too high.

Answer: A

Question 35 Details

Question Type:	Multiple Choice
Topic:	Question #35 (RO/SRO)
System ID:	9818
User ID:	SR-0202-K28
Status:	Active
Must Appear:	No
Difficulty:	3.50
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOP 0202-02, R.23, E.7.a
User Text:	G.2.2.1
User Number 1:	3.70
User Number 2:	3.60
Comment:	Modified from INPO bank # 14486 Higher. Exceed 145 degrees Delta-T between bottom head and reactor coolant temperature. Loop delta-T is 40, limit is 50.

#35

E.3. **Unit 2 only:** ©**IF** Total Core Flow is less than 49 Mlb/hr, **AND** Flow Control Line is greater than 59.4%, **THEN refer** to QCOA 0400-02.© (H.7.a.)

E.4. **WHEN** Reactor core is defueled, **THEN** only one Recirc Pump should be operated. This is to prevent damage to nuclear instrumentation due to flow induced vibration. (H.8.e)

E.5. **WHEN** both recirculation loops are in operation, **THEN** jet pump loop flow mismatch shall be maintained within ≤ 10% of rated core flow when operating at < 70% of rated core flow and ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow. (H.1.a.)

NOTE

Steps E.6 and E.7 only required to be met in MODES 1, 2, 3, and 4 during recirculation pump startup. (H.1.c.)

E.6. **WHEN** starting the first recirculation pump, once within 15 minutes prior to each startup, **THEN**:

a. **Verify** the difference between the bottom head coolant temperature and the reactor pressure vessel (RPV) coolant temperature is ≤ 145°F **AND verify** the difference between the reactor coolant temperature in the recirculation loop to be started and the RPV coolant temperature is ≤ 50°F. (H.1.c.)

E.7. **WHEN** starting the second recirculation pump, once within 15 minutes prior to each startup, **THEN**: (H.1.c.)

a. **Verify** the difference between the bottom head coolant temperature and the reactor pressure vessel (RPV) coolant temperature is ≤ 145°F.

b. **Verify** the difference between the reactor coolant temperature in the recirculation loop to be started and the RPV coolant temperature is ≤ 50°F.

c. Speed of operating recirculation pump must be less than 45%.

36 **ID: SR-0203-K20** **Points: 1.00**

The illuminated red light above the Relief Valve Control Switches indicates the ____(1)_____ is activated on Unit One and the ____(2)_____ is activated on Unit Two.

A. (1) valve solenoid open limit switch;
(2) valve position reed switch

B. (1) valve solenoid open limit switch;
(2) valve solenoid open limit switch

C. (1) valve position reed switch;
(2) valve position reed switch

D. (1) valve position reed switch;
(2) valve solenoid open limit switch

Answer: A B ok

Question 36 Details

Question Type:	Multiple Choice
Topic:	Question #36 (RO/SRO)
System ID:	9787
User ID:	SR-0203-K20
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LIC-0203 R. 9, pg. 11
User Text:	G.~~2.2.1~~ B ok
User Number 1:	3.70
User Number 2:	3.60
Comment:	New question. Lower. Unit 1 valve indication is from a limit switch inside the solenoid. Unit 2 valve indication is from reed switches.

Answer does not meet K/A
to perform S/U procedure - control of plant equipment that affect reactivity?

Ques # 36

3. T-quencher

To reduce the hydraulic loading on the torus, each ADS tailpipe is equipped with a T-quencher which acts to distribute the flow over a larger area.

D. Electromatic/PORV/Target Rock Relief Valve Position Indication

Three means to determine the position of the electromatic/Target Rock relief valves are available:

1. Above the control switch on the 901(2)-3 panel, red and green lights indicate open and closed respectively. (Figure 0203-5)

S/R-0203-EK005
****S/R-0203-EK020**

Show Figure 0203-5

Q: What does the ERV open and close lights on the 901-3 panel indicate?

A: Electromatics - Indicates whether the solenoids are pick up.

Target Rock - Indicates wheth or not air pressure is available

a. A limit switch inside the solenoid, indicating only whether it is picked up or dropped out, provides position indication for the electromatic valves on Unit 1.

b. The PORVs have Reed switches that are actuated by the valve pilot rod. This ensures actual valve position indication.

c. Pressure switches in the air supply line act as the position indicators for the Target Rock valve.

Below 40 psig: valve closed light is energized.
Above 50 psig: valve open light is energized.

d. Because the 901-3 panel indications are not actually dependent on the position of the relief valve itself on U-1, they cannot always be counted on as accurate position indication.

2. An acoustic monitor is provided on panel 901(2)-21 to monitor the status of the electromatic relief valves/PORVs, the Target Rock safety/relief valve and the safety valves (Figure 0203-6). The acoustic monitors have the following indications and controls:

Show Figure 0203-6

S/R-0203-EK005
S/R-0203-EK016
S/R-0203-EK020
****S/R-0203-EK021**

a. A green closed LED light is provided for each valve. It indicates the valve is closed.

b. A red open LED light is also provided for each valve. It comes on when the acoustic monitor output reaches the trip setpoint, which indicates flow through the valve.

37 **ID: SR-1602-K28** **Points: 1.00**

Which one of the following is a prerequisite to Purging/Deinerting the Primary Containment through SBGT?

A. Both divisions of Rx Bldg Vent rad monitoring must be verified operable within four hours ~~prior to purging/deinerting~~.

B. The drywell and torus pressure must be equalized within one hour ~~prior to commencing purge/deinerting operations~~.

C. Torus must be vented for four hours ~~prior to initiating drywell purge~~/deinerting.

D. Both the drywell and torus must be sampled within eight days ~~prior to purging/deinerting~~.

Answer: D

Question 37 Details

Question Type:	Multiple Choice
Topic:	Question #37 (RO/SRO)
System ID:	9740
User ID:	SR-1602-K28
Status:	Active
Must Appear:	No
Difficulty:	3.50
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOP 1600-07 R. 16 C.5
User Text:	G 2.3.9
User Number 1:	2.50
User Number 2:	3.40
Comment:	Bank question. Lower. Drywell has been sampled within 8 days per step C.5 of QCOP 1600-07.

#37

DE-INERTING OF PRIMARY CONTAINMENT WITH SBGTS

A. PURPOSE

The purpose of this procedure is to provide the necessary steps for de-inerting and purging the Primary Containment with the SBGTS as well as steps necessary to transfer de-inerting line-up from SBGT to Reactor Building Ventilation System.

B. DISCUSSION

B.1. The Chemistry Department will provide a venting path recommendation on a weekly basis based on routing Drywell/Torus air samples. Changes in vent path recommendations will be provided by the Chemistry Department based on indications of significant fuel degradation as determined by Chemistry Department interpretation of increased activity on these routing samples. Non-fission product sources of activity in the Drywell/Torus should **NOT** change the vent path recommendation even when HPCI, RCIC, or Main Steam Relief Valves are operated.

a. Rad Protection Department is to be contacted when sampling the containment for de-inerting purposes. Chemistry Department is to be contacted when sampling the containment for purposes of weekly surveillances while inerted. The reason is that Chemistry owns equipment accurate in the low ranges of oxygen while inerted and RP owns the equipment that is accurate in the higher ranges of oxygen that are expected when de-inerting.

B.2. It may be desired to transfer from SBGT purge and vent line-up to Reactor Building Ventilation to ensure adequate dilution and/or flow, or to accomplish de-inerting and purging with greater flow. This procedure contains steps to transfer suction from SBGT System to the Reactor Building Ventilation.

C. PREREQUISITES

C.1. **IF** the SJAE monitor is available **AND** the Offgas activity has increased by $\geq$ 50% within the last four hours after factoring out increases due to power, **THEN notify** the Unit Supervisor to request the Chemistry Department to provide a new venting path recommendation.

Over →

38 **ID: SR-5400-K28** **Points: 1.00**

Why is it NOT permissible to run the Mechanical Vacuum Pump when the reactor mode switch is in the RUN position?

A. Because the SJAE's are required to be on when the mode switch is in RUN and they both use the same suction path.

B. Because the Mechanical Vacuum Pump would trip on high temperature once steam was being dumped to the condenser through the bypass valves.

C. Because this would bypass the Low Condenser Vacuum scram with the mode switch in RUN.

D. Because this would provide an unfiltered release pathway to the Main Chimney.

Answer: D

Question 38 Details

Question Type:	Multiple Choice
Topic:	Question #38 (RO/SRO)
System ID:	2277
User ID:	SR-5400-K28
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	TS 3.3.7.2 Bases
User Text:	G. 2.3.11
User Number 1:	2.70
User Number 2:	3.20
Comment:	LN.05154 (77356) Modified question. Lower. The Mechanical Vacuum Pump bypasses the off-gas train.

d. Turbine Building Ventilation.

e. Offgas Building Ventilation.

f. Offgas Recombiner Rooms Ventilation.

g. Gland Steam Condenser Exhauster.

h. Mechanical Vacuum Pump.

i. Standby Gas Treatment Trains.

j. Offgas System.

2. Sources of Activity

a. The main source of activity leaving the chimney is Xe^{133} with a $T_{1/2}$ of 5.3 days.

b. The major source of long-lived activity is Kr^{85} with a $T_{1/2}$ of 10.5 years. Since the fission yield of KR^{85} is only 0.285% it is not a major gas source for the offgas system.

Q. Mechanical Vacuum Pump

SR-5400-K14
SR-5400-K15
****N-5400-K02**
****N-5400-K14**
****N-5400-K15**
****N-5400-K19**
****N-5400-K05**
****N-5400-K22**

Show Figure 5400-06, Condenser Vacuum Pump/Gland Exhaust Arrangement

1. A mechanical vacuum pump is provided in each unit to evacuate air from the turbine and Main Condenser and establish a sufficient vacuum during plant startup. One vacuum pump suction line services each Main Condenser shell via two air release valves in each shell.

2. The pump discharges to the base of the chimney via the gland seal holdup line.

3. The pump is designed for a flow rate of 2320 scfm at 15" Hg.

4. The pump requires 3 to 4 gpm of clean demin water to lubricate the pump and hold the discharge air temperature below 200 F. Clean demin flow as well as discharge temperature indication is available outside the SJAE room.

5. By Administrative Procedure, the pump cannot be operated with the Mode Switch in the RUN position.

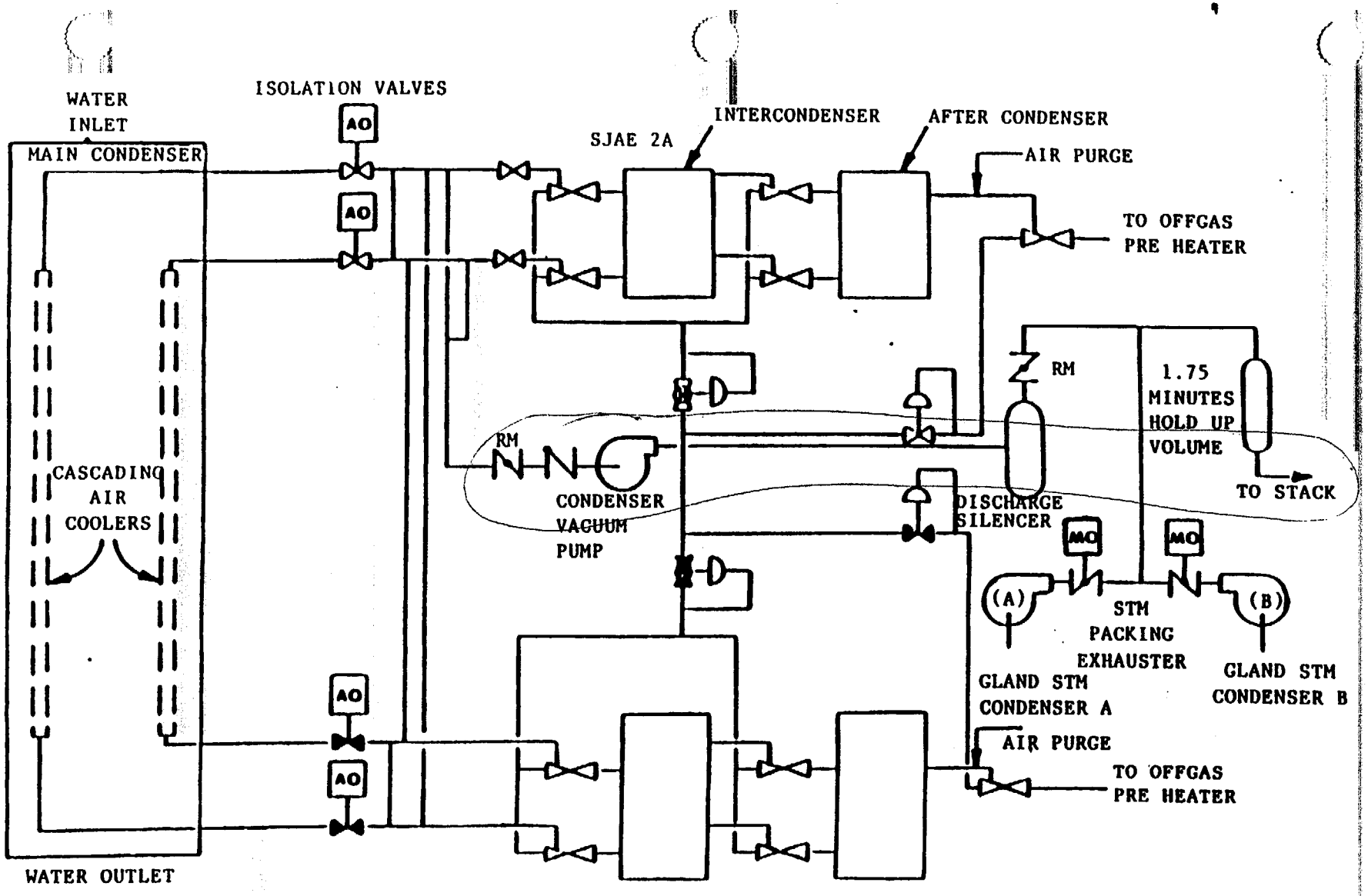


FIGURE - 7	REV. 0
CONDENSER VACUUM PUMP/ GLAND EXHAUST ARRANGEMENT	

NRC COPY #1

#38

#38

BASES (continued)

APPLICABILITY

The mechanical vacuum pump trip is required to be OPERABLE in MODES 1 and 2, when any mechanical vacuum pump is in service (i.e., taking a suction on the main condenser) and any main steam line not isolated, to mitigate the consequences of a postulated CRDA. In this condition fission products released during a CRDA could be discharged directly to the environment. Therefore, the mechanical trip is necessary to assure conformance with the radiological evaluation of the CRDA. In MODE 3, 4 or 5 the consequences of a control rod drop are insignificant, and are not expected to result in any fuel damage or fission product releases. When the mechanical vacuum pump is not in service or the main steam lines are isolated, fission product releases via this pathway would not occur.

ACTIONS

A Note has been provided to modify the ACTIONS related to Mechanical Vacuum Pump Trip Instrumentation channels. Section 1.3, Completion Times, specifies that once a Condition has been entered, subsequent divisions, subsystems, components, or variables expressed in the Condition, discovered to be inoperable or not within limits, will not result in separate entry into the Condition. Section 1.3 also specifies that Required Actions of the Condition continue to apply for each additional failure, with Completion Times based on initial entry into the Condition. However, the Required Actions for inoperable Mechanical Vacuum Pump Trip Instrumentation channels provide appropriate compensatory measures for separate inoperable channels. As such, a Note has been provided that allows separate Condition entry for each inoperable Mechanical Vacuum Pump Trip Instrumentation channel.

A.1 and A.2

With one or more channels inoperable, but with mechanical vacuum pump trip capability maintained (refer to Required Action B.1 Bases), the Mechanical Vacuum Pump Trip Instrumentation is capable of performing the intended function. However, the reliability and redundancy of the Mechanical Vacuum Pump Trip Instrumentation is reduced, such that a single failure in one of the remaining channels could

(continued)

39 **ID: SR-4101-K01** **Points: 1.00**

The purpose of the Pre-Fire Plans is to provide _____

A. direction to the crew for initiating fire actions from the control room.

B. the fire brigade leader with guidance for fighting a fire in a specific area of the plant.

C. the Shift Manager guidance concerning personnel accountability during a fire (assembly).

D. identify actions to the Off-Site Fire Department to egress into the protected area.

Answer: B

Question 39 Details

Question Type:	Multiple Choice
Topic:	Question #39 (RO/SRO)
System ID:	6824
User ID:	SR-4101-K01
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	OP-AA-201-008, R. 1
User Text:	G 2.4.25
User Number 1:	2.90
User Number 2:	3.40
Comment:	LWQ.00451 (81923) Bank question. Lower. Per OP-AA-210-~~108~~ section 1.2. 008 GMT 10/14/02

PRE-FIRE PLANS

1. PURPOSE

1.1. The purpose of this procedure is to describe the provision and control of Pre-Fire Plans.

1.2. Pre-Fire Plans are established for use as a "guide" to aid and assist station fire fighting personnel during a fire event. The plans are designed to provide as much useful information as possible in a short amount of time, yet still have the flexibility of a workable and easily accessible reference document. Fire pre-plans do not delineate "how to" fight a fire in any specific plant area, rather they provide useful information for quickly determining emergency response strategies based on hazards and equipment in the area.

2. TERMS AND DEFINITIONS - None

3. RESPONSIBILITIES

3.1. The Fire Marshal is responsible for ensuring the Pre-Fire Plans are current, including the performance of periodic reviews and updates, as necessary.

3.2. Engineering is responsible for submitting proposed Pre-Fire Plan changes that result from plant design changes.

4. MAIN BODY

4.1. Limitations

4.1.1. A Pre-Fire Plan shall be established for all safety related areas, areas representing a hazard to safety-related equipment, and insured buildings.

4.1.2. A station predefine (or equivalent formal tracking mechanism) shall be established to ensure Pre-Fire Plans are reviewed (and updated as necessary) annually.

4.1.3. As a minimum, controlled copies of the Pre-Fire Plans should be kept in the Main Control Room and in each Fire Brigade Equipment Cage (or equivalent location).

4.1.4. **If** the station specific Pre-Fire Plans are controlled in accordance with other site procedures or processes (e.g., procedure control process, etc.), then Sections 4.1.2, 4.2 and 4.3 of this procedure are not applicable.

40 **ID: NGET** **Points: 1.00**

Which readily available hand held fire extinguisher should be your first choice to extinquish a small electrical fire on the 902-5 panel in the control room?

A. Carbon Dioxide

B. Pressurized water

C. AFFF Foam

D. Dry Chemical

Answer: A

Question 40 Details

Question Type:	Multiple Choice
Topic:	Question #40 (RO/SRO)
System ID:	9742
User ID:	NGET
Status:	Active
Must Appear:	No
Difficulty:	2.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	ERG fire brigade LP fbp10
User Text:	G. 2.4.26
User Number 1:	2.90
User Number 2:	3.30
Comment:	Bank question. Lower. Foam and water extinquishers are not available in the control room. Use of dry chemical is not recommended due to the amount of residue left. CO2 is the best choice. Emergency Response Fire Brigade Training lesson plan fbp10 rev 5

2. Class B

Material Burning (Class B)	Preferred Extinguishing Agent	Second Choice
All Oils - Lube, Hydraulic, Transformer, Diesel Fuel Oils, #2 Fuel Oils, Grease, Battery Casing (Acrylic Plastic)	Dry Chemical preferred for small fires larger fires may require water fog stream for cooling effects, along with dry chemical. Foam may be used for smaller fires, however, is preferred for larger open spill type files. Water god may be desired prior to the application of foam for cooling, but must not allow the dilution of the applied form.	CO_2 may be used for small fires in enclosed or close proximity areas.

3. Class C

Material Burning (Class C)	Preferred Extinguishing Agent	Second Choice
Energized electrical equipment (motors, MCC's, etc.)	CO_2 Note: De-energized electrical equipment will become Class A or B material.	Dry Chemical
Energized cabling (cable pans)	Water fogstream	Dry Chemical

41 ID: SR-PGTM-K3 Points: 1.00

A Control Room annunciator on the 902-5 panel has ~~a round colored sticker attached to the~~ a yellow border annunciator window.

This annunciator ~~indicates~~ ...

A. ~~has an~~ associated equipment deficiency.

B. ~~is a~~ QGA entry ~~condition annunciator.~~ should not be considered

C. has been taken OOS.

D. window is operable with problem inputs bypassed.

Answer: A

what color - may mean nothing - or just an operator reminder + not necessarily what the answer notes.

Also ref. does not justify answer. + not tied to K/A!

Question 41 Details

Question Type:	Multiple Choice
Topic:	Question #41 (RO/SRO)
System ID:	9767
User ID:	SR-PGTM-K3
Status:	Active
Must Appear:	No
Difficulty:	2.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	OP-AA-108-105 R0
User Text:	G.2.4.31
User Number 1:	3.30
User Number 2:	3.40
Comment:	New question. Lower. Answer is correct utilizing referenced procedure. QGA annunicators have yellow border. Disabled or otherwise inoperable annuciators are recorded in round sheets. OP-AA-108-105 rev 0

write new question

Need question - focus on use of response instruction - not K/A!
(Annunciator response inst.)
not an admin procedure for what "could" be used for remedies

#41

QCAN 901(2)-3 A-14
UNIT 1(2)
REVISION 5
Continuous Use

new ref for new equip

TORUS HIGH/LOW LEVEL

DESCRIPTION TORUS HIGH/LOW LEVEL

SETPOINT Actual: Water Level in Torus + 1.25" or - 0.5"
Tech Spec: ≥ 14'1" and ≤ 14'-5".

SENSOR LS 1(2)-1602-6.

A. AUTOMATIC ACTIONS

None.

B. OPERATOR ACTIONS

1. **Observe** level on LI 1(2)-1602-3, TORUS LVL (Narrow Range Indictor) to verify alarm.

2. **Maintain** Torus Level within operating range per QCOP 1600-12.

3. **IF** Torus level is > 14'5" or < 14'1", **THEN refer** to applicable QGA's.

4. **Observe** level as indicated on PR/LR 1(2)-1602-7, TORUS PRESS AND LVL Recorder.

5. **IF** necessary, **dispatch** operator (with required S-Key) to East wall of RB Basement to determine Torus level as indicated by local Torus Level Sightglass:

   a. **Unlock** and **open** 1(2)-1601-100, TORUS LG-1(2)-1602-10 UPPER SV.
   b. **Unlock** and **open** 1(2)-1601-101, TORUS LG-1(2)-1602-10 LOWER SV.
   c. **Determine** Torus level as indicated by Sightglass.
   d. **Close** and **lock** 1(2)-1601-100, TORUS LG-1(2)-1602-10 UPPER SV.
   e. **Close** and **lock** 1(2)-1601-101, TORUS LG-1(2)-1602-10 LOWER SV.

6. **IF** Torus Level is high, **THEN**:

   a. **Check** for any plant evolution that may have caused an increase in Torus Level:

      (1) Any ECCS System operation.
      (2) Minimum Flow Valves for HPCI/RCIC NOT fully closed.
      (3) Condensate Transfer lined up for ECCS Keep Fill.

4.2.5. Attachment 1, "Deficiency Evaluation Checklist", may be used as an aid when evaluating deficiencies.

4.3. Follow-up actions may include:

4.3.1. Evaluate the problem with regard to its effect on equipment and system OPERABILITY.

4.3.2. Take action to comply with applicable Technical Specification Actions or ATR/TRM/ODCM Compensatory Measures. The timeliness of complying with the Actions/Compensatory Measures shall be in accordance with the stated Completion Times.

4.3.3. Perform an "unavailability review" if the deficient equipment or system becomes unavailable for service.

4.3.4. Determine reportability requirements in accordance with the Exelon Reportability Reference Manual.

4.3.5. Evaluate the deficiency's impact on ability to implement emergency operating procedures.

4.3.6. Assess other deficient conditions impacting related or redundant equipment.

4.3.7. Determine if equipment/system can still be used with special restrictions.

4.3.8. Identify if any compensatory actions or additional monitoring required.

4.3.9. Request additional evaluation by Engineering or support personnel as required.

4.3.10. Evaluate deficiency for generic implications (i.e. is it highly probable that a similar deficiency could exist or occur on other systems or equipment) and, if generic implications are found, is testing of systems or equipment required?

4.4. Provide appropriate status controls for the deficiency, that will:

4.4.1. Identify the condition.

4.4.2. Initiate compensatory actions, if required.

4.4.3. Provide special restrictions or instructions for continued operation.

4.5. Identify the equipment deficiency within the main control room, if applicable, as a MCR deficiency.

4.5.1. Deficiency information should be posted using equipment deficiency tags or stickers. They shall be placed in such a manner so as to preclude interference with operation of equipment.

42 **ID: SR-9900-K26** **Points: 1.00**

Unit 2 has experienced a total loss of annunciators due to a loss of the normal power supply.

The operators should align reserve power supply from:

A. 250 VDC B bus.

B. the essential service bus.

C. 125 VDC B bus.

D. the instrument bus.

Answer: C

Question 42 Details

Question Type:	Multiple Choice
Topic:	Question #42 (RO/SRO)
System ID:	9745
User ID:	SR-9900-K26
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOA 0900-01, r. 8, pg. 2
User Text:	G 2.4.32
User Number 1:	3.30
User Number 2:	3.50
Comment:	New question. Lower. 125VDC from division 1 (A bus) is the power source for the annunciators with division 2 (B bus) as the reserve supply. Others are not a potential source of power. QCOA 0900-01 rev 8

#42

LOSS OF ANNUNCIATORS

APPROVAL SIGNATURE	OPERATIONS MANAGER TITLE	11.3.99 EFFECTIVE DATE

A. SYMPTOMS

A.1. ALARM POTENTIAL FAILURE or ANNUNCIATOR DC POWER FAILURE alarms on one or more panels.

A.2. Failure of Annunciator Test.

A.3. Loss of Annunciator Horn.

A.4. Loss of Sequence Of Events Recorder Monitor.

B. AUTOMATIC ACTIONS

None.

C. IMMEDIATE OPERATOR ACTIONS

None.

D. SUBSEQUENT OPERATOR ACTIONS

D.1. **IF** there is a loss of annunciators on 901(2)-3, 901(2)-5, or 901(2)-8 Panels, **THEN notify** the Shift Manager to consider classifying the event as a possible GSEP Condition and initiate GSEP as necessary.

43 **ID: SR-0202-K22** **Points: 1.00**

Unit 2 is operating at 100% power on the 95% Flow Control Line when a trip of the 2B Recirc Pump occurs.

RPV water level will:

A. decrease to the low level scram setpoint.

B. increase to the RFP high level trip setpoint.

C. increase first and return to normal.

D. decrease first and return to normal.

Answer: C

Question 43 Details

Question Type:	Multiple Choice
Topic:	Question #43 (RO/SRO)
System ID:	9757
User ID:	SR-0202-K22
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOP 0202-21, R. 3, pg. 4
User Text:	295001AK2.03
User Number 1:	3.60
User Number 2:	3.70
Comment:	New question. Lower. Reactor water level increases on a recirc pump trip and then returns to normal.

#43

F. PROCEDURE

F.1. **Verify** 1-262-25A/B, PMP A/B SPEED CONTROLLER for both Pumps in INDIVIDUAL MAN mode per QCOP 0202-03.

NOTE

Power changes are to be performed in concurrence with QCGP 3-1.

F.2. ©**IF** time permits, **THEN insert** control rods in-sequence to be less than or equal to 70% FCL.© (H.7.a)

F.3. **Concurrently perform** the following:

a. **Adjust** 1-262-25A/B, PMP A/B SPEED CONTROLLER potentiometer for Pump to be shut down so that Pump speed is less than or equal to 32% speed.

b. **Verify** jet pump loop flow mismatch with both recirculation loops in operation is:

(1) ≤ 10% of rated core flow when operating at < 70% of rated core flow;

(2) ≤ 5% of rated core flow when operating at ≥ 70% of rated core flow. (H.1.a)

NOTE

Recirc Pump trip will result in a large level transient (swell). It may be necessary to lower Reactor vessel water level to less than 30 inches.

F.4. **Trip** desired Recirc MG Set by closing MO 1-202-5A/B, PMP DISCH VLV, for desired Recirc MG Set.

44 **ID: SR-4400-K26** **Points: 1.00**

Unit 2 is operating at 100% power.
Condenser backpressure is 3".
Main Condenser Flow Reversal is in progress from the Control Room.
The NSO notes that Condenser Backpressure is 4.5" and rising .25 inches every five seconds..
All valves are stroking normally.
The NSO should:

A. dispatch an operator to complete the flow reversal manually.

B. have the operator stationed at the Local Panel (2252-71) take Local Control and complete the flow reversal.

C. stop the reversing operation and return the valves to their original position.

D. have the operator stationed at MCC 27-2 attempt to reset the breaker and thermals for any valve that tripped to complete the flow reversal.

Answer: C

Question 44 Details

Question Type:	Multiple Choice
Topic:	Question #44 (RO/SRO)
System ID:	2252
User ID:	SR-4400-K26
Status:	Active
Must Appear:	No
Difficulty:	3.25
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOP 4400-09, R. 11
User Text:	295002AA1.07
User Number 1:	3.10
User Number 2:	2.90
Comment:	ILT.05128 (77331) Bank question. Lower. Per limitations and actions step E.1.

C.3. In order to keep a 2" margin to the Condenser Low Vacuum SCRAM set point (which has a lower limit 23.3" Hg in the normal band for Unit 1 and 22.2" Hg in the normal band for Unit 2), **IF** condenser backpressure is above 3.5" Hg prior to reversing condenser flow, data from recent flow reversals should be reviewed to determine the increase in backpressure expected during the upcoming flow reversal. Items to consider are beginning backpressure, beginning Circ Water Flow direction and increase in backpressure during previous reversals for the same direction. Based on the review of this data, **IF** it is expected that condenser backpressure will exceed 4.7" Hg during the flow reversal, reduce generator load to achieve the required beginning backpressure necessary so the maximum backpressure during the flow reversal is **NOT** expected to exceed 4.7" Hg. A flow reversal should **NOT** be attempted with beginning backpressure of greater than 4" Hg. This step does **NOT** apply in cases where flow reversals are being performed during a transient condition in an attempt to recover condenser vacuum.

D. PRECAUTIONS

D.1. Monitor condenser backpressure closely **IF** vacuum is established during the reversing operation.

D.2. When vacuum is established in the condenser, do **NOT** leave the circulating water flow selector switch in the OFF position because this closes all SJAE suction valves.

D.3. Consideration should be given to reducing load to reduce backpressure to < 3" Hg for the flow reversal.

D.4. Local operation is **NOT** normal and serious damage can result if an improper valve lineup is performed through local control.

E. LIMITATIONS AND ACTIONS

E.1 **IF** vacuum starts to decrease rapidly, **THEN**:

a. **Stop** the reversing operation **AND return** the valves to their original position.

b. **Reduce** load if necessary.

E.2. **IF** the CONDENSER PIT HIGH LEVEL annunciator alarms, **THEN trip** the Circulating Water Pumps.

45 **ID: SR-0500-K26** **Points: 1.00**

Unit One was operating at full power with all systems in their normal lineup when both feed breakers to 480 vac MCC's 18-2 and 19-2 simultaneously trip.

What is the operational impact of failsafe design associated with this loss of AC power?

A. The alternate feed breakers automatically close to restore power to essential loads.

B. A half scram and half Groups II and III Isolations occur due to lost loads.

C. A full reactor scram and full Groups II and III Isolations occur due to lost loads.

D. The alternate feed breakers automatically close maintaining all power and loads.

Answer: C

Question 45 Details

Question Type:	Multiple Choice
Topic:	Question #45 (RO/SRO)
System ID:	9784
User ID:	SR-0500-K26
Status:	Active
Must Appear:	No
Difficulty:	2.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QOA 7000-01, R. 26, pg. 1
User Text:	295003AK1.05
User Number 1:	2.60
User Number 2:	2.70
Comment:	New. Higher. Ref QOA 7000-01. Full scram and Gp 2 and 3 isolations due to loss of RPS. No auto transfer of power for RPS.

#45

120 VAC REACTOR PROTECTION BUS FAILURE (ONE OR BOTH BUSES)

A. SYMPTOMS

1. Alarms.

   a. 901(2)-5 A-10/A-15, CHANNEL A/B MANUAL SCRAM.

   b. 901(2)-5 D-10/D-15, CHANNEL A/B REACTOR SCRAM.

   c. 901(2)-5 B-7, GROUP I ISOL CH. TRIP.

   d. 901(2)-5 A-8, GROUP II ISOL CH. TRIP.

   e. 901(2)-5 B-8, GROUP III ISOL CH. TRIP.

   f. Alarms associated with RPS trips 901(2)-5.

   g. Alarms associated with SJAE suction valve closure 902-7 (Unit 2 only).

   h. 901(2)-5 A-14, CHANNEL A/B DISCH VOL HIGH LEVEL.

B. AUTOMATIC ACTIONS

1. Loss of BOTH RPS buses:

   a. Full Reactor scram.

   b. Group II isolation.

   c. Group III isolation.

   d. Reactor Building Vent, Drywell and Torus Purge Fans trip.

   e. Reactor Building Vent isolation.

   f. Control Room Vent isolation.

   g. Standby Gas Treatment System auto-start.

   h. Condenser Mechanical Vacuum Pump trips.

   i. SJAE suction valves close (Unit 2 only).

   j. APRMs and RBMs INOP trip.

   k. Channel A Reactor Building Vent and Fuel Pool Floor Rad Monitors fail downscale.

   l. Reactor Building Floor Drain Sumps and Equipment Drain Tank pump trip off.

IV. INTERCONNECTIONS WITH OTHER SYSTEMS

A. Supporting Systems

SR-0500-K19
**SR-0500-K23

#45

1. Electrical Distribution

a. 480 VAC power from MCC 18-2(19-2) is supplied to the RPS MG Sets which supply normal power to the RPS buses.

1) Loss of power to the MG Sets will result in a loss of that RPS Bus which gives you in a half scram. The flywheel inertia will maintain power temporarily if the power loss is of a short duration. As the MG Sets go away, the EPAs will provide protection to RPS Bus and its associated loads as the voltage and frequency go out of tolerance.

b. 480 VAC power from MCC 15-2(25-2) is also supplied through a reserve power transformer to the RPS buses (one at a time) if an MG Set is inoperable for some reason.

c. Power to the backup scram valve solenoids is 125 vdc Turbine Building Bus 1A1, circuit 8, Essential Division I for 0302-19A and Turbine Building Bus 1B1, circuit 12, Essential Division II for 0302-19B.

1) If DC power is lost to one Division, that Backup valve will not open upon receipt of a scram signal, but the other one should energize to bleed down the scram air header.

2) If DC power is lost to both backup valves they will not reposition upon receipt of a scram signal and thus will not provide backup to the scram pilot solenoid valves.

d. ARI Valves 25A, 181A, and 182A valve solenoids receive power from the Division I 125 VDC @ 4160 switchgear Bus 11 (21). The 25B, 181B and 182B valve solenoids receive power from the Division II 125 VDC @ 4160 switchgear Bus 12 (22).

2. If power is lost to one division of 125 vdc, that division of ARI vales will not open upon receipt of the ATWS/ARI signals, but the other division should respond as necessary to bleed down the scram air header.

SR-0500-K19

46 **ID: SRN-6900-K01** **Points: 1.00**

Why is the Emergency Seal Oil Pump required to be tripped within 2 hours of a Unit One blackout?

A. The battery sizing calculations assumed that specific loads are shed from the bus during the analyzed four-hour period.

B. There would be no need for the Hydrogen Seal Oil pump since the generator would be no longer rotating after 2 hours.

C. To extend the battery capability beyond the analyzed four-hour design period.

D. To ensure that Unit One RCIC remains available for the four-hour design period.

Answer: A

Question 46 Details

Question Type:	Multiple Choice
Topic:	Question #46 (RO/SRO)
System ID:	9783
User ID:	SRN-6900-K01
Status:	Active
Must Appear:	No
Difficulty:	3.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOA 6900-05,R. 7, pg 2,3
User Text:	295004AK3.01
User Number 1:	2.60
User Number 2:	3.10
Comment:	New. Lower. Battery sizing calculations assume specific loads are shed during the analyzed 4 hour period.

D.1. (cont'd)

b. Unit 2 - MCC 29-2 compartment B4, #2 Battery Charger.

c. Unit 1/2 - MCC 18-2 compartment D3, or MCC 28-2 compartment D4, #1/2 Battery Charger.

D.2. **IF** AC power is available, **THEN re-energize** affected charger per QOP 6900-01.

D.3. **IF** AC power is **NOT** available **OR** affected charger can **NOT** be re-energized, **THEN place** the spare 250V DC Battery Charger in operation per QOP 6900-01.

D.4. **IF** a 250V battery charger is **NOT** available to supply the load, **THEN perform** the following steps within the indicated time period:

a. Within 30 minutes, **trip** Recirc MG Set Emergency Lube Oil Pumps 1(2)A and 1(2)B by placing local control switches to STOP.

b. Emergency Hydrogen Seal Oil Pump:

(1) **IF** AC power is available to MCC 18-2 (28-2), **THEN:**

(a) **Start** GEN H2 MN SEAL OIL PMP.

(b) Within 2 hours, **trip** EMERG H2 SEAL OIL PMP.

(2) **IF** AC power is **NOT** available to MCC 18-2 (28-2), **THEN:**

(a) Within 2 hours, **trip** EMERG H2 SEAL OIL PMP.

(b) **Notify** Radiation Protection to monitor H2 concentration on the Main Turbine Floor.

(c) **Purge** Hydrogen from Main Generator in accordance with QCOP 5320-03.

c. **IF** at any time AC power becomes available, **THEN verify** that a charger is energized and feeding the battery and DC loads.

D.5. **Perform** a review of QCAP 1500-02 for possible Safe Shutdown system inoperability.

E. DISCUSSION

E.1. Each 250V DC battery is sized to start and carry the normal DC loads required for safe shutdown on one unit and operations required to limit the consequences of a design-basis-event on the other unit for a period of four hours without power from the chargers. This time period is deemed adequate to safeguard the plant until normal sources of power are restored. The battery sizing calculation assumes that the 250V DC loads addressed in this procedure are shed from the bus during the four hour evolution, at the specified time.

E.2. 250 VDC loads may fail to operate if battery terminal voltage drops below 210 VDC.

F. ATTACHMENTS

None.

G. REFERENCES

G.1. Technical Specifications:

a. TS 3.8.4, DC Sources - Operating.

b. TS 3.8.5, DC Sources - Shutdown.

G.2. P&IDs:

None.

G.3. Drawings:

a. 4E-1389D, 250V DC Battery Charger #1.

b. 4E-1389E, 250V DC Battery Charger 1/2.

c. 4E-2389, 250V DC Battery Charger #2.

G.4. Manuals:

None.

G.5. Procedures:

a. QCAP 1500-02, Administrative Requirements for Inoperable Safe Shutdown Equipment.

b. QOP 6900-01, 250 VDC Electrical System.

c. QCOP 5320-03, Main Generator Hydrogen Removal.

47 ID: SR-3500-K15 Points: 1.00

Unit 2 is operating at 100% power when a reactor scram occurs.

Instrument Air is _____ the extraction steam non-return check valves in order to prevent _____.

A. applied to; condenser overpressurization

B. vented off; condenser overpressurization

C. vented off; turbine overspeeding

D. applied to; turbine overspeeding

Answer: C

Question 47 Details

Question Type:	Multiple Choice
Topic:	Question #47 (RO/SRO)
System ID:	9802
User ID:	SR-3500-K15
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LN-3500 R.2, pg. 18
User Text:	295005AK3.05
User Number 1:	2.50
User Number 2:	2.60
Comment:	Modified question. Lower. IA is vented off on a turbine trip to prevent steam from the FW heaters causing the turbine to overspeed.

Ques #47

A. Content/Skills

I. Extraction Steam Non-Return Check Valves (Figures 3500-9 and 3500-10)

There is one non-return check valve on each extraction steam line from the LP turbine section to the B, C, and D feedwater heaters. These check valves protect the turbine from overspeeding. This might occur when the turbine is tripped and the subsequent lowering of pressure in the turbine and heaters (due to the vacuum in the condenser) results in flashing of the moisture in the heaters to steam and the passage of this steam back through the extraction steam lines into the turbine, through the blading, and on into the condenser.

Even though this may only be a relatively small amount of steam, the turbine can easily be oversped due to the fact that there may no longer be any load on the generator due to the trip.

The extraction non-return check valves are swing check valves placed in the extraction steam lines between the turbine and the feedwater heaters. Each valve is equipped with an air operated spring loaded closing cylinder. The closing cylinder is mounted on the side of the valves. Each valve is also equipped with an outside lever and weight which is adjusted to give a slight closing tendency (bias) to the valve. The closing cylinder is held in the "valve open" position by instrument air. In the "valve open" position a piston is pushed up compressing the closing spring. An open limit switch is also actuated, which illuminates the red open indication located next to the test "joysticks." In this position the valve disk is free to swing open or closed due to extraction steam flow, independent of the closing cylinder. The piston inside the closing cylinder seats against a neoprene washer in the valve open position preventing air leakage. On a loss of air the spring in the closing cylinder is released pulling the check valve disc in the closed direction. When the turbine trips the extraction non-return check valves close on the loss of instrument air created by the operation of the turbine extraction dump valve. The reverse flow in the extraction lines caused by the flashing of the heater drains will also close the extraction non-return check valves.

There are local position indications and test "joysticks" for each of the non-return check valves. The joysticks and position indication are located on two separate racks. Rack 225X-16E contains the joysticks and indication for the "B" and "C" heater extraction non-return check valves. This rack is located down on the CRD level (Turbine Building, 572' 6" elev.). Rack 225X-14B contains the joysticks and indication for the "D" heater extraction non-return check valves. The rack is located on the 595' level across from the RFP Rooms.

2 ID: 75539 Points: 1.00

What component in the Feedwater Heating System prevents the Main Turbine from overspeeding when the turbine is tripped?

A. Low Pressure Feedwater Heater Level Control Valves

B. Extraction Steam Stop Valves

C. Low Pressure Feedwater Heater Flash Tank

D. Extraction Steam Non-Return Check Valves

Answer: D

Question 2 Details

Question Type:	Multiple Choice
Topic:	ILT.01080 : NO TOPIC
System ID:	467
User ID:	75539
Status:	Active
Must Appear:	No
Difficulty:	0.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	
User Text:	245000SG.7
User Number 1:	3.50
User Number 2:	3.60
Comment:	

48 **ID: SR-0500-K20** **Points: 1.00**

Unit 2 is in RUN.
The scram discharge volume DISCH VOL HI WTR BYP keylock switch is in BYPASS.
Both scram discharge volumes have increased to 50 gallons.

The blue SCRAM lights on the full core display will be _____ and the Scram Solenoid Group lights will be _____.

A. energized; energized

B. de-energized; energized

C. energized; de-energized

D. de-energized; de-energized

Answer: C

Question 48 Details

Question Type:	Multiple Choice
Topic:	Question #48 (RO/SRO)
System ID:	1978
User ID:	SR-0500-K20
Status:	Active
Must Appear:	No
Difficulty:	2.50
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOP 0300-28,QCOA 0500-02
User Text:	295006AA2.05
User Number 1:	4.60
User Number 2:	4.60
Comment:	ILT.04238 (77057) Bank question. ~~Lower~~ Higher. When the scram valves are opened, the blue scram lights are energized. The Scram Solenoid Group lights are deenergized when RPS is tripped.

48

QCAN 901(2)-5 B-1
UNIT 1(2)
REVISION 2
Continuous Use

DESCRIPTION SCRAM DISCHARGE VOLUME HIGH LEVEL BYPASS

SETPOINT

Actual: DISCH VOL HI WTR BYP Switch in BYPASS Position.

Tech Spec: None.

SDV HIGH LVL SCRAM BYPASSED

SENSOR Relay 1(2)-590-111A/B/C/D.

A. AUTOMATIC ACTIONS

1. IF Reactor Mode Switch is in SHUTDOWN OR REFUEL, THEN a Control Rod block will occur.

B. OPERATOR ACTIONS

NOTE

DISCH VOL HI WTR BYP Switch is only active when RX MODE SELECT Switch is in SHUTDOWN OR REFUEL.

1. Verify DISCH VOL HI WTR BYP Switch is in BYPASS Position.
2. IF DISCH VOL HI WTR BYP Switch is NOT required to be in BYPASS Position, THEN:
   a. Verify alarm on Panel 901(2)-5 Window A-14, CHANNEL A/B DISCH VOLUME HIGH LEVEL is NOT up.
   b. Return DISCH VOL HI WTR BYP Switch to NORMAL.
3. IF alarm is in with DISCH VOL HI WTR BYP Switch in NORMAL, THEN check for faulty circuit OR relay.

b.1.a. Scrams (continued)

Name/Purpose	Device/Setpoint/ Logic	Bypass/Reset	Response
APRM INOP	Output from the APRM High-High Trip Unit. Setpoints: APRM mode switch out of OPERATE, Module unplugged, < 50% of assigned LPRM inputs in OPERATE. Logic is 1-out-of-2 taken twice.	Bypassed with by joystick.	Output from APRM Trip Unit opens contact in its assigned Trip Channel which deenergizes one of the 107 relays which opens a contact in its associated RPS Trip Logic.
SDV HIGH LEVEL or FAILED INSTRUMENT	Output from one thermal level switch, one D/P level switch and one thermal switch feed each Trip Channel leg. Setpoint: 40 gal. Logic is 1-out-of-2 taken twice.	Bypassed when Mode Switch in "SHUTDOWN" or REFUEL with SDV High Level Bypass Keylock Switch in "BYPASS" and both RPS Buses energized.	When a high level condition or failed instrument exists, its associated contact in the assigned Trip Channel opens deenergizing one of four 590-100 relays which opens a contact in its associated RPS Trip Logic.
REACTOR LOW WATER LEVEL	Output from one of four Level Transmitters. [1(2)-263-57A/B & 58A/B] Setpoint: +8 inches Logic is 1-out-of-2 taken twice.	No Bypass	When a low level condition exists a contact opens in its assigned Trip Channel deenergizing one of four 590-105 relays which opens a contact in its associated RPS Trip Logic.
REACTOR HIGH PRESSURE	Output from one of four Pressure Transmitters. [1(2)-263-55A-D] Setpoint: 1060 psig Logic is 1-out-of-2 taken twice.	No Bypass	When a high pressure condition exists in the RPV, a contact opens in its assigned Trip Channel deenergizing one of four 590-104 relays which opens a contact in its associated RPS Trip Logic.

SR-0500-K07
SR-0500-K08
L-0500-K08
SR-0500-K13

Show Figure 0500-12.

#48

F. LIMITATIONS AND ACTIONS

F.1. At the completion of the surveillance the US must immediately review the results of this test for compliance to Technical Specifications requirements.

F.2. **IF** a Control Rod inadvertently scrams, **THEN refer** to QCOA 0300-04 and QCOA 0300-11.

F.3. **IF** the logic fails to operate properly, **THEN notify** Unit Supervisor.

F.4. **IF** two **OR** more control rods start to drift, **AND** all RPS scram solenoid lights lit, **THEN scram** the Reactor.

F.5. **IF** four **OR** more control rods start to drift, **THEN scram** the Reactor.

F.6. **IF** partial testing is required, **THEN** the Unit Supervisor will **document** in the PREREQUISITES, **EITHER** the steps to be performed **OR** the steps to be disregarded, **AND** any special instructions required for the performance of the partial test.

G. PERFORMANCE ACCEPTANCE CRITERIA

G.1. **WHEN** RX SCRAM CH A **OR** RX SCRAM CH B manual scram pushbutton is depressed, **THEN** the following actions occur:

a. ALL four respective RPS SCRAM SOLENOID GROUP indicating lights for that RPS channel are **out**. (J.1.a)

b. Annunciator 901(2)-5 A-10 **OR** A-15, CHANNEL A or B MANUAL SCRAM alarms.

H. PROCEDURE

H.1. **Verify** proper operation of RPS Channel A manual scram instrumentation:

a. **Depress** RX SCRAM CH A manual scram pushbutton.

b. **Verify** red light on RX SCRAM CH A manual scram pushbutton is LIT.

E.2. **IF** repetitive steps are in progress that insert individual control rods (e.g., manual insertion using RMC, individual rod scramming, etc.) **AND** the method is **NOT** successful, **THEN** that method may be stopped following 2 or 3 attempts on rods associated with each CRD bank.

E.3. Documentation of jumper or fuse manipulation may be performed any time after the appropriate step is completed and will typically be done when plant conditions are stable enough to allow sufficient time.

F. PROCEDURE

F.1. **IF** ALL Scram Valves are open, as indicated by the blue scram lights on the full core display being lit, **THEN go to** step F.4.

NOTE

The next three steps of this procedure are to be implemented concurrently. Completion of the next three steps is **NOT** required prior to implementing subsequent procedure steps. The next three steps are:

De-energizing scram solenoids.
Venting the scram air header.
Manual control rod insertion.

F.2. **IF** ALL Scram Valves are **NOT** open, as indicated by the blue scram lights **NOT** being lit on full core display, **THEN remove** the following fuses to de-energize the scram solenoids:

a. At Panel 901(2)-15, Terminal Board "C":

(1) 590-715A, F5. ____

(2) 590-715C, F6. ____

(3) 590-715E, F7. ____

(4) 590-715G, F8. ____

49 ID: SR-0203-K28 Points: 1.00

Unit 2 was operating at 100% power when an inadvertent Group 1 occured.
Relief valves are cycling on their auto setpoints.
Reactor pressure is 1116 psig.
The "B" relief valve closed five seconds ago.

The "B" relief valve is expected to automatically open ____.

A. when reactor pressure reaches 1135 psig

B. immediately

C. in five seconds

D. in nine seconds

Answer: D

Question 49 Details

Question Type:	Multiple Choice
Topic:	Question #49 (RO/SRO)
System ID:	9786
User ID:	SR-0203-K28
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	LIC-0203, pg. 4
User Text:	295007AA1.04
User Number 1:	3.90
User Number 2:	4.10
Comment:	New question. Higher. The ADS valves have a timer that prevents auto reopening for 14 seconds.

3) 110 second timer timed out, and

4) CS or RHR pump running > 100 psig

- OR -

1) Low-Low RWL (-59"), and

2) CS or RHR pump running > 100 psig, and

3) 8.5 minutes timer timed out.

4. Electromatic Relief Valve Control (Figure 0203-1)

Show Figure 0203-1

a. Each relief valve has a control switch with 3 positions:

Auto: An ADS signal or exceeding high pressure setpoint will actuate the valve.

Off: The valve will actuate on an ADS signal only.

Man: This position opens the relief by directly energizing the valve solenoid.

****S/R-0203-EK007a**
****S/R-0203-EK021**

Q: What signal will cause the ERV's to open with their contr switches in OFF?
A: ADS signal only.

b. When the 203-3B and 203-3C open automatically due to an ADS signal or high pressure, a 14.5 seconds delay is activated which prevents the valves from automatically reopening for 14.5 seconds after closing.

S/R-0203-EK013
S/R-0203-EK028
****S/R-0203-EK020**

This time delay allows the tailpipe vacuum breakers to cycle, ensuring water hasn't been drawn up into the line as a vacuum is being formed when the steam in the line condenses. The subsequent reopening of a relief valve when the tailpipe is partially filled with water could over-pressurize the relief line and/or result in structural damage to the suppression pool when this slug of water is blown into the suppression pool.

Q: The 3C ERV is cycled open then closed and the green and amber lights come on. What does the amber light indicate?
A: 10 second inhibit timer actuated.

During these 14.5 seconds, manual actuation is physically possible; however, procedure cautions direct the operator not to actuate the valves for 14.5 seconds after closing. A light labeled INHIBIT is illuminated during these 14.5 seconds to warn the operator of the 14.5 second limitation.

Q: What is the purpose of this interlock?
A: Prevent possible damage to the tail pipe/suppression pool by warning operator not to open RV for 14.5 seconds.

The inhibit time delay was changed to 14.5 seconds, from 10 seconds, to account for valve stroke time from full open to full closed.

Q: Can the relief valve be opened manually?
A: Yes.

REF. ISC 96-001E

50 **ID: SR-0202-K09** **Points: 1.00**

Which of the following statements correctly describes the operation of the Reactor Recirculation MG sets with RPV level at -59" and RPV pressure 800 PSIG?

A. LPCI loop select logic causes the drive motor breakers to trip and the ARI system causes the field breakers to trip after a 9-second time delay.

B. PCIS logic causes both drive motor breakers to trip and the ARI system trips the field breakers immediately.

C. The ARI system causes the drive motor breakers to trip and the field breakers to trip after a 9-second time delay.

D. The ARI system causes the field breakers to trip and the drive motor breakers do NOT trip.

Answer: A

Question 50 Details

Question Type:	Multiple Choice
Topic:	Question #50 (RO/SRO)
System ID:	9736
User ID:	SR-0202-K09
Status:	Active
Must Appear:	No
Difficulty:	3.50
Time to Complete:	4
Point Value:	1.00
Cross Reference:	QCAN 901-4 H-3 & A-9
User Text:	295037 EK2.03
User Number 1:	4.10
User Number 2:	4.20
Comment:	NEW 124902 Lower. LPCI loop select logic causes the drive motor breakers to trip and the ARI system causes the field breakers to trip after a 9-second time delay.

#50

DESCRIPTION RECIRCULATION MG SET DRIVE MOTOR AUTOMATIC TRIP

SETPOINT

RECIRC SETS DRIVE MOTOR AUTO TRIP

Actual:
1. < -59 inches Reactor Vessel level.
2. Recirc Pump suction valve < 90% open.
3. Recirc Pump discharge valve < 90% open.
4. 4kV Bus undervoltage.
5. Fluid drive oil temperature > 210°F.
6. Lube oil pressure < 25 psig for 5 seconds.
7. LPCI Loop Select logic trip.
8. MG Set Emerg Pushbutton.

Tech Spec: None.

SENSOR
1. 52a contact at SG 11(21), Compt 4 for Pump 1(2)-202-51A.
2. 52b contact at SG 12(22), Compt 11 for Pump 1(2)-202-51B.

A. AUTOMATIC ACTIONS

1. Recirculation Pump A/B drive motor breaker opens.

B. OPERATOR ACTIONS

1. **Verify** MG Set A/B tripped.

NOTE

The maximum current before overloading a Reactor Recirculation Pump motor is 724 amps.

The maximum speed during single loop operation to prevent riser brace failure is 78%.

2. **Reduce speed** on operating Recirculation Pump to less than 78% and **maintain** Pump motor current less than 724 amps as indicated at 1(2)-202-730A/B, PMP CUR.

NRC COPY #1

APPROVAL SIGNATURE	STATION MANAGER TITLE	5-12-93 Δ EFFECTIVE DATE

DESCRIPTION RECIRCULATION MG SET A FIELD BREAKER OPEN

SETPOINT Actual: 1. Generator lockout relay tripped.
2. Generator exciter field overvoltage.
3. ATWS- Reactor pressure 1250 psig.
4. ~~ATWS-~~ Reactor low-low level -59 inches with 9 second time delay. ~~Unit 1 only~~

A RECIRC MG SET FIELD BREAKER OPEN

Tech Spec: None.

SENSOR 1-202-60-111A

A. AUTOMATIC ACTIONS

1. Recirculation MG Set A trips:
   a. Generator drive motor tripped and locked out.
   b. Generator field breaker tripped and locked out.

B. OPERATOR ACTIONS

1. **Verify** MG Set A tripped.
2. **IF** unit is operating in EGC, **THEN**:
   a. **Trip** EGC.
   b. **Transfer** Recirculation flow control from MASTER AUTO to INDIVIDUAL MANUAL.

NOTE

The maximum current before overloading a Reactor Recirculation Pump motor is 724 amps.

The maximum speed during single loop operation to prevent riser brace failure is 78%.

51 **ID: SR-3700-K24** **Points: 1.00**

~~Unit 1 is being started after a weekend outage.~~
~~No DW entry was made~~; the DW is still inerted.
A reactor startup is in progress in accordance with QCGP 1-1, Normal Unit Startup.
While placing the first FRV in service, the REACTOR VESSEL HIGH LEVEL annunciator ALARMS.
The NSO takes action to reduce vessel level to normal by increasing RWCU system blowdown from 100 GPM to 200 GPM.
~~What consequence could result from the increased RWCU blowdown?~~

A. RWCU system demins will isolate on high post strainer DP.

B. Reactor pressure will decrease and a Group 2 isolation will be received.

C. RWCU system demins will isolate on high post strainer temperature.

D. Drywell temperature would increase, ~~possibly~~ causing the QGAs to be initially entered on High Drywell Pressure.

Answer: D

Question 51 Details

Question Type:	Multiple Choice
Topic:	Question #51 (RO/SRO)
System ID:	9775
User ID:	SR-3700-K24
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCGP 1-1, R43 pg. 32 D.7
User Text:	295010AK1.03
User Number 1:	3.20
User Number 2:	3.40
Comment:	Bank question. Higher. Due to the reject flow, you have less cooling flow returning to the RHX, which in turn places a greater heat load on the NRHX and RBCCW, which in turn causes overheating the Drywell coolers.

D.6. Reactor operation at or below the point of adding heat is inherently different than when the Reactor is operated above the point of adding heat; fuel temperature reactivity effects are negligible below the point of adding heat and small reactivity changes can result in large changes in power before any temperature feedback occurs.

D.7. Excessive reject of Reactor water can overload the RBCCW System via the RWCU Non-Regenerative Heat Exchangers and cause an increase in Drywell temperature resulting in high Drywell pressure Scram/Group 2 Isolation and/or RWCU Isolation due to high Non-Regenerative Heat Exchanger outlet temperature of 140°F.

D.8. Reactor water temperature should be maintained < 284°F **until** Reactor water dissolved oxygen is < 300 ppb. Reactor water dissolved oxygen needs to be minimized in order to reduce the rate of IGSCC and reduce the probability of initiating new cracks.

D.9. **IF** Reactor water temperature is > 284°F **AND** Reactor water dissolved oxygen is > 300 ppb, **THEN** Reactor heat-up should remain on hold until dissolved oxygen drops below 300 ppb.

D.10. During normal heat-up, do **NOT** exceed Reactor coolant heat-up rate of 100°F/hr when averaged over a **one** hour period. (H.1.ac)

D.11. The following Pressure/Temperature Limit surveillances shall be observed:

a. During system heatup, the reactor coolant system temperature and pressure shall be determined to be within the required heatup limits and to the right of the limit lines of Figure 3.4.9-3 at least once per 30 minutes and **refer** to QCOS 0201-02. (H.1.ac)

D.12. Opening the Turbine Vacuum Breaker at high rpm (i.e., greater than 1200 rpm) imposes excessive loads on the Turbine LP Rotor last stage buckets.

D.13. **IF** the 1/2 250 VDC Battery Charger is feeding the Unit battery, **THEN** when a large load is placed on the battery, nuclear instrumentation may spike due to induced currents in the 24/48 VDC System. (H.8.e)

52 **ID: SR-0001-K22** **Points: 1.00**

A LOCA on Unit 2 has caused high Drywell pressure.

Drywell temperature is required to be monitored prior to spraying the Drywell in order to verify:

A. Drywell parameters are within the DSIL curve.

B. ~~Drywell temperature is below 260 degrees F~~. PCPL

C. ~~Drywell temperature is below 180 degrees F~~. RPV SAT curve

→ Technically correct depending on what DW press reads.

D. Drywell parameters are within the PSP curve. credible ?

Answer: A

Question 52 Details

Question Type:	Multiple Choice
Topic:	Question #52 (RO/SRO)
System ID:	9772
User ID:	SR-0001-K22
Status:	Active
Must Appear:	No
Difficulty:	4.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QGA Details, pg. 26-31
User Text:	295010AK3.05
User Number 1:	3.50
User Number 2:	3.40
Comment:	New question. Recall. Required to check DSIL prior to initaiting sprays. PSP looks at Torus pressure and temperature. 180 and 260 degrees F by themselves do not prevent spray initiation. QGA 200 rev 8

check ref ?! DW spray water temp is at 32°F ? freezing! I don't think so.

III. FIG K, DRYWELL SPRAY INITIATION LIMIT (DWSIL)

A. Definition and general description

SR-0001-K09
S-0001-K11
S-0001-K12

1. The DWSIL was previously defined as the highest drywell temperature at which initiation of drywell sprays will not result in an evaporative cooling pressure drop to below either:

   - The drywell-below-wetwell differential pressure capability, or
   - The high drywell pressure scram setpoint.

2. No credit was taken for vacuum breaker operation. It was conservatively assumed that the worst-case evaporative cooling pressure drop could occur more rapidly than pressure could be equalized through the vacuum breakers.

3. New analyses indicate that the evaporative cooling transient will occur much more slowly than assumed, even if the drywell atmosphere is initially dry.

Vacuum breakers are now assumed to function effectively.

4. The curve defines a maximum drywell temperature as a function of pressure.

5. The DWSIL is used to avoid containment failure or deinertion following initiation of drywell sprays.

6. Evaporative cooling

   a. Occurs when water is sprayed into a dry or superheated atmosphere.

   b. The spray droplets absorb heat and flash to steam until the surrounding atmosphere saturates.

   c. Results in a large, rapid pressure reduction. The rate can be faster than the capacity of the vacuum breakers.

   d. Unrestricted spray initiation could result in a negative drywell-to-torus differential pressure large enough to damage the primary containment.

   e. Evaporative cooling continues until the atmosphere is saturated. Higher initial temperatures and pressures result in greater pressure drops since the atmosphere can absorb a greater mass of water vapor before saturating.

#57

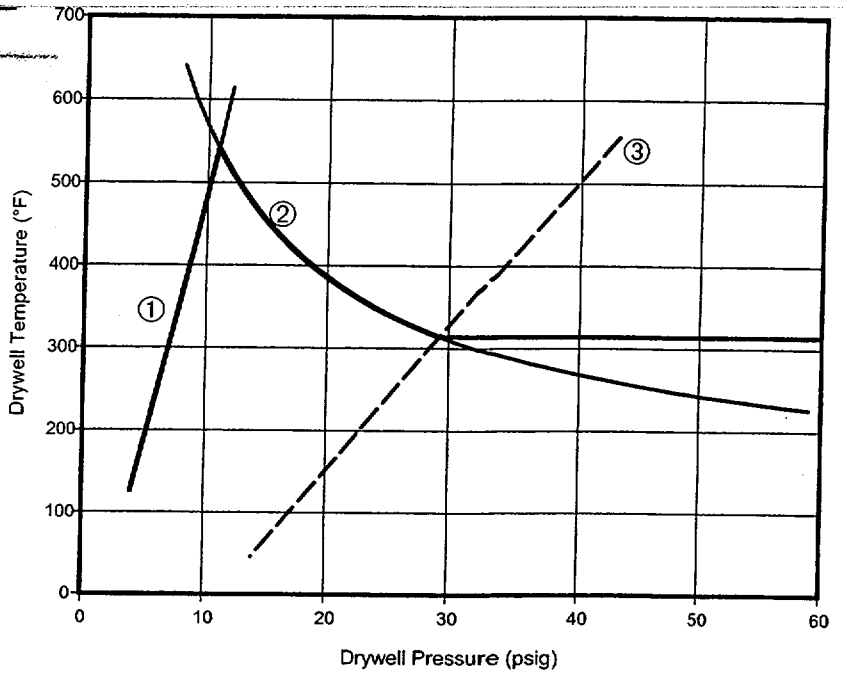


Figure 3: Drywell Spray Initiation Limit

B. Locations

1. The DWSIL is used in the following QGAs:

   - QGA 200, Primary Containment Control
   - QGA 200-5, Hydrogen Control

C. Derivation (Figure 3)

1. The DWSIL is determined by heat balance between the injected spray water and the drywell atmosphere.

2. Line ① defines the drywell temperature and pressure from which evaporative cooling will reduce drywell pressure to the scram setpoint.

   a. Limiting the final pressure to a positive value permits time to take manual action to terminate sprays before pressure drops below atmospheric.

   b. Maintaining a positive pressure avoids opening the vacuum breakers and deinerting the containment.

   c. The scram setpoint is used since it is a predefined, easily recognized, relatively low value.

   d. The allowable temperature increases with pressure since a higher initial pressure permits a greater pressure drop.

   e. Initiating sprays to the left of the line could result in a final pressure below atmospheric, causing the vacuum breakers to open.

3. Line ② is no longer used. New analyses indicate that the evaporative cooling transient will occur much more slowly than assumed, even if the drywell atmosphere is initially dry.

   a. The rate is limited by physical processes:

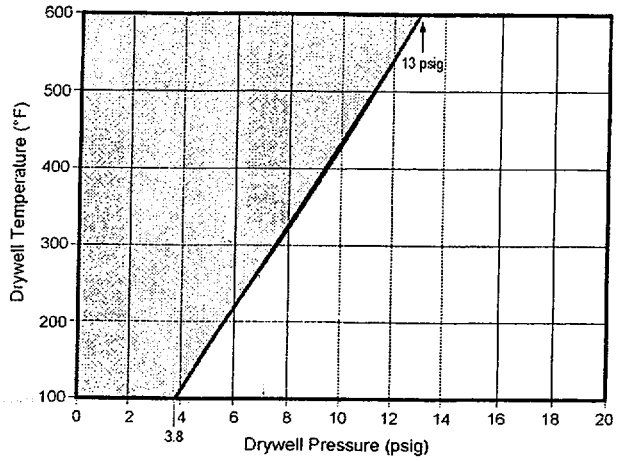
      1) Evaporative cooling will slow as the local atmosphere surrounding each spray droplet saturates.

      2) The water normally stored in the spray headers is preheated by the drywell atmosphere. The first water discharged when sprays are initiated is therefore expected to be warmer than previously assumed.

      3) Full spray flow is not reached instantaneously when sprays are initiated.

#57

K Drywell Spray Initiation Limit



b. Analyses indicate that the torus-to-drywell vacuum breakers will be effective in limiting the differential pressure across the drywell-torus boundary.

c. The right side of the DWSIL has therefore been eliminated. The new limit corresponds to the left side of the old limit.

4. Line ③ is no longer used.

D. Assumptions

1. Drywell spray water temperature is 32°F.

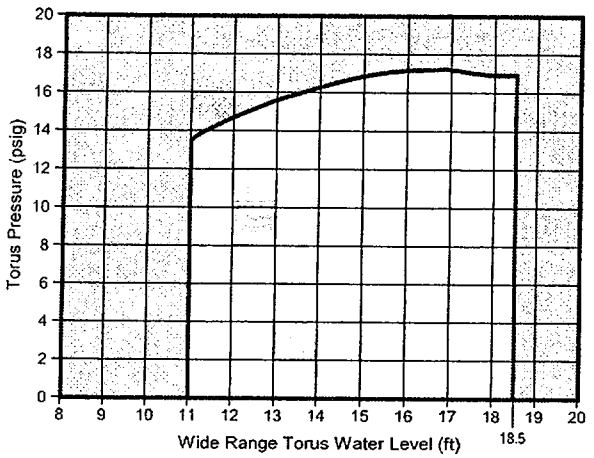
2. Drywell humidity is 0% when drywell sprays are initiated.

3. The torus and drywell are at the same pressure when drywell sprays are initiated.

4. Vacuum breakers deal with the evaporative cooling transient.

#52

L Pressure Suppression Pressure



53 ID: SR-0001-K20 Points: 1.00

~~QGA 200~~ requires starting additional Drywell Coolers to prevent jeopardizing _____ ~~integrity.~~

A. Recirc Pump Seal

B. Reactor Vessel Head

C. Primary Containment

D. RPV Level Instrument

Answer: C

Question 53 Details

Question Type:	Multiple Choice
Topic:	Question #53 (RO/SRO)
System ID:	9774
User ID:	SR-0001-K20
Status:	Active
Must Appear:	No
Difficulty:	2.50
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QGA 200 LP, pg. 5, 37, 39
User Text:	295012AK3.01
User Number 1:	3.50
User Number 2:	3.60
Comment:	Bank question. Lower. QGA 200 is concerned with Primary Containment integrity. The distractors are concerned with reactor integrity.

#53

II. ENTRY CONDITIONS

A. General

SR-0001-K20
SR-0001-K21

1. The entry conditions are symptomatic of emergencies or events that may degrade into emergencies.

2. The entry conditions are related to the key parameters controlled by QGA 200.

3. QGA 200 must be entered whenever any entry condition occurs. If the flowchart is already in use, it must be reentered if another entry condition occurs or an entry condition clears and later reoccurs.

4. The entry conditions setpoints were chosen to be:

   a. Operationally significant.

   b. Unambiguous.

   c. Easy to detect.

   d. Familiar to operators.

B. Drywell pressure above 2.5 psig

1. Corresponds to the high drywell pressure scram setpoint.

2. High drywell pressure is a symptom of a break in the drywell.

3. Also requires entry of QGA 100.

C. Drywell temperature above 180°F

1. Corresponds to the maximum normal operating temperature.

2. High drywell temperature is a symptom of events that may jeopardize primary containment integrity and equipment operability:

   - Loss of coolant
   - Loss of drywell cooling
   - ADS valve actuation

IV. DRYWELL TEMPERATURE

A. General

1. The initial step uses the normal method of drywell temperature control—drywell cooling.

2. If temperature cannot be held below 180°F, later steps use drywell sprays.

3. If temperature cannot be restored and held below the drywell design temperature, an RPV blowdown is performed.

4. Significant action levels include:

   a. 180°F (maximum normal operating temperature)

   b. 280°F (drywell design temperature)

B. Drywell cooling

1. Hold drywell temperature below 180°F

   a. The initial control method is the same as that used during normal plant operation—operate drywell cooling.

   b. Provides a transition from normal operating procedures.

   c. 180°F is the maximum normal operating temperature—the highest temperature expected to occur during normal plant operation.

   d. No further action is required as long as temperature can be held below 180°F.

2. If temperature *cannot* be held below 180°F, go to #18.

   a. Provides more detailed guidance on contingency actions (sprays, scram, blowdown).

   b. The "cannot hold" decision can be made before temperature actually reaches 180°F. (Refer to the definition of "cannot hold.")

SR-0001-K22
SR-0001-K23
S-0001-K24

3. Start all available drywell cooling.

   a. Provides explicit direction to maximize drywell cooling.

   b. Ensures that drywell cooling has been used in preference to less desirable actions.

4. Detail A

   a. High drywell temperatures may affect RPV water level indications.

   b. Detail A identifies conditions under which RPV water level instruments may be unreliable or must be considered invalid.

   c. If drywell temperature is above the RPV Saturation Temperature, water in the instrument runs may start to boil, resulting in unreliable level indication.

   d. If the criteria in Table C are not satisfied for an instrument, the actual RPV water level may be below the instrument variable leg tap. Under these conditions, the instrument will not respond to changes in actual level and cannot be used.

   e. Inaccuracies due to out-of-calibration conditions are not addressed. The intent of the detail is to define conditions under which neither the displayed value nor the indicated trend of an instrument can be relied upon.

   f. The derivation of Detail A is discussed in the *Calculations* lesson plan.

   g. References to Detail A are also included in flowchart branches controlling RPV water level.

54 **ID: SR-0001-K21** **Points: 1.00**

Given the following plant conditions:

- RPV level 10 inches
- Drywell pressure 3 psig
- RPV pressure 1050 psig
- Drywell temperature 170 °F
- Reactor power 2%

WHICH ONE of the following correctly states the QGA procedures that initially should be entered based on the above information ONLY?

A. QGA 101 and QGA 200-5.

B. QGA 100 and QGA 200.

C. QGA 101 and QGA 200.

D. QGA 100 and QGA 200-5.

Answer: B

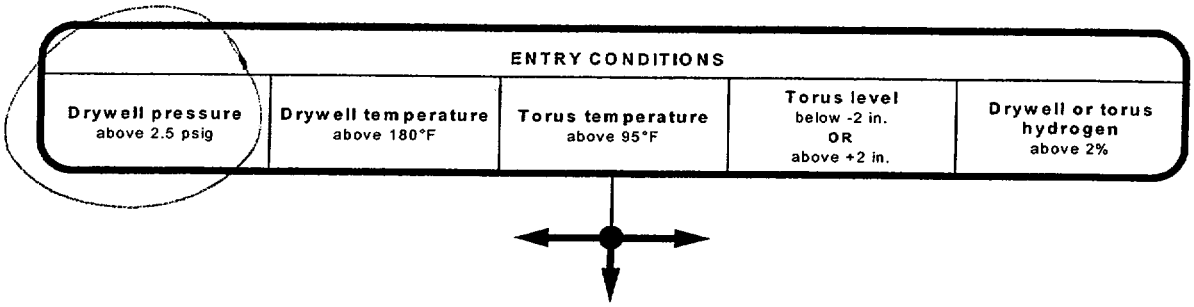
Question 54 Details

Question Type:	Multiple Choice
Topic:	Question #54 (RO/SRO)
System ID:	9751
User ID:	SR-0001-K21
Status:	Active
Must Appear:	No
Difficulty:	2.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QGA 100, 200
User Text:	295013G2.4.4
User Number 1:	4.00
User Number 2:	4.30
Comment:	Bank question. Lower. Drywell pressure of 3 psig requires entry into QGA 100 and 200. Reactor power is < 3%, so no QGA 101 entry. No indications of H2, so no requirement to enter QGA 200-5.

#5

ENTRY CONDITIONS			
RPV water level below 0 in.	**RPV pressure** above 1060 psig	**Drywell pressure** above 2.5 psig	**Reactor power** above 3% or unknown when scram required

#54


ENTRY CONDITIONS
Drywell pressure
above 2.5 psig
Drywell temperature
above 180°F
Torus temperature
above 95°F
Torus level
below -2 in.
OR
above +2 in.
Drywell or torus
hydrogen
above 2%

55 **ID: SR-1000-K18** **Points: 1.00**

Unit 2 had an ADS valve leaking for several days that is still operable.
A plant cooldown is in progress on Unit 2, Reactor pressure is currently 700 psig.
The RHR system was JUST started in the Torus Cooling Mode and the ANSO reports Torus temperature rapidly rising.

The rapid rise in Torus temperature is due to _____.
If indicated Torus temperature exceeds _____ degrees F, a Reactor scram is required.

A. ADS valve leakage impinging directly on the temperature sensor; 105
B. initial stratification of water in the Torus; 105
C. ADS valve leakage impinging directly on the temperature sensor; 110
D. initial stratification of water in the Torus; 110

Answer: D

Question 55 Details

Question Type:	Multiple Choice
Topic:	Question #55 (RO/SRO)
System ID:	9768
User ID:	SR-1000-K18 29
Status:	Active
Must Appear:	No
Difficulty:	3.50
Time to Complete:	0
Point Value:	1.00
Cross Reference:	OE-4679
User Text:	295013AK1.01
User Number 1:	2.50
User Number 2:	2.60
Comment:	New question. Higher. With a leaking Relief valve and no Torus Cooling flow, you can get high Torus temps when the flow is initiated.

Qwn #55

From: "Root, Clarence M. (TVA)" <RootCM@inponn.org>
Subject: OE4679 - SUPPRESSION POOL TEMPERATURE EXCEEDED TECH SPEC LIMIT DUE TO STRATIF
ICATION - BROWNS FERRY NUCLEAR PLANT UNIT 2
Date: Tuesday, July 02, 1991 2:34 PM

SUBJECT: BROWNS FERRY UNIT 2 RESTART EXPERIENCE - NOTIFICATION OF UNUSUAL EVENT (NOUE) - SUPPRESSION POOL TEMPERATURE EXCEEDED TECHNICAL SPECIFICATION LIMIT DUE TO STRATIFICATION

ON JUNE 29, 1991, WITH UNIT 2 IN HOT STANDBY AT LESS THAN ONE PERCENT REACTOR POWER AND THE REACTOR CORE ISOLATION COOLING (RCIC) SYSTEM IN SERVICE FOR SEVERAL HOURS TO CONTROL REACTOR PRESSURE (OUTBOARD MAIN STEAM ISOLATION VALVES CLOSED), HEAT ADDED TO THE SUPPRESSION POOL BY THE RCIC TURBINE EXHAUST CAUSED A STRATIFIED LAYER OF WARMER WATER AT THE POOL SURFACE. SUPPRESSION POOL BULK WATER TEMPERATURE INDICATION WAS WITHIN LIMITS AND STABLE UNTIL A RESIDUAL HEAT REMOVAL (RHR) PUMP WAS STARTED AND THE RHR SYSTEM PLACED IN THE SUPPRESSION POOL COOLING MODE FOR PERFORMANCE OF THE QUARTERLY RHR SYSTEM RATED FLOW TEST. AFTER THE RHR PUMP WAS STARTED, MIXING OF THE SUPPRESSION POOL WATER RESULTED IN A RAPID INCREASE OF INDICATED TEMPERATURE, AND ALL AVAILABLE SUPPRESSION POOL COOLING WAS PLACED IN SERVICE IN ACCORDANCE WITH EMERGENCY OPERATING INSTRUCTIONS. WITHIN A FEW MINUTES, SUPPRESSION POOL WATER TEMPERATURE EXCEEDED 110 DEGREES FARENHEIT. THE REACTOR WAS MANUALLY SCRAMMED AND A NOUE DECLARED. THE NOUE WAS TERMINATED WHEN SUPPRESSION POOL WATER TEMPERATURE DECREASED TO 103 DEGREES.

INVESTIGATION OF THE EVENT IS IN PROGRESS. THE ROOT CAUSE APPEARS TO BE INADEQUATE PROCEDURAL CONTROLS TO COMPENSATE FOR THE DESIGNED LOCATION OF THE SUPPRESSION POOL TEMPERATURE ELEMENTS. A STICKING SUPPRESSION POOL ATMOSPHERE TEMPERATURE RECORDER PEN MAY HAVE HINDERED TIMELY IDENTIFICATION OF INCREASING POOL WATER TEMPERATURE.

ACTIONS TAKEN THE DAY OF THE EVENT INCLUDED A WALKDOWN OF THE SUPPRESSION POOL AREA TO ENSURE DAMAGE HAD NOT OCCURRED AND ISSUANCE OF AN OPERATIONS STANDING ORDER REQUIRING INITIATION OF SUPPRESSION POOL COOLING WHENEVER SIGNIFICANT HEAT IS ADDED TO THE SUPPRESSION POOL. (A SURVEY OF OTHER UTILITIES DID NOT INDICATE THAT THIS WAS A UNIVERSAL PRACTICE.)

THE FINAL EVENT REPORT IS EXPECTED TO IDENTIFY ADDITIONAL ACTIONS, SUCH AS REVISING PROCEDURES TO ADDRESS SUPPRESSION POOL COOLING REQUIREMENTS AND A METHOD TO ENSURE CONTROL ROOM RECORDERS ARE FUNCTIONING PROPERLY.

OE4679 - SUPPRESSION POOL TEMPERATURE EXCEEDED TECH SPEC LIMIT DUE TO STRATIFICATION - BROWNS FERRY NUCLEAR PLANT UNIT 2

Information Contact: RAY SWAFFORD, OPERATIONS, (205) 729-3338

56 **ID: SR-0800-K28** **Points: 1.00**

An ATWS has occured. Reactor power is 3% and steady. Reactor pressure is 920 psig and being controlled by turbine bypass valves. Reactor water level has been lowered to -145 inches IAW QGA 101, RPV Control (ATWS).

Which one of the following describes the status of core cooling and safety limits?

Adequate core cooling _(1)_ assured and _(2)_ safety limit has been violated.

A. (1) IS NOT
(2) A

B. (1) IS
(2) A

C. (1) IS NOT
(2) NO

D. (1) IS
(2) NO

Answer: B

Question 56 Details

Question Type:	Multiple Choice
Topic:	Question #56 (RO/SRO)
System ID:	9780
User ID:	SR-0800-K28
Status:	Active
Must Appear:	No
Difficulty:	3.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	L-QGA101 LP, pg. 35
User Text:	295015G2.2.22
User Number 1:	3.40
User Number 2:	4.10
Comment:	New. Higher. Adequate coore cooling is assured by maintaining RPV level above the miniumum steam cooling level (-166 inches). Level above the top of active fuel (-142 inches) safety limit is violated. Ref TS 2.1

3. If the conditions in the second row of the override exist, lower level to reduce reactor power.

   a. The combination of conditions indicates that heat is being added to the torus faster than it can be removed.

      1) Power above 3% (the APRM downscale setpoint) indicates that significant power is being generated.

         a) At lower power levels, lowering RPV water level would be of little benefit since decay heat would still be produced.

         b) If power is unknown, it must be assumed to be above 3%.

      2) An ADS valve open or drywell pressure above 2.5 psig (the scram setpoint) indicates that heat is being added to the torus.

         a) Heat can be added through the ADS valve discharges or the drywell vents.

         b) The high drywell pressure scram setpoint is specified since it is a relatively low pressure, is well-known, and is easily recognized.

      3) A torus temperature above 110°F indicates that torus heatup is occurring.

         a) The action level is the temperature at which Tech Specs requires a scram.

         b) The Tech Spec LCO is specified because:

            - It is relatively low but significantly above normal.
            - A scram is not required until temperature reaches this value.

      4) An RPV water level above TAF indicates that lowering level is possible and may be beneficial.

         a) Level must be held above –166 in. to provide adequate core cooling.

         b) Further reduction would be of little benefit.

#56

2.0 SAFETY LIMITS (SLs)

2.1 SLs

2.1.1 Reactor Core SLs

2.1.1.1 With the reactor steam dome pressure < 785 psig or core flow < 10% rated core flow:

THERMAL POWER shall be ≤ 25% RTP.

2.1.1.2 With the reactor steam dome pressure ≥ 785 psig and core flow ≥ 10% rated core flow:

For Unit 1, with Cycle 17A exposure less than or equal to 4,000 MWD/MT, for two recirculation loop operation, MCPR shall be ≥ 1.11, or for single recirculation loop operation, MCPR shall be ≥ 1.12. For Unit 1, with Cycle 17A exposure greater than 4,000 MWD/MTU, for two recirculation loop operation MCPR shall be ≥ 1.15, or for single recirculation loop operation MCPR shall be ≥ 1.16.

For Unit 2, MCPR shall be ≥ 1.11 for two recirulation loop operation, or for single recirculation loop operation, MCPR shall be ≥ 1.12.

2.1.1.3 Reactor vessel water level shall be greater than the top of active irradiated fuel.

2.1.2 Reactor Coolant System Pressure SL

Reactor steam dome pressure shall be ≤ 1345 psig.

2.2 SL Violations

With any SL violation, the following actions shall be completed within 2 hours:

2.2.1 Restore compliance with all SLs; and

2.2.2 Insert all insertable control rods.

57 ID: SR-0302-K15 Points: 1.00

Both Units are operating at full power when Unit 1 experiences a scram from full power. Plant conditions on Unit 1 are as follows:

-Half of the control rods are still at positions greater than 04.
-Reactor power indicates approximately 8%.
-Reactor water level is between +8" and +48" and stable.
-RPV pressure is less than 1040# and is being controlled with bypass valves.
-The rods DO NOT move inward when scrammed with reactor pressure.
-The running CRD pump TRIPS and CANNOT be restarted.
-The other CRD pump also TRIPS when it is started and WILL NOT restart.

What is the next action taken to insert control rods?

A. Open CRD crosstie and use opposite unit pump to insert control rods.

B. Shut the 1 301-25 CRD Charging Header Isolation and drive Control Rods.

C. Open SDV vents to relieve the hydraulic lock.

D. Locally vent the overpiston area of each control rod that IS NOT inserted.

Answer: A

Question 57 Details

Question Type:	Multiple Choice
Topic:	Question #57 (RO/SRO)
System ID:	7816
User ID:	SR-0302-K15
Status:	Active
Must Appear:	No
Difficulty:	3.00
Time to Complete:	2
Point Value:	1.00
Cross Reference:	QCOA 0300-1, QCOP 0300-19
User Text:	295015AK2.01
User Number 1:	3.80
User Number 2:	3.90
Comment:	LORT 124429 Bank question. Higher. With both CRD pumps tripped, you must crosstie to get CRD flow. It does no good to close the 0303-25 valve with no CRD pumps running. There is no direction to open SDV vents or vent CRD overpistion areas.

#57

CAUTION

The cross-tie line may be used if sufficient time is available to perform the in-plant lineups. Loss of both CRD Pumps on a Unit will result in possible accumulator trouble lights within a few minutes. Use Step D.2 for scram criteria.

6. IF neither Unit CRD Pump is available, THEN perform QCOP 0300-19 or QCOP 0300-33 as applicable.

7. IF standby CRD Pump was started in Step D.1, THEN:

   a. Close MO 1(2)-301-2A/B, 1(2) A/B CRD PMP DSCH VLV on the tripped pump.

   b. Dispatch an operator to verify proper operation of the running pump.

   c. Close 1(2)-301-254A/B, 1(2)A/B CRD PUMP MIN FLOW ISOLATION VLV on the tripped pump.

   d. Open 1(2)-301-254A/B, 1(2)A/B CRD PUMP MIN FLOW ISOLATION VLV on the running pump.

E. DISCUSSION

1. For Unit 2 only, with NO CRD Pump in operation, Reactor Recirc Pump Seal Injection flow is NOT available.

2. Technical Specification 3.1.5 requires that the reactor mode switch by placed in the shutdown position if charging water header pressure can NOT be restored to $\geq$ 940 psig within 20 minutes. An accumulator is inoperable if the local pressure is < 940 psig. There is NO method directly available to determine accumulator operability in the Control Room; conservative action is directly based on the presence of accumulator trouble alarms. (F-10)

3. A cross-tie line exists between the discharges of the CRD pumps of the two Units. This cross-tie may be utilized in situations where ample time exists to valve in a pump from the other Unit. Discretion should be used based on the possible imminent failure of a CRD Pump with the standby CRD Pump inoperable. In these situations, both Unit CRD Pumps may be inoperable provided the same CRD Pump is NOT supplying both Units. Loss of both CRD Pumps on a Unit will result in numerous accumulator trouble lights within a few minutes.

CRD PUMP CROSS-TIE OPERATION USING U1 CRD PUMPS

A. PURPOSE

The purpose of this procedure is to provide the necessary steps to use the CRD Cross-Tie Line between Units using U1 CRD pumps.

B. DISCUSSION

B.1. This Procedure contains four sections. The first section is for operating with both CRD Suction Filters. The next two sections are for Cross-Tie Operations which contain sub-sections for the Unit 1 CRD Pump cross-tie combinations. The last section is for returning the CRD System to normal:

a. Section step titles are as follows:

(1) Step F.1, **IF** operation with **both** CRD Suction Filters is required, **THEN**:

(2) Step F.2, **IF** Unit 1 CRD Pump is to supply Unit 2 CRD System, **THEN**:

(3) Step F.3, **IF** Unit 1 CRD Pump is to supply both Units CRD System, **THEN**:

(4) Step F.4, **WHEN** CRD System Cross-Tie Operation is NO longer required, **THEN**:

C. PREREQUISITES

C.1. This procedure will be executed when **one** of the following criteria is satisfied:

a. As directed by a QGA **OR** SAMG. ____

b. Discretion based on the possible imminent failure of a CRD Pump with the standby CRD Pump inoperable. ____

C.2. CRD System required to provide cross-tie support is in operation with either the A **OR** B CRD Pump per QCOP 0300-01. ____

58 **ID: SRN-ARP-K04** **Points: 1.00**

An uncontrolled fire in the Control Room necessitates evacuation of the Control Room before the safe shutdown equipment can be obtained.

Where can the operators go to acquire the necessary equipment?

To the QCARP locker in the:

A. OSC.

B. Unit 1 Turbine Building Trackway.

C. Work Execution/Communications Center.

D. Unit 2 Turbine Building Trackway.

Answer: C

Question 58 Details

Question Type:	Multiple Choice
Topic:	Question #58 (RO/SRO)
System ID:	103
User ID:	SRN-ARP-K04
Status:	Active
Must Appear:	No
Difficulty:	2.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOS 0010-03, R. 14
User Text:	295016AK2.02
User Number 1:	4.00
User Number 2:	4.10
Comment:	ILT.00671 75175 Bank question. Lower. Comm Center is location of QCARP locker outside of Control Room.

#58

SAFE SHUTDOWN EQUIPMENT INSPECTION

A. PURPOSE

To outline the method of routinely verifying that tools and components are available to support the Appendix R Safe Shutdown Procedures.

B. DISCUSSION

None.

C. EQUIPMENT REQUIRED

C.1. V-Key to open QCARP Lockers in the Control Room and Communication Center. ____

D. PREREQUISITES

D.1. The Unit Supervisor has completed the following:

a. Unit ____ 1(2)

b. Reason for test (check appropriate item):

Normal Surveillance	( )
Post-Maintenance	( )
Partial for _____	( )
Other _____	( )

c. Permission to start test: _____ ____/____
US Signature Date/Time

E. PRECAUTIONS

None.

F. LIMITATIONS AND ACTIONS

F.1. **IF** any item is found to be defective **OR** missing, **THEN** **notify** the Unit Supervisor, **document** in comments section and **initiate** action to correct the deficiency.

59 **ID: SR-4700-K24** **Points: 1.00**

The reactor has been scrammed from full power and the Mode Switch taken to S/D in response to an instrument air header rupture that has resulted in a loss of Instrument Air on Unit 2.

Which one of the following describes how the operation of the MSIVs will be affected by this condition?

A. The inboard MSIVs would close when their accumulators discharged; the outboard MSIVs would remain open.

B. All MSIVs would remain open since the drywell pneumatic system will automatically align to supply the MSIVs.

C. All MSIVs would remain open since the MSIV Instrument Air Crosstie will automatically open.

D. The inboard MSIVs would remain open; the outboard MSIVs would close.

Answer: D

Question 59 Details

Question Type:	Multiple Choice
Topic:	Question #59 (RO/SRO)
System ID:	966
User ID:	SR-4700-K24
Status:	Active
Must Appear:	No
Difficulty:	2.75
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QOA 4700-06, R. 12,
User Text:	295020AK2.12
User Number 1:	3.10
User Number 2:	3.20
Comment:	ILT.01951 (76044) Bank question. Higher. The Outboard MSIVs are supplied from IA. The Inboard MSIVs are supplied from DW pnuematics.

Instrument Air provides air pressure to air operated valves throughout the plant. When air pressure is lost, these valves may fail in one of three modes; i.e. fail open (FO), fail closed (FC), and fail as is. Some valves have air accumulators that are designed to maintain the valve in position following a loss of air supply. However, air systems cannot be made completely leak tight, and these valves may begin drifting to their fail position shortly after a loss of supply air. The accumulators on the MSIVs provide a motive force to assist the springs in closing the MSIVs on loss of supply air. On a slow loss of instrument air, the valves may fail in a random sequence, causing operational difficulties.

It is important to document all actions taken to recover from this type of event to aid in restoration. Once the plant is stable a plan should be developed to restore the unit to normal status. This restoration plan should include repair and inspections of affected components. Prior to restoring instrument air, ensure positive control of all air operated components.

Following restoration of Instrument Air, include walkdowns of all air operated components to ensure they are in their expected configuration. If a scram occurred, include this walkdown in the Master Outage Checklist QCGP 1-5 to be completed prior to startup. (SOER 88-1)

A list of selected valves and fail positions is provided below:

VALVE	FAIL MODE	NOTES
Scram Inlet and Outlet Valves	FO	
SDV Vent and Drain Valves	FC	
Low Flow Feedwater Regulator Valve	Lock up	May Drift Open
Outboard MSIVs	FC	Air Accumulator Ensures Closure
CRD FCV	FC	
SJAE Suction Valves	FC	Air Accumulators
Chimney Isolation Valve	FC	Air Accumulator
PCI Group II Valves	FC	Air Accumulators
Condensate Normal Reject	FO	
Condensate Emergency Reject	FO	
Condensate Normal Makeup	FC	
Condensate Emergency Makeup	FC	
RFP Minimum Flow	FO	
Unit 1 Condensate Pump Minimum Flow	FO	
Unit 2 Condensate Pump Minimum Flow	FC	
Steam to SJAE and Booster SJAE	FC	
Hood Spray Valve	FC	
Torus to Reactor Building Vacuum Breaker	FO	
Outboard Recirc Sample Valve	FC	
Off-Gas Line Drain Valves	FC	
SBGTS FCV	FO	
Extraction Steam Bypass Valve	FO	
Heater Normal Drains	FC	
Heater Emergency Drains	FO	
Desuperheater Valve	FC	
Reactor Water Cleanup Reject FCV	FC	
Gland Water LCV	FC	
TBCCW LCV	FC	
RBCCW LCV	FC	
Service Water Load TCVs	FO	
RHR Head Spray FCV	FO	
Off-Gas Charcoal Absorber Bypass Valve	FO	Bypasses the Absorbers
HPCI Drain Pot Drain Valves	FC	
HPCI Drain Pot Bypass Valve	FO	
RCIC Steam Line Drain Valve	FC	
RWCU Demin Inlet Isolation Valve	FC	
ACAD Valves	FC	
SBLC 90X-5 Tank Level Ind.	Fails Downscale	

60 **ID: HTFF-K8.35** **Points: 1.00**

Initial conditions are as follows:

- Unit One in mode 4.
- Reactor Water level is 30 inches.
- Shutdown Cooling is in operation.

A spurious High Drywell Pressure signal is recieved and will NOT reset.
Reactor pressure is slowly increasing.
Reactor Shell and Flange temperatures are also slowly increasing.

The correct operator action is to:

A. open safety relief valves.

B. secure Reactor Water Clean Up reject flow.

C. raise reactor water level to between 90 and 100 inches.

D. monitor running recirc pump parameters.

Answer: C

Question 60 Details

Question Type:	Multiple Choice
Topic:	Question #60 (RO/SRO)
System ID:	5269
User ID:	HTFF-K8.35
Status:	Active
Must Appear:	No
Difficulty:	4.00
Time to Complete:	0
Point Value:	1.00
Cross Reference:	QCOA 1000-02 R12
User Text:	295021AK1.04
User Number 1:	3.60
User Number 2:	3.70
Comment:	New question. Higher. Answer is correct due to no recirc pumps running due to the spurious high drywell pressure signal and signs of thermal statification from pressure and metal temps increasing require enhancing natural circulation. Distractors would add to the stratification. QCOA 1000-02 rev 12