

WRITTEN EXAMINATION PERFORMANCE ANALYSIS AND APPLICANT QUESTIONS

(Fort Calhoun Station March 2004 Initial Exams)

The following questions were missed by 50% or more of the students on the March 12, 2004 NRC written exam:

QUESTIONS REPORT

for NRC EXAM 2004

QUESTION NUMBER: 042

The Reactor Protection System is designed to prevent exceeding a transient linear heat generation rate of 21 kw/ft. This limit is based on:

- A. Preventing DNBR from going above the limit.
- B. Preventing fretting of the fuel pins.
- C. Preventing cladding oxidation.
- D. Preventing fuel centerline melting.

Question 42 KA # 012000 K5.02

Knowledge of the operational implications of the following concepts as they apply to the RPS:

Power density

RO Importance: 3.1* SRO Importance: 3.3* CFRSection: 41.5 / 45.7

FCS Objective 0712-25 01.04

EXPLAIN the bases for each reactor trip.

KA#: 012000 K5.02 Bank Ref #: 07-12-25 025

LP# / Objective: 0712-25 01.04 Exam Level: BOTH

Cognitive Level: LOW Source: NEW

Reference: LP 07-15-31 Handout: NONE

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(42) RO Question 42, SRO Question 67 was answered correctly by 3 of 10 candidates. This was a new question that tested the candidates on their knowledge of the basis for the transient linear heat generation rate of 21 kw/ft. The correct answer was choice "D", "preventing fuel centerline melting". Six of the candidates picked distractor "A", "Preventing DNBR from going above the limit". This distractor is incorrect because it is desirable to maintain DNBR above the limit. The candidates were trained on the basis for the transient linear heat generation rate and it is discussed in FCS lesson plans.

QUESTIONS REPORT

for NRC EXAM 2004

QUESTION NUMBER: 068

Which one of the following is a purpose of the 86/SVG1 relay?

- A. Provides a signal to trip the reactor following a main generator trip.
- B. Provides a signal to trip the reactor following a main turbine trip.
- C. Limits motoring of the main generator while preventing turbine overspeed if stop and/or intercept valves stay open following a turbine trip.
- D. Limits field overvoltage if the exciter field breaker stays closed following a main generator trip.

Question 68 KA # 000000 2.1.28

Knowledge of the purpose and function of major system components and controls.

RO Importance: 3.2 SRO Importance: 3.3 CFRSection: 41.7

FCS Objective 0711-18 01.01b

State the functional relationship between the turbine and the following systems: Main Electrical Generator.

KA#: 000000 2.1.28 Bank Ref #: N/A

LP# / Objective: 0711-18 01.01B Exam Level: BOTH

Cognitive Level: LOW Source: NEW

Reference: STM 14 Handout: NONE

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(68) RO Question 68, SRO Question 93 was answered correctly by 3 of 10 candidates. This was a new question that asked the purpose of the 86/SVG1 relay. The correct choice was "C", "Limits motoring of the main generator while preventing turbine overspeed if stop and/or intercept valves stay open following a turbine trip". Six of the candidates picked distractor "B", "Provides a signal to trip the reactor following a main turbine trip". This distractor is incorrect because the 86/SVG1 relay does not provide an input to the RPS. After reviewing the training material, it was concluded that more detailed discussion of the purpose of the 86/SVG1 relay should be included in the System Training Manual. This will be done. However, the candidates should have been able to eliminate all of the distractors based on their training.

QUESTIONS REPORT

for NRC EXAM 2004

QUESTION NUMBER: 073

EOP-20 has been entered, and the status of the safety functions is being determined. In which one of the following is the reactivity control safety function being satisfied?

- A. All but two trippable CEAs are fully inserted. SUR is -0.33 dpm. Power is $5 \times 10^{-3}\%$ power, emergency boration is not in progress.
- B. All but two trippable CEAs are fully inserted. SUR is +0.1 dpm. Power is $5 \times 10^{-3}\%$ power, emergency boration is in progress.
- C. All but four trippable CEAs are fully inserted, SUR is 0 dpm, Power is $8 \times 10^{-5}\%$ power, emergency boration is not in progress.
- D. All but four trippable CEAs are fully inserted, SUR is 0 dpm, Power is $8 \times 10^{-6}\%$ power, emergency boration is not in progress.

Question 73 KA # 000000 2.4.17

Knowledge of EOP terms and definitions.

RO Importance: 3.1 SRO Importance: 3.8 CFRSection: 41.10 / 45.13

FCS Objective 0718-10 01.13

GIVEN a set of plant conditions and the SPTA checklists, DETERMINE if the safety function meets the acceptance criteria listed.

KA#: 000000 2.4.17 Bank Ref #: N/A

LP# / Objective: 0718-10 01.13 Exam Level: BOTH

Cognitive Level: HIGH Source: NEW

Reference: EOP-20 Handout: NONE

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(73) RO Question 73, SRO Question 98 was answered correctly by 5 of 10 candidates. This was a new question that tested the candidates' ability to determine if the reactivity control safety function is being met. The correct choice was "D", "All but four trippable CEAs are fully inserted, SUR is 0 dpm, Power is 8×10^{-6} % power, emergency boration is not in progress. Five of the candidates picked distractor "B", "All but two trippable CEAs are fully inserted. SUR is +0.1 dpm. Power is 5×10^{-3} % power, emergency boration is in progress". This distractor is incorrect because of the positive startup rate. The Safety Function Status Check requires that: "startup rate must be negative" or "Reactor power must be below 10^{-5} % and stable or lowering" No training program deficiencies were identified relative to this question.

QUESTIONS REPORT for NRC EXAM 2004

QUESTION NUMBER: 076

A pressurizer steam space LOCA has caused PPLS and SIAS actuation. CETs are stable at 550°F. RCS pressure is stable at 1300 psia, pressurizer level is 20% and rising. HPSI flow is 390 gpm. Two Reactor Coolant Pumps are running. Both steam generators are providing heat removal.

Which one of the following may result during the performance of HPSI Stop and Throttle from these conditions?

- A. RCS pressure will lower and may result in a loss of heat removal by the steam generators.
- B. RCS pressure will lower and may result in a loss of NPSH for the reactor coolant pumps
- C. RCS pressure will remain steady. The reduced HPSI flow may result in lowering pressurizer level.
- D. RCS pressure will remain steady. The reduced HPSI flow may result in inadequate subcooling

Question 76 KA # 000008 AA2.22

Ability to determine and interpret the following as they apply to the Pressurizer Vapor Space Accident:
Consequences of loss of pressure in RCS; methods for evaluating pressure loss

RO Importance: 3.8 SRO Importance: 4.2 CFRSection: 43.5 / 45.13

FCS Objective 0718-13 01.04

GIVEN a copy of the Technical Basis Documents (TBDs), EXPLAIN the bases behind the major operator actions contained in EOP-03, LOCA.

KA#: 000008 AA2.22 Bank Ref #: 07-18-13 010

LP# / Objective: 0718-13 01.04 Exam Level: SRO ONLY

Cognitive Level: HIGH Source: MODIFIED

Reference: LP 07-15-23 Handout: NONE

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(76) SRO only Question 1 was answered correctly by 1 of 4 candidates

This was a new question that tested the candidates' knowledge of RCS pressure response to reduced HPSI flow during a very small LOCA and the results of the pressure response. The correct answer was "B", "RCS pressure will lower and may result in a loss of NPSH for the Reactor Coolant Pumps". This is correct, given the conditions in the stem, because the RCS is in a "pressure balance" where HPSI flow is helping to maintain RCS pressure. Each of the four candidates picked a different answer. After reviewing the training material, it was determined that the discussion of "HPSI Stop and Throttle" in the training material should be expanded to include a discussion of pressure response and potential consequences. This will be done.

QUESTIONS REPORT

for NRC EXAM 2004

QUESTION NUMBER: 085

In which one of the following conditions do you direct the use of SI-186 to establish "Alternate Hot Leg Injection" per EOP/AOP Attachment 11.

- A. A LOCA has existed for 8.5 to 11 hours, RAS has occurred and only one HPSI pump is available.
- B. A LOCA has existed for 8.5 to 11 hours, RAS has occurred and only one LPSI pump is available.
- C. A LOCA has existed for 8.5 to 11 hours, RAS has occurred and Instrument Air is not available
- D. A LOCA has existed for 8.5 to 11 hours, RAS has occurred and Component Cooling Water is not available

Question 85 KA # 000074 2.4.06

Knowledge symptom based EOP mitigation strategies.

RO Importance: 3.1 SRO Importance: 4.0 CFRSection: 41.10 / 43.5 / 45.13

FCS Objective 0715-28 01.09

EXPLAIN the problems associated with boron precipitation for a cold leg break, what actions are taken to minimize it and why it is not a problem for a hot leg break

KA#: 000074 2.4.06 Bank Ref #: N/A

LP# / Objective: 0715-28 01.09 Exam Level: SRO ONLY

Cognitive Level: HIGH Source: NEW

Reference: Handout: NONE

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(85) SRO only Question 10 was answered correctly by 2 of 4 candidates

This was a new question that tested the candidates' knowledge of the various ECCS flow alignments used in the EOPs. The correct answer was "A", "A LOCA has existed for 8.5 to 11 hours, RAS has occurred and only one HPSI pump is available". One candidate picked distractor "B", "A LOCA has existed for 8.5 to 11 hours, RAS has occurred and only one LPSI pump is available". This is incorrect because the LPSI pumps are designed to trip on RAS. Another candidate picked choice "C", "A LOCA has existed for 8.5 to 11 hours, RAS has occurred and Instrument Air is not available". This would have been correct if the stem had referred to EOP/AOP attachment 10 instead of attachment 11. No training program deficiencies were identified relative to this question.

QUESTIONS FROM WRITTEN EXAMINATION PROCTOR'S LOG

SRO #5, should choice B be 'HCV-1040' vs. MS-1040'? Reply: Yes. Informed all SRO's and posted on board.

RO #24, are there words missing from the question, it doesn't flow right? Reply: Read question to him and replied 'no'.

RO #48, SRO #73, should it be 'HCV-1106 vs. 'FCV-1106' in choices B and D? Reply: Yes. Informed all applicants and posted on board.

I crossed out and answer but I want it to be the choice. What should I do? Reply: Write your choice after the 4 circles.