Examination Report No.: 50-312/OL-88-02

Facility: Rancho Seco Nuclear Power Plant

Docket No.: 50-312

Examinations administered at Rancho Seco Nuclear Power Plant, Clay Station, California.

Chief Examiner: Gary W. Johnston 1/23/89

Gary W. Johnston, Date Signed
Operator Licensing Examiner

Approved: P J Morrill for JOE 2/6/89

John O. Elin Date Signed
Chief, Operations Section

Summary:

Examinations on December 6-13, 1988 (Report No. 50-312/OL-88-02). Written and oral examinations were administered to seven Senior Reactor Operator candidates. All seven SRO candidates passed both the written and oral examinations.

REPORT DETAILS

1. Examiners:

   G. Johnston, RV (Chief Examiner)

2. Persons Attending the Exit Meeting:

   G. Johnston, RV
   C. Felton, Rancho Seco

3. Written Examination and Facility Review:

   The written examinations were administered to seven SRO candidates on December 6, 1988.

   A preadministration review of the written examination was conducted with facility training and operations subject matter experts on November 30, 1988. The reviewers provided the Chief Examiner with comments and suggested corrections. These comments were duly considered and changes were made prior to administration of the examination to the candidates.

   At the conclusion of the written exam, the facility staff was provided a copy of the examination and were instructed to provide written comments. The comments made by the staff are included in the attachment (1). These comments were reviewed by the Chief Examiner and appropriate changes were made to the examinations prior to grading.

4. Operating Examinations

   The Chief Examiner administered all of the operating examinations from December 7 through 13, 1988. No specific generic weaknesses or concerns were identified.

5. Reference Material

   The Chief Examiner identified a concern about the quality and completeness of the reference material provided by the facility for the preparation of the examinations. When the material was received information on the following systems were not provided:

   Main Turbine and Generator
   Condensate System
   Feedwater System
   Circulating Water System
   Main Steam System
   Once Through Steam Generators
   Steam Bypass System

Further there were instances of a lack of diagrams for many of the systems descriptions that were provided. The Chief Examiner did convey the lack of the information early on in the process of preparing the examinations and the facility did provide the requested material. The requirements for material to be provided for preparation of examinations is clearly identified in the attachments sent with the 90 day letter scheduling the examinations.

The material provided for the missing information did not have identified lesson plans or learning objectives. The Chief Examiner requested during the pre-examination review with the facility training staff that they indicate any question they could identify as not meeting any specific requirement. None were identified by the facility staff during the review, and the Chief Examiner noted that these had been accepted by the staff.

6. Exit Meeting

The Chief Examiner met with the facility representative denoted in Paragraph 2 on December 13, 1988. The examiner discussed the findings to that point and the examination process.

ATTACHMENT 1

RESOLUTION OF FACILITY COMMENTS

Question 5.15

Facility Comment:

"'a.' could be considered a correct answer as well as 'c.' OTSG Tsat and Tc will be coupled and stable."

Resolution:

The Chief Examiner will delete this question, because of two possible correct answers.

Question 6.01

Facility Comment:

"No RCPs running or RCS pressure _1000 psig should be accepted as a correct answer."

Resolution:

The Chief Examiner will include the comment as a possible answer.

Question 6.02

Facility Comment:

"For the 'a' portion the only starts are High Radiation and Manual.

For the 'b' portion the only answer should be "High temperature in the NSEB switchgear room.""

Resolution:

Part 'a' will be changed, and part 'b' will be changed to ensure that high temperature is the answer.

Question 6.04

Facility Comment:

"'b' should read "Valves close when demand is at 20% and decreasing.""

Resolution:

The key will be changed to incorporate the comment.

Question 6.12

Facility Comment:

"One pump per loop and three pump operation are two separate limits.

The minimum load limit is also a correct response."

Resolution:

The Chief Examiner will add the responses to the key.

Question 7.08

Facility Comment:

"Since the question does not state that the OTSG has been isolated, steaming is required by E.06 until an isolation criteria has been met. The answer given assumes that the generator has been isolated."

Resolution:

The Chief Examiner sees no need to change the key. The question doesn't clearly state that the OTSG is isolated, but the way the question is phrased that is the only possibility.

Question 7.11

Facility Comment:

"The 381 inches level is established to enhance boiler condenser cooling and mention of this should be correct as well as the natural circulation answer given on the key."

Resolution:

The Chief Examiner will add this comment to the key.

Question 7.19

Facility Comment:

"The 40 deg. F to 60 deg. F dT is to promote heat transfer (ensure a heat sink is available)."

Resolution:

The Chief Examiner will accept for full credit that the delta T is to ensure adequate heat transfer from the primary to the secondary.

Question 8.14

Facility Comment:

"The vent valves shall also be closed and tagged."

Resolution:

The Chief Examiner agrees and will add this to the key.

As Given

U.S. NUCLEAR REGULATORY COMMISSION

SENIOR REACTOR OPERATOR LICENSE EXAMINATION

Facility: Rancho Seco
Reactor Type: Babcock and Wilcox
Date Administered: December 6, 1988
Examiner: Gary W. Johnston
Candidate: Key

INSTRUCTIONS TO CANDIDATE

Use separate paper for the answers. Write answers on one side only. Staple question sheet on top of the answer sheets. Points for each question are indicated in parentheses after the question. The passing grade requires at least 70% in each category and a final grade of at least 80%. Examination papers will be picked up six (6) hours after the examination starts.

Category Value	% of Total	Candidate's Score	% of Category Value	Category
25	25			5. Theory of Nuclear Power Plant Operation, Fluids, and Thermodynamics
25	25			6. Plant Systems Design, Control and Instrumentation
25	25			7. Procedures - Normal, Abnormal, Emergency, and Radiological Control
25	25			8. Administrative Procedures, Conditions, and Limitations
100		Final Grade		TOTALS

All work done on this examination is my own, I have neither given nor received aid.

Candidate's Signature

NRC RULES AND GUIDELINES FOR LICENSE EXAMINATIONS

During the administration of this examination the following rules apply:

1. Cheating on the examination means an automatic denial of your application and could result in more severe penalties.

2. Restroom trips are to be limited and only one candidate at a time may leave. You must avoid all contacts with anyone outside the examination room to avoid even the appearance or possibility of cheating.

3. Use black ink or dark pencil only to facilitate legible reproductions.

4. Print your name in the blank provided on the cover sheet of the examination.

5. Fill in the date on the cover sheet of the examination (if necessary).

6. Use only the paper provided for answers.

7. Print your name in the upper right-hand corner of the first page of each section of the answer sheet.

8. Consecutively number each answer sheet, write "End of Category __" as appropriate, start each category on a new page, write only one side of the paper, and write "Last Page" on the last answer sheet.

9. Number each answer as to category and number, for example, 1.4, 6.3.

10. Skip at least three lines between each answer.

11. Separate answer sheets from pad and place finished answer sheets face down on your desk or table.

12. Use abbreviations only if they are commonly used in facility literature.

13. The point value for each question is indicated in parentheses after the question and can be used as a guide for the depth of answer required.

14. Show all calculations, methods, or assumptions used to obtain an answer to mathematical problems whether indicated in the question or not.

15. Partial credit may be given. Therefore, ANSWER ALL PARTS OF THE QUESTION AND DO NOT LEAVE ANY ANSWER BLANK.

16. If parts of the examination are not clear as to intent, ask questions of the examiner only.

17. You must sign the statement on the cover sheet that indicates that the work is your own and you have not received or been given assistance in completing the examination. This must be done after the examination has been completed.

18. When you complete your examination, you shall:

a. Assemble your examination as follows:

(1) Exam questions on top.

(2) Exam aids - figures, tables, etc.

(3) Answer pages including figures which are a part of the answer.

b. Turn in your copy of the examination and all pages used to answer the examination questions.

c. Turn in all scrap paper and the balance of the paper that you did not use for answering the questions.

d. Leave the examination area, as defined by the examiner. If after leaving, you are found in this area while the examination is still in progress, your license may be denied or revoked.

$F = ma$ $\quad v = s/t$

$W = mg$ $\quad s = v_o t + \frac{1}{2}\, at^2$

$E = mc^2$ $\quad a = (v_f - v_o)/t$

$KE = \frac{1}{2}\, mv^2$ $\quad v_f = v_o + at$

$PE = mgh$ $\quad \omega = \theta/t$

$W = \nu \Delta P$

$\Delta E = 931 \Delta m$

$\dot{Q} = \dot{m} C_P \Delta T$ $\quad \dot{Q} = \dot{m}\, \Delta h$

$\dot{Q} = UA\Delta T$ $\quad \dot{Q} = UA\,(T_{AVG} - T_{STM})$

$P_{WT} = W_f\, \dot{m}$

$P = P_o\, 10^{SUR(t)}$

$P = P_o\, e^{t/\tau}$

$SUR = 26.06/\tau$

$\tau = 1.44\ DT$

$SUR = 26 \left(\frac{\lambda_{eff}\, \rho}{\beta - \rho}\right)$

$\tau = (\ell^*/\rho) + [(\bar{\beta} - \rho)/\lambda_{eff}\, \rho]$

$\tau = \ell^*/(\rho - \bar{\beta})$

$\tau = (\bar{\beta} - \rho)/\lambda_{eff}\, \rho$

$\rho = (k_{eff} - 1)/k_{eff} = \Delta k_{eff}/k_{eff}$

$\rho = [\ell^*/\tau\, k_{eff}] + [\bar{\beta}/(1 + \lambda_{eff}\, \tau)]$

$P = \Sigma \phi V/(3 \times 10^{10})$

$\Sigma = N\sigma$

Cycle efficiency $= \frac{\text{New Work (out)}}{\text{Energy (in)}}$

$A = \lambda N$ $\quad A = A_o\, e^{-\lambda t}$

$\lambda = \ln 2/t_{\frac{1}{2}} = 0.693/t_{\frac{1}{2}}$

$t_{\frac{1}{2}}\ (eff) = \frac{(t_{\frac{1}{2}})\ (t_b)}{(t_{\frac{1}{2}} + t_b)}$

$I = I_o\, e^{-\Sigma x}$

$I = I_o\, e^{-\mu x}$

$I = I_o\, 10^{-x/TVL}$

$TVL = 1.3/\mu$

$HVL = 0.693/\mu$

$SCR = S/(1 - k_{eff})$

$CR_x = S/(1 - k_{effx})$

$CR_1\,(1 - k_{eff})_1 = CR_2\,(1 - k_{eff})_2$

$M = 1/(1 - k_{eff}) = CR_1/CR_0$

$M = (1 - k_{eff})_0\ /(1 - k_{eff})_1$

$SDM = (1 - k_{eff})/k_{eff}$

$\ell^* \approx 1 \times 10^{-5}$ seconds

$\lambda_{eff} = 0.1\ seconds^{-1}$

$I_1\, d_1 = I_2\, d_2$

$I_1\, d_1^2 = I_2\, d_2^2$

$R/hr = (0.5\ CE)/d^2$ (meters)

$R/hr = 6\ CE/d^2$ (feet)

WATER PARAMETERS

1 gal = 8.345 lbm
1 gal = 3.78 liters
1 ft^3 = 7.48 gal
Density = 62.4 lbm/ft^3
Density = 1 gm/cm^3
Heat of Vaporization = 970 Btu/lbm
Heat of fusion = 144 Btu/lbm
1 Atm = 14.7 psi = 29.9 in. Hg.
1 ft. H_2O = 0.4335 lbf/in^2

MISCELLANEOUS CONVERSIONS

1 Curie = 3.7×10^{10} dps
1 kg = 2.21 lbm
1 hp = 2.54×10^3 Btu/hr
1 MW = 3.41×10^6 Btu/hr
1 Btu = 778 ft-lbf
1 inch = 2.54 cm
°F = (9/5°C) + 32
°C = 5/9 (°F - 32)

Section 5

Principles of Nuclear Power Plant
Operation, Thermodynamics, Heat Transfer,
and Fluid Flow

*QUESTION 5.01 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Technical Specification 3.5.2.1 states that the available Shutdown Margin shall not be less than 1% delta k/k.

Which of the following is correct?

a. The Shutdown Margin is the reactivity difference between criticality and all rods fully inserted.

b. The highest worth rod must be considered in the core to calculate the Shutdown Margin.

c. The Shutdown Margin is the amount the reactor can be shut down with the most reactive rod stuck out.

d. Reactivity is not influenced by the position of the control rods when calculating Shutdown Margin.

*ANSWER

c.

*REFERENCE
OP 30 C0500, RXT-05-001, OBJ-1, page 1.
192005K115
192002K110

*QUESTION 5.02 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Ignoring the minor system losses, the heat transferred from the reactor coolant system to the secondary system is equal. Which of the following describes why the primary and secondary mass flow rates across the OTSG's differ?

a. The piping diameters are significantly different, therefore to maintain the same velocities the flow rate has to vary.

b. The delta T through the secondary side of the OTSG's is smaller than the delta T through the primary side.

c. The enthalpy change through the secondary side of the OTSG's is smaller than the enthalpy change through the primary side.

d. The secondary side of the OTSG's undergoes a phase change while the primary side does not undergo a phase change.

*ANSWER

d.

*REFERENCE
OD 30 D 0700 OBJ 1, PG 2
OD 30 D 1400 OBJ 1, PG 2
002000K501
002000K511
193003K108

*QUESTION 5.03 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

During a Xenon free reactor startup, critical data was inadvertently taken two decades below the required Intermediate Range (IR) level. Assuming RCS temperatures and boron concentrations were the same:

Which of the following describes the relationship between the critical rod position AT THE PROPER Intermediate Range level versus the critical rod position taken TWO DECADES BELOW the proper Intermediate Range level?

a. The critical rod position AT THE PROPER Intermediate Range level is less than the critical rod position taken TWO DECADES BELOW the proper Intermediate range level.

b. The critical rod position AT THE PROPER Intermediate Range level is the same as the critical rod position taken TWO DECADES BELOW the proper Intermediate range level.

c. The critical rod position AT THE PROPER Intermediate Range level is greater than the critical rod position taken TWO DECADES BELOW the proper Intermediate range level.

d. The critical rod position AT THE PROPER Intermediate Range level cannot be compared to the critical rod position taken TWO DECADES BELOW the proper Intermediate range level.

*ANSWER

b.

*REFERENCE
OD 30 C 0600 OBJ 13
OD 30 C 0600 OUTLINE PG 19-21
192008K110
192002K107

*QUESTION 5.04 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

In the event of a rod ejection accident, which one of the following will be the first to insert negative reactivity?

a. Moderator temperature coefficient.

b. Pressure coefficient.

c. Void coefficient.

d. Doppler Coefficient.

*ANSWER

d.

*REFERENCE
OD 30 C 0400 OBJ 6
OD 30 C 0400 OUTLINE PG 15
192004K113
00001EK11B

*QUESTION 5.05 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which one of the following statements best describes the production and removal mechanisms for Xe-135?

a. At low power levels, xenon decay is the major removal mechanism. At high power levels, burnout is the major removal mechanism.

b. At full power, steady state, about 10% of the xenon is produced by iodine decay and the other 90% is produced as a direct fission product.

c. Following a reactor trip from equilibrium conditions, xenon peaks because delayed neutron precursors continue to decay to xenon while neutron absorption (burnout) has ceased.

d. Xenon production and removal increases linearly as power level increases, i.e., the value of 100% equilibrium xenon is twice that of 50% equilibrium xenon.

*ANSWER

a.

*REFERENCE
OD 30 C 0500 OBJ 14
OD 30 C 0500 OUTLINE PG 16-17
001000K533
192006K103
192006K104

*QUESTION 5.06 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which of the following is CORRECT concerning the conduct of a secondary calorimetric?

a. The calorimetric equation does not take into account the heat input from the reactor coolant pumps or loss to the containment, because these offset.

b. If feedwater temperature is read erroneously high the calculated reactor power will be lower than actual because the change in enthalpy will be lower.

c. The mass flow rate of the secondary system is determined by totaling the average steam flows from the two OTSGs.

d. The results of a primary calorimetric may be used as the basis for calibration of the Power Range nuclear instrumentation but not the Intermediate Range.

*ANSWER

b.

*REFERENCE
OD 30 D 1400 OBJ 1
OD 30 D 1400 OUTLINE PG 2
193007K108

*QUESTION 5.07 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Reactor power has just been increased by 30%. Which of the following best describes what will happen to Xenon concentration after the increase in power?

a. Xenon concentration will increase and reach a high in 12 to 18 hours.

b. Xenon concentration will increase and reach a high in 4 to 8 hours.

c. Xenon concentration will dip reaching a low in 12 to 18 hours.

d. Xenon concentration will dip reaching a low in 4 to 8 hours.

*ANSWER

d.

*REFERENCE
OD 30 C 0500 OBJ 16
OD 30 C 0500 OUTLINE PG 17 - 19
192006K111

*QUESTION 5.08 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

The reactor is critical at 10^{-8} amps in the Intermediate Range when an OTSG Atmospheric Dump valve fails open. The plant is at beginning of life (BOL) conditions, the reactor does not trip, and the rods are in manual. (POAH = Point of Adding Heat).

Which of the following best describes the value of Tave and nuclear power for the resulting new steady state condition?

a. Final Tave less than initial Tave, final power at POAH.

b. Final Tave less than initial Tave, final power above POAH.

c. Final Tave greater than initial Tave, final power above POAH.

d. Final Tave greater than initial Tave, final power at POAH.

*ANSWER

b.

*REFERENCE
OD 30 C 0700 OBJ 5.7
OD 30 C 0700 OUTLINE 9 - 11
OD 30 C 0700 TRAINEE HANDOUT PG 1 - 4
192008K114

*QUESTION 5.09 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which of the following best describes the heat transfer process through the pellet to clad gas gap in a fuel pin?

a. Radiation

b. Convection

c. Conduction

d. Transmission

*ANSWER

c.

*REFERENCE
OD 30 0900 OBJ 2
OD 30 0900 SUBJECT NOTES PG 4 - 7
193007K101

*QUESTION 5.10 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which of the following best describes the System Head Loss for a main feedwater pump operating in normal conditions?

a. The System Static Head (OTSG pressure) plus the Pump Delta Head.

b. The Total Pump Head plus the System Static Head (OTSG pressure).

c. The System Static Head (OTSG pressure) minus the Pump Delta Head.

d. The Total Pump Head minus the System Static Head (OTSG pressure).

*ANSWER

d.

*REFERENCE
OD 30 D 1300 OBJ 10
OD 30 D 1300 SUBJECT NOTES PG 13-14 TO 13-16
193005K115
193004K114

*QUESTION 5.11 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Consider a main feedwater pump operating in normal conditions.

Which of the following parameters will increase the available Net Positive Suction Head for the main feedwater pump as pump volumetric flow is increased?

a. The system static pressure is lowered.

b. The system saturation pressure is raised.

c. The system fluid temperature is raised.

d. The system fluid temperature is lowered.

*ANSWER

d.

*REFERENCE
OD 30 D 1300 OBJ 13
OD 30 D 1300 OUTLINE PG 3
193004K10c
191004K101

*QUESTION 5.12 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Rancho Seco is in a natural circulation cooldown following a loss of offsite power. A void (bubble) has inadvertently been formed in the head during the cooldown.

If Auxiliary Spray is used in the pressurizer, which of the following best describes what will happen in the Reactor Coolant System?

a. The size of the void in the head decreases because RCS pressure decreases.

b. The size of the void in the head increases because of the RCS pressure decrease.

c. The void in the head increases in size because the pressurizer bubble has decreased in size.

d. The void in the head remains the same in size, only RCS pressure will decrease.

*ANSWER

c.

*REFERENCE
NO REFERENCE FOUND IN MATERIAL FOR REACTOR THEORY. Facility reviewer's accepted.
1930038102
1930038108

*QUESTION 5.13 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Due to a failure of the rod position indication a control rod has been left fully inserted in the core while at full power. The control rod is withdrawn slowly over a one hour interval.

Which one of the following best describes the effect this event has on the Departure from Nucleate Boiling Ratio (DNBR) in the core?

a. It has increased in the area where the rod was primarily due to the low xenon concentration.

b. It has increased in the area where the rod was primarily due to the high xenon concentration.

c. It has decreased in the area where the rod was primarily due to the low xenon concentration.

d. It has decreased in the area where the rod was primarily due to the high xenon concentration.

*ANSWER

c.

*REFERENCE
OD 30 D 1000 OBJ 1
OD 30 D 1000 OUTLINE PG 1 - 3
OD 30 D 1000 SUBJECT NOTES 10-2 TO 10-4
001000K513

*QUESTION 5.14 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which of the following best describes what occurs following a reactor trip from sustained operation at 100% power?

a. The power (neutron flux) level drops to about 80% and then decreases with a decay rate that approaches an -1/3 decade per minute rate.

b. The power (neutron flux) level drops to about 6% and then decreases with a rate that approaches a -1/3 decade per minute rate.

c. The power (neutron flux) level drops to about 96% and then decreases with a decay rate that approaches an -80 second decay period.

d. The power (neutron flux) level drops to about 96% and then decreases with a decay rate that approaches a -1/3 decade per minute rate.

*ANSWER

b. (0.75)

*REFERENCE
OD 30 C 0600 OBJ 19
OD 30 C 0600 OUTLINE PG 43
192003K108

*QUESTION 5.15 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which of the following describes an indication that assists in verifying natural circulation is occurring following a loss of offsite power? (0.75)

a. Reactor Coolant System wide range cold leg temperature stable or decreasing slowly.

b. Reactor Coolant System wide range hot leg temperature near saturation temperature of Steam Generator.

c. Reactor Coolant System wide range hot leg temperature stable or decreasing slowly.

d. Reactor Coolant System wide range hot leg temperature more than saturation temperature of Steam Generator.

*ANSWER

c. (0.75)

*REFERENCE
OD 30 D 1400 OBJ 10,12
OD 30 D 1400 SUBJECT NOTES 14-15 TO 14-18
193008K122

Question dropped.

*QUESTION 5.16 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Assuming all other Departure from Nucleate Boiling parameters remain constant, which of the following will cause the Departure from Nucleate Boiling Ratio (DNBR) to decrease? (0.75)

a. Reactor thermal power decreases

b. Average Reactor Coolant temperature increases

c. Reactor Coolant pressure increases

d. Reactor Coolant flow increases

*ANSWER

b. (0.75)

*REFERENCE
General Physics, Rx PWR Limits p.243
General Physics, Boiling Heat Transfer p.122
OD 30 D 0900 OBJ 3
1530088105

*QUESTION 5.17 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

For the following question assume that no operator action occurs. Consider each occurrence independently with steady high power operation.

Which of the following will decrease Net Positive Suction Head available to the Reactor Coolant Pumps? (0.75)

a. Grid frequency decreases to 59.6 HZ.

b. Pressurizer temperature decreases.

c. Turbine power increases with rod control in manual.

d. Pressurizer pressure increases.

*ANSWER

b. (0.75)

*REFERENCE
OD 30 D 1300 OBJ 3
OD 30 D 1300 OUTLINE PG 3.4
OD 30 D 1300 SUBJECT NOTES PG 13-2
003000K110
003000K201
191004K106

*QUESTION 5.18 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which of the following describes what happens to the integral rod worth at 100% power as the core age increases? (0.75)

a. Increases due to the fact that the boric-acid concentration in the core is less at EOL.

b. Increases due to the fact that temperature of the rods are higher at EOL.

c. Decreases due to the fact that the temperature of the rods are higher at EOL.

d. Decreases due to the fact that the boric-acid concentration in the core is less at EOL.

*ANSWER

a. (0.75)

*REFERENCE
OD 30 C 0500 OBJ 7
OD 30 C 0500 OUTLINE PG 9
001000K502
192005K105
192005K106

*QUESTION 5.19 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which one of the following best describes the effect that DECREASING RCS Tave from 585 degrees F to 560 degrees F will have on Moderator Temperature Coefficient? (0.75)

a. It becomes less negative because boron and water molecules are swept into the core as a result of the outsurge from the pressurizer resulting in more resonance capture.

b. It becomes less negative because the rate of change in the density of water per degree temperature change is less at lower temperature resulting in a lower change of resonance escape probability.

c. It becomes more negative because thermal utilization increases and resonance escape probability decreases.

d. It becomes more negative because as temperature is lowered, the moderator becomes more dense, increasing the water molecules in the core with the neutrons have a greater probability of colliding with a water molecule and increasing the negative reactivity effect.

*ANSWER

b. (0.75)

*REFERENCE
OD 30 C 0400 OBJ 4
OD 30 C 0400 OUTLINE 8 - 9
001000K526
192004K106

*QUESTION 5.20 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

With the plant operating at 85% power and all systems in a normal/auto configuration, the operator borates 30 ppm.

Which one of the following best describes what happens to the available Shutdown Margin?
(0.75)

a. Increase

b. Increase until rods move

c. Decrease

d. Decrease until rods move

*ANSWER

a. (0.75)

*REFERENCE
OD 30 C 0800 OBJ 3
OD 30 C 0800 OUTLINE PG 9 - 14
192002K114

*QUESTION 5.21 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

When synchronizing the generator to the grid, an operator will regulate turbine speed to slowly rotate the synchroscope in the fast (clockwise) direction.

Which choice below gives the two parameters that the synchroscope is indicating? (0.75)

a. Current and voltage differences

b. Voltage and frequency differences

c. Frequency and phase differences

d. Phase and current differences

*ANSWER

c. (0.75)

*REFERENCE
OD 30 G 0400 OBJ 20
062000A403

*QUESTION 5.22 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which one of the following statements is CORRECT concerning the paralleling of electrical systems? (0.75)

a. Although it is desirable to have speed and phase position matched, it is much more important to have voltages matched than to have phases matched.

b. If voltages are not matched at the time the synchronizing switch is closed, there will be VAR flow from the lower to the higher voltage.

c. If the incoming machine is at synchronous speed but out of phase with the running bus when the breaker is closed, heavy currents will flow to either accelerate or retard the incoming machine.

d. If the incoming machine is in phase but slightly faster than synchronous speed when paralleled, the system will tend to speed up to synchronous speed.

*ANSWER

c. (0.75)

*REFERENCE
OD 30 G 0400 OBJ 20
062000A215

*QUESTION 5.23 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Rancho Seco is operating at 50% power, BOL, when a steam bypass valve fails open. Assume that rod control is in manual, no operator action is taken, and no reactor trip occurs.

Which of the following describes the relationship affecting reactor power? (0.75)

a. Reactor power increases due to the negative reactivity added through the Moderator Temperature Coefficient.

b. Reactor power will stabilize at a higher level after the Doppler Coefficient adds sufficient negative reactivity.

c. Reactor power will stabilize at a higher level after the Doppler Coefficient adds sufficient positive reactivity.

d. Reactor power decreases due to the negative reactivity added through the Moderator Temperature Coefficient.

*ANSWER

b. (0.75)

*REFERENCE
OD 30 C 0700 OBJ 6
OD 30 C 0700 OUTLINE PG 10 - 11
192008K117
192008K121

*QUESTION 5.24 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

What reactivity addition is required to double the count rate if Keff is 0.98? (0.75)

a. 0.1015 % delta k/k

b. 0.500 % delta k/k

c. 1.015 % delta k/k

d. 5.000 % delta k/k

*ANSWER

c. (0.75)

*REFERENCE
OD 30 C 0600 OBJ 7.9
OD 30 C 0600 OUTLINE PG 9 - 17
004000K507
004000K508

*QUESTION 5.25 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which one of the following best describes the purpose of using soluble boron to control excess reactivity in the Rancho Seco reactor core? (0.75)

a. It increases the effective rod worth by increasing the Shutdown Margin.

b. It results in a less positive Moderator Temperature Coefficient.

c. It allows a faster loading rate for power maneuvering at high reactor power.

d. It allows a more uniform neutron flux distribution in the reactor.

*ANSWER

d. (0.75)

*REFERENCE
OD 30 C 0500 OUTLINE PG 10 - 11
OD 30 C 0500 OBJ 9
192007K105

*QUESTION 5.26 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which one of the following statements concerning the Moderator Temperature Coefficient (MTC) correctly explains why the MTC becomes more negative from BOL to EOL? (0.75)

a. A decrease in the fuel to clad gap over core age results in a decrease in the fuel temperature.

b. A decrease in the boron concentration over core age results in a larger change in the product of the thermal utilization factor and the resonance escape probability.

c. Plutonium building over core age results in more fissionable material being available to compete with boron atoms for neutrons.

d. Plutonium building over core age causes "hardening" of the neutron flux which results in more fast neutrons available for fast fission and an increase in the fast fission factor.

*ANSWER

b. (0.75)

*REFERENCE
OD 30 C 0400 OBJ 4
OD 30 C 0400 OUTLINE PG 9 - 12
192004K106

*QUESTION 5.27 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which one of the following statements is CORRECT concerning soluble boron reactivity control? (0.75)

a. As fission products build up, differential boron worth (PCM/ppm) increases.

b. As boron concentration decreases, the differential boron worth (PCM/ppm) decreases.

c. As boron concentration increases, the differential boron worth (PCM/ppm) decreases.

d. As Tave increases the differential boron worth (PCM/ppm) increases.

*ANSWER

c. (0.75)

*REFERENCE
OD 30 C 0500 OBJ 10
OD 30 C 0500 OUTLINE PG 11 - 12
192004K109
001000K528

*QUESTION 5.28 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Over core life the reactor becomes more responsive to a given reactivity change. Which of the following is the primary cause of this change?

a. Pu-239 increases, decreasing the delayed neutron fraction.

b. Pu-240 increases, decreasing the delayed neutron fraction.

c. Pu-239 increases, increasing Beta effective.

d. Pu-240 increases, increasing Beta effective.

*ANSWER

a.

*REFERENCE
OD 21 C 0700, OBJ 3.
RANCHO SECO REACTOR THEORY EXAM BANK
19200BK124

*QUESTION 5.29 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

The reactor has just been brought critical during a startup. The power is increased to 10**-8 amps on the Intermediate Range instrumentation for critical data.

Which of the following describes what happens to the rod height as a result of this maneuvering?

a. It is higher at 10**-8 amps than when it was critical to overcome the Doppler feedback.

b. It is lower at 10**-8 amps than when it was critical to overcome the decreased leakage at the higher power level.

c. It is higher at 10**-8 amps than when it was critical due to the increased consumption of neutrons in the control rods at the higher power.

d. It is lower at 10**-8 amps than when it was critical because the reactor was actually supercritical when critical was declared.

*ANSWER

d.

*REFERENCE
OD 30 C 0700 OBJ 5
RANCHO SECO REACTOR THEORY EXAM BANK
192008K110
192008K111

*QUESTION 5.30 (0.75)

MULTIPLE CHOICE (Choose the best answer.)

Which of the following best describes a methodology for preventing possible centrifugal pump runout conditions?

a. The pump has a discharge valve fully open to maintain the maximum flow from the pump above any possible runout condition.

b. The pump is located such the the NPSH is maintained as close as possible to the saturation pressure such that the system head is at its maximum.

c. The pump has a discharge valve throttled to maintain the maximum flow from the pump below any possible runout condition.

d. The pump is located such the the NPSH is maintained as high as possible relative to the saturation pressure such that the system head is at its minimum.

*ANSWER

c.

*REFERENCE
GENERAL PHYSICS, SECTION III, PART B
OD 30 D 1300 OBJ 3
191004K112

*QUESTION 5.31 (1.25)

In order to maintain a 200 degrees F subcooling margin in the RCS when reducing RCS pressure to 1600 psia, OTSG pressure must be reduced to approximately what pressure? (1.25)

*ANSWER

200 ^{o}F at 1600 psig

1600 psia sat temp = 604.87 ^{o}F (+ or - 5) (0.5)

subcooled temp = 604.87 - 200 = 404.87 ^{o}F (0.5)

S/G pressure sat temp = Tc = 404.87 ^{o}F

= 260 (+ or - 5) (0.25)

*REFERENCE
Steam Tables
OD 30 D 0300 OBJ 3,7
193003K125

*QUESTION 5.32 (1.25)

The reactor is operating at a thermal power level of 2500 MW. The mass flow rate through the core is 164 X 10E6 lbm/hr, with a core exit temperature of 610 deg F. C_p = 1.3.

What is the inlet (Cold Leg) temperature to the core? (1.25)

(0.75 concept, 0.5 formulation, 0.25 answer)

*ANSWER

$Q = mC_p$ (Delta T) (0.5)

Delta T = $Q/(mC_p)$

2500 MW = (2500 MW X 3.41 X 10^6) =

= 8.525 X 10^9 BTU/hr

Delta T 8.525 X 10^9 /(1.64 X 10^8)(1.3) = 38.7 ^oF (0.5)

610 ^oF - 38.7 ^oF = 571.3 ^oF (+ or - 2) (0.25)

*REFERENCE
OD 30 D 0300 OBJ 3
OD 30 D 0300 OUTLINE PG 1 - 13
193007106

End of Section 5

Go on to Section 6

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Section 6

Plant Systems Design,
Control, and Instrumentation

*QUESTION 6.01 (1.0)

Under what conditions would the Margin to Saturation (Subcooling) Meters not accurately represent the subcooling in the Reactor Coolant System? (1.0)

*ANSWER

The RTD's used in the circuitry could be sitting in a void or stagnant area. (1.0)

*REFERENCE
RANCHO SECO FACILITY EXAMINATION BANK
No OBJ, accepted by facility reviewers.
016000K101
016000K402

OR:

No RCP's running. OR;
RCS pressure < 1000 psig.

~~(1.5)~~ 1.0

*QUESTION 6.02

Concerning Heating and Ventilating systems:

a. What condition will start the Control Room HVAC System? (0.5)

b. What two (2) room conditions in the NSEB will start the NSEB Essential HVAC System? ~~(1.5)~~ (0.5)

*ANSWER

a. ~~High temperature in the Control Room.~~ (0.5)

b. High temperature in NSEB Switchgear rooms. (0.5)
~~High temperature in NSEB Inverter rooms.~~ ~~(0.5)~~

*REFERENCE
RANCHO SECO FACILITY EXAMINATION BANK
No OBJ. accpted by facility reviewers.
000060EA102

a. High Radiation

*QUESTION 6.03 (3.0)

The Turbine Bypass and Atmospheric Dump systems have operating biases that are set in to relieve excess steam demand when certain conditions exist. What are the plant conditions and purpose for each of the following that require the following steam header biases?

a. 0 psig. (1.0)

b. 50 psig. (1.0)

c. 115 psig. (1.0)

*ANSWER

a. Less than 15 % load, control for startup and shutdown. (1.0)

b. ~~Greater than 15 % load, prevents lifting during small transients.~~ (1.0)

c. For reactor trip to minimize cooldown of primary system. (1.0)

*REFERENCE
CHAPTER 35 ICS - PG 35-21 TO 35-31
No OBJ, accpeted by facility reviewers.
041020K302
041020K304
041020K404
041020K405

b. Valves close when demand is 20% and decreasing.

*QUESTION 6.04 (2.0)

What are the four (4) control features that the Integrated Control System provides for the Main Feedwater Block valves? (2.0)

*ANSWER

a. Opens the block valves when the Startup control valves are 80 % open. (0.5)

b. Closes the block valves when the Startup control valves go 20 % closed. (0.5)

c. Close when all four RCPs trip. (0.5)

d. Close when both Main Feed pumps trip. (0.5)

*REFERENCE
CHAPTER 35 ICS - PG 35-241 TO 35-243, FIG. 35-77
No OBJ, accepted by facility reviewers.
059000K416
059000K105

close the valves if ≤ 20%

*QUESTION 6.05 (2.0)

What are the four (4) parameters/signals that are used to generate the BTU limits in the Integrated Control System? (2.0)

*ANSWER

a. OTSG pressure. (0.5)

b. Thot. (0.5)

c. Feedwater temperature. (0.5)

d. RCS flow. (0.5)

*REFERENCE
CHAPTER 35 ICS - PG 35-46
No OBJ. accepted by facility reviewers.
0160000K402
0160000K403

*QUESTION 6.06 (1.0)

The pegging steam supply isolation valve can be closed remotely. Why is the valve only able to be opened manually? (1.0)

*ANSWER

To prevent the valve from being opened too fast and causing water hammer to occur. (1.0)

*REFERENCE
RANCHO SECO FACILITY EXAM BANK
OD 30 1 1300 OBJ 6
045050K601
193006K104

*QUESTION 6.07 (2.0)

The Makeup Pump is taking suction from the Makeup Tank only. What are the four factors in the Makeup and Purification System that will affect the available Net Positive Suction Head to the Makeup Pump? (2.0)

*ANSWER

1. Makeup Tank level. (0.5)

2. Gas overpressure in Makeup Tank. (0.5)

3. Temperature of Makeup Tank water. (0.5)

4. Makeup Pump flowrate. (0.5)

*REFERENCE
RANCH SECO FACILITY EXAM BANK
OD 30 1 0600 OBJ 5
191004K106

*QUESTION 6.0B (3.0)

Regarding the Train 'A' Nuclear Services Raw Water System:

a. What is the primary purpose of NRW-041A the Spray Bypass Valve? (1.0)

b. Why is the Spray Bypass Valve NRW-041A mechanically interlocked with NRW-041 the Mechanical Interlock Valve? (1.0)

c. What is the preferred source of makeup water to the NSRW system? (0.5)

d. What is the other source of makeup water to the NSRW system? (0.5)

*ANSWER

a. To provide a means of preventing freezing of the Spray Pond in cold weather conditions.

b. To ensure that neither valve is wide open at the same time causing pump runout of the NRW pump.

c. Service Water.

d. Fire Protection System.

*REFERENCE
CHAPTER 22 NSRW PAGE 40.
OD 30 1.2200 DBJ 2
0750008401

*QUESTION 6.09 (2.5)

Bank 4 Pressurizer Heater Controls for the ten groups of heaters in the bank are different than for Banks 2 and 3. Assume that the controls for Bank 4 are in automatic:

a. What will occur when the "ON" pushbutton is depressed, and then the "AUTO" pushbutton is depressed? (1.0)

b. What indications ("AUTO", "ON", "OFF" backlighted pushbuttons) would you expect to see for 5 heater groups energized? (1.5)

*ANSWER

a. A heater group will be energized then deenergized. (1.0)

b. AUTO - lit (0.5)
ON - lit (0.5)
OFF - lit (0.5)

*REFERENCE
RANCH SECO FACILITY EXAM BANK
No OBJ. accepted by facility reviewers.
010000K607
010000K603

*QUESTION 6.10 (1.5)

The RCP starting circuitry has several interlocks that prevent inadvertent starts from occurring.

a. WHY must Reactor power be less than 30% of full power? (0.5)

b. Why must Component Cooling Water flow be greater than 507 gpm? (0.5)

c. Why must the Reactor Coolant System temperature be greater than 500 deg. F.? (0.5)

*ANSWER

a. Precludes possible power excursion due to positive reactivity added by the addition of cold water from the idle loop. (0.5)

b. Assures proper cooling water is available to RCP motor and seals. (0.5)

c. Assures D/P across core will not be sufficient to cause "core lift". (0.5)

*REFERENCE
CH. 2 REACTOR COOLANT SYSTEM PGS. 2-75 TO 2-78.
RANCHO SECO FACILITY EXAM BANK
No ORG. accepted by facility reviewers.
003000K404
003000K402

*QUESTION 6.11 (1.0)

Why are the Safety Groups of control rods moved only with the use of the auxiliary power supply rather than the normal power supply? (1.0)

*ANSWER

The normal supply is a DC "hold bus". It cannot move the Safety Groups. (1.0)

*REFERENCE
CH. 37 CONTROL ROD DRIVE MECHANISM
RANCHO SECO FACILITY EXAM BANK
No OBJ. accepted by facility reviewers.
001000K402
001000K403

*QUESTION 6.12 (2.0)

What are the four (4) conditions that will create a load limit in the Integrated Control System? (2.0)

*ANSWER

1. Loss of a Reactor Coolant Pump (loss of 1 pump or 2 pumps - 1 per loop). (0.5)

2. Loss of either Feedwater Pump. (0.5)

3. Asymmetric Rod fault. (0.5)

4. Greater than operator set maximum/minimum load limit. (0.5)

*REFERENCE
CH. 35 INTEGRATED CONTROL SYSTEM
RANCH SECO FACILITY EXAM BANK
No OBJ. accepted by facility reviewers.
016000K402
016000K403

*QUESTION 6.13 (2.5)

Ranch Seco is operating in full ICS automatic at 85% unit load when a Reactor Coolant Pump in the "B" OTSG loop inadvertently trips. Assuming a delta-Tc of zero.

a. What is the ratio of feedwater flow rates between the "A" and "B" OTSG's at the end of the transient? (1.0)

b. What is the final delta-Tc at the end of the transient? (0.5)

c. What is the final unit delta-T after the transient? (1.0)

*ANSWER

a. 2.44:1 (1.0)

b. Zero (0.5)

c. Approximately 50 deg. F (45 to 50 deg. F acceptable) (1.0)

*REFERENCE
CH. 35 INTEGRATED CONTROL SYSTEM FG 35-309
RANCH SECO FACILITY EXAM BANK
No OBJ. accepted by facility reviewers.
0016000K402
0016000K403

End of Section 6

Go on to Section 7

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Section 7

Procedures - Normal, Abnormal, Emergency, and Radiological Control

*QUESTION 7.01 (1.5)

The Reactor is in Hot Standby. Procedure B.2 Section 5 "Approach to Criticality" is being used.

a. What is the minimum amount Group 5 must be withdrawn to allow criticality? (0.5)

b. When is "Criticality" indicated to have occurred during a Reactor startup? (1.0)

*ANSWER

a. 20% (0.5)

b. "Criticality" is indicated when Reactor power level continues a relative constant rate after all positive reactivity addition has been stopped. (CONCEPT) (1.0)

*REFERENCE
PROCEDURE B.2 PG 36.
OD 30 J 0100 OBJ 2.3
001000A106

*QUESTION 7.02 (1.0)

A note for Step 5.2 of procedure B.3 "Normal Operation", Control Rod Operation Guidelines' states that there are no restrictions placed on the rate of movement or the distance of travel of the APSR's for the first 310 days of the cycle 7 fuel load.

What allows the APSR's to be moved in this fashion? (1.0)

*ANSWER

The APSR's are "Grey" and are designed for minimum delta kw/ft changes during rod movement. (1.0)

*REFERENCE
PROCEDURE B.3 PG 13.
OD 30 J 0100 ORJ 2.3
0000036003

*QUESTION 7.03 (1.5)

Why does Procedure B.9 "Soluble Boron Concentration Control" have the operator determine the contracted mass of the Reactor Coolant System at the temperature the Reactor Coolant Pumps are stopped rather than at the final cold RCS temperature? (1.5)

*ANSWER

With the pumps stopped there is inadequate mixing (1.0), this presents the hazard of a dilution accident (0.5).

*REFERENCE
PROCEDURE B.9 PG 5.
(0) 30 J 0100 OBJ 2
0040000K102

*QUESTION 7.04 (1.0)

Prior to filling the RCS, the OTSG levels are required to be at 85% on the operating range per procedure B.2, "Plant Heatup and Startup". What is the basis for this requirement? (1.0)

*ANSWER

Assures that the Tube to Shell differential temperature is within allowable limits during the filling and venting of the RCS. (1.0)

*REFERENCE
B.2 FG 5
OD 30 J 0100 OBJ 2
035010L109
035000G010

*QUESTION 7.05 (1.5)

Procedure B.3, "Normal Operations" states that it is desireable to maintain the controlling group of CRA's from 93 to 97 percent withdrawn. What are three (3) of the four reasons for this positioning of CRA's? (1.5)

*ANSWER

1. To provide adequate Tave control.

2. Results in relatively uniform fuel burnup.

3. Even flux distribution - minimize imbalance.

4. Rods slightly inserted gives a more rapid response for down power maneuver (i.e. runbacks).

Any 3 @ (0.5) points each

*REFERENCE
PROCEDURE B.3
OD 30 J 0100 OBJ 2
001000k506

*QUESTION 7.06 (1.5)

An uncomplicated Reactor trip has occurred. The plant is being cooled down and depressurized. What three (3) conditions would have to verified to allow you to isolate the Core Flood tanks? (1.5)

*REFERENCE

1. Subcooling exists. (0.5)

2. RCS depressurization is being "controlled". (0.5)

3. RCS pressure is below 700 psig. (0.5)

*REFERENCE
PROCEDURE CP.104
OD 30 J 0200 OBJ 2
006000K103

Told candidates CP.104 governing procedure.

*QUESTION 7.07 (1.0)

When responding to Emergency Operating Procedure E.01, an operator is required to throttle letdown flow down to 40 gpm. Why is this action required rather than isolating the letdown flow? (1.0)

*ANSWER

This reduces the possibility of a letdown cooler tube leak from thermal cycling of the tubes in the coolers. (1.0)

*REFERENCE
B&W Letter 1/18/83 RS-83-004
OD 30 J 0310 OBJ 1
000007EK301

*QUESTION 7.08 (1.5)

An OTSG tube rupture event is in progress. Emergency Operating Procedure E.06 "Steam Generator Tube Rupture" has been implemented. What are three (3) of the four instances that would allow you to steam the affected OTSG? (1.5)

*ANSWER

1. To maintain OTSG pressure below 1000 psig.

2. <381 inches in the OTSG.

3. To promote or establish natural circulation.

4. Maintain Tube to Shell delta T < 100 deg. F.

Any 3 @ (0.5) each

*REFERENCE
PROCEDURE E.06
OD 30 J 0360 OBJ 8
000038EK306

*QUESTION 7.09 (1.0)

One of the criteria of "Excessive Heat Transfer" Emergency Operating Procedure E.05 is a decrease in Tcold of greater than or equal to 50 deg. F for a transient when Tave is less than 560 deg. F. What is the intent of this criteria? (1.0)

*ANSWER

This is to ensure that excessive heat transfer events that are other than "at power" transients are addressed. (1.0)

*REFERENCE
PROCEDURE E.05 PG 2.
OD 30 J 0350 0B3 7
0000406011
0000406012

*QUESTION 7.10 (3.0)

Periodically throughout all of the Emergency Operating Procedures guidance is provided on the information pages regarding the verification of natural circulation conditions. What are the three verification criteria? (3.0)

*ANSWER

1. Tcold and OTSG Tsat approximately equal. (1.0)

2. Incore Thermocouple temperature within 10 degrees F of Thot. (1.0)

3. OTSG pressure decrease causes Thot, Tcold, and incore thermocouple temperature decreases. (1.0)

*REFERENCE
PROCEDURE E.05 INFORMATION PG
OD 30 J 0300 OBJ 5
000056G011
000056G012

*QUESTION 7.11 (1.0)

Following a loss of Offsite power event it is determined that natural circulation has not been established. Why does Rule 4. "OTSG Level Setpoints" require that the level be set to 381 inches on EFIC High Range? (1.0)

*ANSWER

To raise the centroid of the heat sink to induce natural circulation. (Concept) (1.0)

*REFERENCE
RULE 4
OD 30 J 0380 OBO 1
000056G012

(or enhance boiler/condenser cooling.)

*QUESTION 7.12 (1.0)

Following an evacuation of the Control Room due to a fire, the operators are procedurally required to establish an alternate recirculation path for the HPI/MU Pump. Why is this path required for this event? (1.0)

*ANSWER

This allows continuous operation of the HPI/MU pump. (1.0)

*REFERENCE
C.13A & B EVACUATION OF CONTROL ROOM DUE TO FIRE
RANCHO SECO FACILITY EXAM BANK
OD 30 J 0200 OBJ 2
000068G012
004000F405

*QUESTION 7.13 (1.0)

Procedure E.07, "Inadequate Core Cooling" has been implemented, and the plant P/T point has entered region 3. Why are all of the high point vent valves opened at this time? (1.0)

*ANSWER

The vents are opened to relieve non-condensible gases from the hot legs that could prevent natural circulation from occurring. (1.0)

*REFERENCE
E.07 INADEQUATE CORE COOLING
OD 30 J 0370 OBJ 7
000074G011
000074G012
002000K104

*QUESTION 7.14 (1.0)

Why is increased letdown required following termination of an overcooling transient during which HPI was initiated? (1.0)

*ANSWER

Reheating of the RCS by decay heat will cause the primary coolant to swell, possibly causing a solid pressurizer and/or overpressure condition. (1.0)

*REFERENCE
E.05-4 EXCESSIVE HEAT TRANSFER
RANCHO SECO FACILITY EXAM BANK
OD 30 J 0350 OBJ 7.8
006050A101

*QUESTION 7.15 (1.5)

Concerning Procedure B.2, "Startup Procedure":

a. What is the minimum required overlap between the Source and Intermediate Range ex-core nuclear instrumentation? (0.5)

b. What is the maximum transient startup rate allowed? (0.5)

c. What is the maximum delta-T between Main Feedwater temperature and OTSG lower downcomer temperature? (0.5)

*ANSWER

a. A minimum of one decade overlap. (0.5)

b. 1.5 DPM (0.5)

c. Maximum delta-T is 350 deg. F. (0.5)

*REFERENCE
B.2 STARTUP PROCEDURE
RANCHO SECO FACILITY EXAM BANK
DD 30 J 0100 OBJ 2
015000A102
015000A103

*QUESTION 7.16 (2.0)

Rule 1, "Initiate HPI" requires that HPI be initiated whenever Subcooling Margin is lost.

a. What other conditions require that HPI be initiated? (1.0)

b. Why is it necessary to ensure that TWO HPI pumps are running at full capacity when the Subcooling Margin is lost? (1.0)

*ANSWER

a. Both heat transfer is lost and Feedwater is not available before RCS pressure reaches the EMOV setpoint (2450 psig). (1.0)

b. Running two HPI pumps ensures adequate core cooling because the actual RCS inventory is not known. (1.0)

*REFERENCE
RULE 1
A106 PART II - VOLUME 1 CHAPTER E
RANCHO SECO FACILITY EXAM BANK
OD 30 J 0380 OBJ 1
0060S0A102

*QUESTION 7.17 (1.0)

What is the reason for the limitation of 10% per hour power increase between 0% and 20% of full power? (1.0)

*ANSWER

This assumes that there are pinholes in the cladding of the fuel allowing water into the fuel pin. A fast heatup could flash the water to steam and cause excessive stress and (possibly a rupture of the pin). (1.0)

*REFERENCE
B.2 NORMAL PLANT OPERATIONS
RANCHO SECO FACILITY EXAM BANK
OD 30 J 0100 OBJ 2
002000A106
002000K613

*QUESTION 7.18 (1.0)

A loss of Makeup has just occurred due to a trip of the Makeup pump from an electrical fault. Valve SFV-23616, "Seal Injection Isolation Valve" has been closed manually. Why must the special precaution of slowly increasing the flow be used in the restoration of seal injection? (1.0)

*ANSWER

Restore slowly to avoid thermal shock and the subsequent damage of seal parts. (1.0)

*REFERENCE
C.9 Loss of Reactor Coolant Makeup/Letdown
OD 30 J 0200 OBJ 2
0030000001

*QUESTION 7.19 (1.0)

A reactor trip has occurred from a temporary loss of offsite power (offsite power has been restored) and indications exist that Primary to Secondary heat transfer has been lost and the Primary is saturated. you have entered E.04 "Loss Heat Transfer".

Why must OTSG saturation temperature be 40 to 60 deg. F lower than incore Core Exit Thermocouple (Incore Thermocouple) temperature when bumping an RCP to restore heat transfer? (1.0)

*ANSWER

Pressurizer outsurge will occur when the steam voids in the Reactor Coolant System collapse. (1.0)

*REFERENCE
E.04 Loss of Heat Transfer PG 10
OD 30 J 0340 OBJ 7
0000566007
0000566011
0000566012

End of Section 7

Go on to Section 8

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Section 8

Administrative Procedures, Conditions, and Limitations

*QUESTION 8.01 (2.0)

Technical Specification 3.1.3, "Minimum Temperature for Criticality" requires that the reactor remain subcritical by at least 1% delta K/K until a bubble is formed in the Pressurizer.

a. What range of level must be present in the Pressurizer to satisfy the LCO? (1.0)

b. What is the basis for the requirement to establish a bubble prior to criticality? (1.0)

*ANSWER

a. Between 10 and 316 inches. (1.0)

b. To assure that the RCS will not go solid (in the event of a rod withdrawal accident). (1.0)

*REFERENCE
T.S. 3.1.3
OD 30 J 0600 OBJ 3
002000K407
002000G105
002000G106

*QUESTION 8.02 (1.0)

The reactor is at 100% of full power when a regulating rod has become misaligned resulting in a Quadrant Power Tilt of 12%. Action to reduce reactor power must be taken to bring the QPT to within 4.92%. By how much must reactor power be reduced? (1.0)

*ANSWER

Power must be reduced by 2% for each 1% above 4.92%

(12% - 4.92%) X 2 = 14.16% (or 85.84% of full power) (1.0)

*REFERENCE
1.5. 3.5.2.4.B
OD 30 J 0600 OBJ 3
0010006005
0010006006

*QUESTION 8.03 (2.0)

A channel check must be done on the Containment Area High Range Monitor at least once every shift (once every 12 hours). Some extensions of the basic interval are allowed by the Technical Specifications.

Surveillance records show that these checks were done on:

December 7 at 0100
December 7 at 1600
December 8 at 0100
December 8 at 1500
December 9 at 0600

When is the next channel check surveillance due to be performed AT THE LATEST? ---> Show how you derived the time!

(2.0)

*ANSWER

Max interval for 3 surveillances is 36 + 12(0.25) = 39 hours

12/8 0100 to 12/9 0100 is 24 hours. to preserve 39 hour interval next check must be done by 0100 + 15 hours (1.0)

The answer is 12/9 1600 (1.0)

*REFERENCE
T.S. 1.9 and TABLE 4.1-1
OD 30 J OBJ 1,3,4
072000G010

*QUESTION 2.04 (1.5)

You are filling the position of Shift Supervisor during Cold Shutdown.

a. What other positions are required by the Technical Specifications to be manned under these conditions? (1.0)

b. If a member of the required crew complement becomes incapacitated, how much time is allotted for the designated replacement to report on site? (0.5)

*ANSWER

a. 2 licensed ROs (Assitant CO's) and 1 non-licensed operator. (1.0)

b. 2 hours. (0.5)

*REFERENCE
T.S. TABLE 6.2-1
OD 30 0 ONS 5
19400101A109

*QUESTION 8.05 (3.0)

Regarding Administrative Procedure AP.4A, "Safe Clearance Procedure":

a. Who is responsible for determining if SFAS Independent Verification is required for a clearance? (1.0)

b. If the boundary for a clearance cannot be drained or vented what action must be taken? (1.0)

c. What two actions must be undertaken for those clearances that have been outstanding for 30 days or more? (1.0)

*ANSWER

a. Shift Supervisor (or designated representative). (1.0)

b. A Caution tag must be hung on the applicable boundary (valve body, flange, etc.) (1.0)

c. 1. A review for applicability. (0.5)

2. And a physical verification. (0.5)

*REFERENCE
PROCEDURE AP.4A PAGES 13, 19.
GD 30 J 0600 OBJ 4
194001K101
194001K102

*QUESTION 8.06 (2.0)

Procedure RSAP-507, "Change Notices to Procedures" describes the methodology of making changes to procedures. In this procedure there are six specified changes that affect the intent of a procedure or procedural step.

What are four (4) of the six changes that could change the intent of a procedure or procedural step? (2.0)

*ANSWER

1. A change to the acceptance criteria

2. A change to the limits and precautions.

3. Deletion or change of any step with a specified acceptance criteria.

4. Deletion or revision of USAR requirement.

5. Deletion or revision of T. S. requirement.

6. Deletion or revision steps, subsection, or section implementing a commitment document.

Any 4 at (0.5) each.

*REFERENCE
RSAP-507 PAGE 3.
OD 30 J.0800 OBJ 2.4
194001A101

*QUESTION 8.07 (1.0)

Special Order #88-11 specifies the operator good practice concerning repositioning of valves during the performance of clearances and lineups. What is this good practice? (1.0)

*ANSWER

The Supervisor should give the operator specific guidance on what to do if a valve is not in the required position. (1.0)

*REFERENCE
SPECIAL ORDER #88-11.
DD 30 J 0800 080 4
1940018102

*QUESTION 8.08 (2.0)

Special Order #88-37, "Use of HPI Subsequent to Reactor Trips" discusses the actions that were taken for the reactor trip of August 6, 1988. During this trip the operators utilized all four HPI injection nozzles to minimize the pressurizer level decrease. Under AP.28, "Post Trip Transient Investigation, Assessment, and Reporting" the event was classified as a Type II event because of the use of all four nozzles.

a. Why was the use of all four HPI nozzles not allowed for the conditions of an uncomplicated reactor trip? (1.0)

b. What is the difference between a Type II and a Type I event? (1.0)

*ANSWER

a. It causes unnecessary thermal cycling of the injection nozzles. (1.0)

b. The Type II event requires an investigative team to review the event and determine if corrective actions are needed. For a Type I event, a Shift Supervisor can recommend a restart without a review. (1.0)

*REFERENCE
AP.28, SPECIAL ORDER #88-37.
OD 30 J 0900 OBJ 4
1900010102

*QUESTION 8.09 (2.0)

What is the color of each of the following equipment control tags?

a. Clearance/Danger (0.5)

b. Abnormal (0.5)

c. Test (0.5)

d. Caution (0.5)

*ANSWER

a. Red (0.5)

b. Blue (0.5)

c. Green (0.5)

d. Yellow (0.5)

*REFERENCE
AP.4A,4B,4C
DD 30 J 0800 OBJ 2
194001K102

*QUESTION 8.10 (1.0)

What is the purpose of the Abnormal tag? (1.0)

*ANSWER

The tag identifies an abnormal condition in an operating plant system without a drawing change. (1.0)

*REFERENCE
AP.26 PG 2
OD 30 J 0800 OBJ 4
194001K102

*QUESTION 8.11 (1.5)

Procedure RP.305-7, "Area Definitions and Posting" defines those areas of radiological concern which must be posted and established.

What are the defining conditions for the following areas per RP.305-7?

a. Radiation Area (0.5)

b. High Radiation Area (0.5)

c. Secured High Radiation Area (0.5)

*ANSWER

a. > 2.5 mrem/hr < 100 mrem/hr (0.5)

b. > 100 mrem/hr < 1000 mrem/hr (0.5)

c. > 1000 mrem/hr when measured at 18 inches (0.5)

REFERENCE
RP.305-7
OD 30 J 0800 OBJ 4
19400IK103

*QUESTION 8.12 ~~(2.5)~~ 2.0

10CFR50.72 describes the NRC reporting requirements. Generally there are (3) categories of events, each with a time period within which a report has to be made to the NRC.

a. What are the two reporting time periods associated with these events? (1.0)

b. When do the reporting time "Clocks" for these periods start? ~~(1.0)~~

c. How would you directly inform the NRC? (0.5)

*ANSWER

a. 1 hour and 4 hours. (1.0)

b. When facility management "should have known" (i.e. at the time of discovery by the person who discovered the event or condition). ~~(1.0)~~

c. By picking up the "RED" phone in the Control Room. (0.5)

*REFERENCE
10CFR50.72
10CFR Lesson Plan Objective
194001A106

*QUESTION 8.13 (1.0)

The plant is in Hot Standby when the following information is turned over to the on-coming Shift Supervisor:

1.8 gpm - leakage past check valves from RCS to both Core Flood Tanks (0.9 GPM ea.)

1.2 gpm - Primary to secondary leakage (total) with RCS activity of 0.2 uCi/gm of I-131.

4.8 gpm - Total RCS leakage

15 gpm - Leakage from Reactor Coolant Pump Seals

What RCS leakage or other limits have been exceeded? (1.0)

*ANSWER

The leakage limits for unidentified leakage of greater than 1 GPM has been exceeded. (0.5)

And the 1.2 gpm primary to secondary is in excess of 500 gallons per day. (0.5)

*REFERENCE
Technical Specification 3.1.6. 1.2.14
OD 30 J 0600 OBJ 1.3
002020G011
002000G005
002000K405

*QUESTION 8.14 (2.0)

The Rancho Seco Technical Specifications require that the the Core Flood Tanks be operable when RCS pressure is above 800 psig. What are four (4) of the five conditions required to be verified to satisfy this requirement? VALUES ARE NOT REQUIRED, only the parameter need be listed. (2.0)

*ANSWER

- Isolation valves open
- Water volume
- Boron concentration
- Cover pressure
- Pressure instrumentation operable [any 4, 0.5 each]

*REFERENCE
Technical Specification 3.3.3
OD 30 J 0600 OBJ 3
006020600S
006000600S

↳ Vent valves closed and tagged.

*QUESTION 8.15 (1.0)

What must be done by a licensed operator to maintain his/her license in an "active" status per the regulations of 10 CFR 55 "Operators' Licenses"? (1.0)

*ANSWER

The operator shall actively perform the functions of the appropriately licensed operator on a minimum of seven 8 hour shifts or five 12 hour shifts (0.5) per calendar quarter (0.5).

*REFERENCE
10 CFR 55.53(e)
10CFR Lesson Plan Objective
194001A103

End of Section 8

End of Examination

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