

2002 INITIAL LIMITED SENIOR REACTOR OPERATOR LICENSE
WRITTEN EXAMINATION FINAL OUTLINE

EXAM DATE: 11/18/02

FACILITIES: PVNGS UNITS 1, 2, & 3

I. WRITTEN EXAM

A. OUTLINE: (ES-701)

Group (Sample %)	Subject area	Number of Questions
1 (15%)	Reactor and fuel characteristics and physical aspects of core construction important to fuel handling or shutdown activities	8
2 (30%)	System equipment and instruments that are important to plant safety and are located near or used during fuel handling activities or during alternate shutdown procedures	15
3 (40%)	Normal, abnormal, emergency operating and administrative procedures related to fuel handling activities	21
4 (15%)	Health physics and radiation protection for fuel handling activities and general employee responsibilities	6
100%	Totals	50

B. CONTENT:

Group 1 : 15%

8 Questions

Subject Area: Reactor and fuel characteristics and physical aspects of core construction important to fuel handling or shutdown activities

	System #	System Name	K/A #	K/A Topic(s)	Imp.
1	42036	Fuel Handling Incidents	AK1.03	Knowledge of the operational implications of the following concepts as they apply to Fuel Handling Incidents: Indications of approaching criticality	4.3
2	6192002	Neutron Life Cycle	K1.10	Describe the neutron life cycle using the following terms: Define SDM	3.6
3	6192002	Neutron Life Cycle	K1.11	Describe the neutron life cycle using the following terms: Define reactivity	3.0
4	32002	RCS	K6.14	Knowledge of the effect or a loss or malfunction on the following RCS components: Core components	2.8
5	6193007	Heat Transfer	K1.04	Describe how the presence of gases or steam can affect heat transfer and fluid flow in HX's	3.0
6	31004	CVCS	K5.20	Knowledge of the operational implications of the following concepts as they apply to the CVCS: Reactivity effects of XE, Boration, and Dilution	3.7
7	32002	RCS	K3.02	Knowledge of the effect that a loss or malfunction of the RCS will have on the following: Fuel	4.5
8	2.2	Equipment Control	2.2.32	Knowledge of the effects of alterations on core configuration	3.3

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Group 2 : 30%

15 Questions

Subject Area: System equipment and instruments that are important to plant safety and are located near or used during fuel handling activities or during alternate shutdown procedures

Knowledge and use of radiation monitors, spent fuel pool cooling and residual heat removal (RHR) systems and the Technical Specifications associated with those systems.

Question #	System #	System Name	K/A #	K/A Topic(s)	Imp
1	42036	Fuel Handling Incidents	AK3.02	Knowledge of the reasons for the following responses as they apply to the Fuel Handling Incidents: Interlocks associated with fuel handling equipment	3.6
2	5191003	Controllers and Positioners	K1.02	+Function and operation of a speed controller	2.7
3	5191005	Motor and Generators	K1.02	Potential consequences of overheating insulation or bearings	2.9
4	5191005	Motor and Generators	K1.03	Causes of excessive current in motors and generators, such as low voltage, overloading, and mechanical binding	2.8
5	37072	Area Radiation Monitoring	K1.03	Knowledge of the physical connections and/or cause-effect relationships between the ARM system and the following systems: Fuel building isolation	3.7
6	38029	Containment Purge System	K4.02	Knowledge of design feature(s) and/or interlock(s) which provide for the following: Negative pressure in containment	3.1
7	38033	Spent Fuel Pool Cooling System	K1.05	Knowledge of the physical connections and/or cause-effect relationships between the Spent Fuel Pool Cooling System and the following systems: RWST	2.8
8	38033	Spent Fuel Pool Cooling System	K4.01	Knowledge of design feature(s) and/or interlock(s) which provide for the following: Maintenance of spent fuel level	3.2
9	38033	Spent Fuel Pool Cooling System	K4.02	Knowledge of design feature(s) and/or interlock(s) which provide for the following: Maintenance of spent fuel cleanliness	2.7

Group 2 : 30%

15 Questions

Subject Area: System equipment and instruments that are important to plant safety and are located near or used during fuel handling activities or during alternate shutdown procedures
 Knowledge and use of radiation monitors, spent fuel pool cooling and residual heat removal (RHR) systems and the Technical Specifications associated with those systems.

Question #	System #	System Name	K/A #	K/A Topic(s)	Imp
10	38033	Spent Fuel Pool Cooling System	K4.04	Knowledge of design feature(s) and/or interlock(s) which provide for the following: Maintenance of spent fuel pool radiation	2.9
11	38034	Fuel Handling Equipment System	K1.03	Knowledge of the physical connections and/or cause-effect relationships between the Fuel Handling System and the following systems: CVCS	2.7
12	38034	Fuel Handling Equipment System	K1.05	Knowledge of the physical connections and/or cause-effect relationships between the Fuel Handling System and the following systems: Shutdown monitor	3.4
13	38034	Fuel Handling Equipment System	K1.06	Knowledge of the physical connections and/or cause-effect relationships between the Fuel Handling System and the following systems: SFPCS	3.0
14	34005	Residual Heat Removal System (RHRS)	K3.07	Knowledge of the effect that a loss or malfunction of the RHRS will have on the following: Refueling operations	3.6
15	42036	Fuel Handling Incidents	AA1.02	Ability to operate and / or monitor the following as they apply to the Fuel Handling Incidents: ARM System	3.5

Group 3 : 40%

21 Questions

Subject Area: Normal, abnormal, emergency operating and administrative procedures related to fuel handling activities, core safety, and accident mitigation, including general facility events.

Control room operator's response to events only as it relates to fuel handling activities and the general response expected of employees.

Question #	System #	System Name	K/A #	K/A Topic(s)	Imp
1	42036	Fuel Handling Incidents	AK3.03	Knowledge of the reasons for the following responses as they apply to the Fuel Handling Incidents: Guidance contained in EOP for fuel handling incident	4.1
2	32006	Emergency Core Cooling System (ECCS)	K3.02	Knowledge of the effect that a loss or malfunction of the ECCS will have on the following: Fuel	4.4
3	42069	Loss of Containment Integrity	AA2.01	Ability to determine and interpret the following as they apply to the Loss of Containment Integrity: Loss of containment integrity	4.3
4	32002	Reactor Coolant System (RCS)	K1.12	Knowledge of the physical connections and/or cause-effect relationships between the RCS and the following systems: NIS	3.6
5	32006	Emergency Core Cooling System (ECCS)	K1.03	Knowledge of the physical connections and/or cause-effect relationships between the ECCS and the following systems: RCS	4.3
6	2.2	Equipment Control	2.2.27	Knowledge of the refueling process.	3.5
7	32002	RCS	A2.04	Ability to (a) predict the impacts of the following malfunctions or operations on the RCS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Loss of heat sinks	4.6

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Group 3 : 40%

21 Questions

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Control room operator's response to events only as it relates to fuel handling activities and the general response expected of employees.

Question #	System #	System Name	K/A #	K/A Topic(s)	Imp
8	2.2	Equipment Control	2.2.30	Knowledge of RO duties in the control room during fuel handling such as alarms from fuel handling area, communication with fuel storage facility, systems operated from the control room in support of fueling operations, and supporting instrumentation.	3.3
9	34005	Residual Heat Removal System (RHRS)	K3.07	Knowledge of the effect that a loss or malfunction of the RHRS will have on the following: Refueling operations	3.6
10	34076	Service Water System (SWS)	K3.01	Knowledge of the effect that a loss or malfunction of the SWS will have on the following: Closed cooling water	3.6
11	35022	Containment Cooling System (CCS)	K4.03	Knowledge of CCS design feature(s) and/or interlock(s) which provide for the following: Automatic containment isolation	4.0

Group 3 : 40%

21 Questions

Subject Area: Normal, abnormal, emergency operating and administrative procedures related to fuel handling activities, core safety, and accident mitigation, including general facility events.

Control room operator's response to events only as it relates to fuel handling activities and the general response expected of employees.

Question #	System #	System Name	K/A #	K/A Topic(s)	Imp
12	36062	Electrical Distribution	A2.01	Ability to (a) predict the impacts of the following malfunctions or operations on the ac distribution system; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Types of loads that, if de-energized, would degrade or hinder plant operation	3.9
13	35103	Containment System	A2.02	Ability to (a) predict the impacts of the following malfunctions or operations on the containment system-and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations Necessary plant conditions for work in containment	3.2
14	37015	Nuclear Instrumentation System	A1 07	Ability to predict and/or monitor changes in parameters to prevent exceeding design limits) associated with operating the NIS controls including: Changes in boron concentration	3.4
15	2.1	Conduct of Operations	2.1.3	Knowledge of shift turnover practices.	3.4
16	2.1	Conduct of Operations	2.1.4	Knowledge of shift staffing requirements.	3.4
17	2.1	Conduct of Operations	2.1.6	Ability to supervise and assume a management role during plant transients and upset conditions.	4.3
18	2.2	Equipment Control	2.2.26	Knowledge of refueling administrative requirements.	3.7

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Group 3 : 40%

21 Questions

Subject Area: Normal, abnormal, emergency operating and administrative procedures related to fuel handling activities, core safety, and accident mitigation, including general facility events.

Control room operator's response to events only as it relates to fuel handling activities and the general response expected of employees.

Question #	System #	System Name	K/A #	K/A Topic(s)	Imp
19	32006	Emergency Core Cooling System (ECCS)	K2.01	Knowledge of bus power supplies to the following: ECCS Pumps	3.9
20	2.4	Emergency Procedures /Plan	2.4.25	Knowledge of fire protection procedures.	3.4
21	2.4	Emergency Procedures /Plan	2.4.37	Knowledge of the lines of authority during an emergency.	3.5

Group 4 : 15%

6 Questions

Subject Area: Health physics and radiation protection for fuel handling activities and general employee responsibilities.

Administrative procedures associated with radiation protection.

Question #	System #	System Name	K/A #	K/A Topic(s)	Imp
1	42036	Fuel Handling Incidents	AK1.01	Knowledge of the operational implications of the following concepts as they apply to Fuel Handling Incidents: Radiation exposure hazards	4.1
2	2.4	Emergency Procedures / Plan	2.4.29	Knowledge of the emergency plan.	4.0
3	2.3	Radiation Control	2.3.2	Knowledge of facility ALARA program	2.9
4	37072	Area Radiation Monitoring (ARM) System	A1.01	Ability to predict and/or monitor changes in parameters (to prevent exceeding design limits) associated with operating the ARM system controls including: Radiation levels	3.6
5	2.3	Radiation Control	2.3.1	Knowledge of 10 CFR:20 and related facility radiation control requirements.	3.0
6	2.3	Radiation Control	2.3.4	Knowledge of radiation exposure limits and contamination control, including permissible levels in excess of those authorized.	3.1