



UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W.
ATLANTA, GEORGIA 30323

ENCLOSURE 1

Examination Report - 50-269/OL-90-01

Facility Licensee: Duke Power Company

Facility Name: Oconee Nuclear Station

Facility Docket Nos. 50-269, 50-270, and 50-287

A written examination was administered at the Region II offices in Atlanta, Georgia.

Chief Examiner: *Richard S. Baldwin* 7/5/90
Richard S. Baldwin Date Signed

Approved: *Charles A. Casto* 7/5/90
Charles A. Casto, Chief Date Signed
Operator Licensing Section 2

Summary:

An examination was administered on June 6, 1990.

A written examination was administered to one senior reactor operator (SRO).

This SRO passed the examination.

REPORT DETAILS

1. Facility Employees Contacted:

Paul Stovall, Director, Operations Training
Travis Farmer, Instructor

2. Examiners:

*Richard Baldwin
George Hopper

*Chief Examiner

3. Examination Review Meeting

At the conclusion of the written examination, the examiners provided Ocone training staff with a copy of the written examination and answer key for review.

There were no facility comments.

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Nuclear Regulatory Commission
Operator Licensing
Examination

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U. S. NUCLEAR REGULATORY COMMISSION
SENIOR REACTOR OPERATOR LICENSE EXAMINATION
REGION 2

FACILITY: Oconee 1, 2 & 3

REACTOR TYPE: PWR-B&W177

DATE ADMINSTERED: 90/06/07

CANDIDATE:

INSTRUCTIONS TO CANDIDATE:

Points for each question are indicated in parentheses after the question. To pass this examination, you must achieve an overall grade of at least 80%. Examination papers will be picked up four and one half (4 1/2) hours after the examination starts.

NUMBER QUESTIONS	TOTAL POINTS	CANDIDATE'S POINTS	CANDIDATE'S OVERALL GRADE (%)
75	88.00		

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. After the examination has been completed, you must sign the statement on the cover sheet indicating that the work is your own and you have not received or given assistance in completing the examination. This must be done after you complete the examination.
3. 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.
4. Use black ink or dark pencil only to facilitate legible reproductions.
5. Print your name in the blank provided in the upper right-hand corner of the examination cover sheet.
6. Fill in the date on the cover sheet of the examination (if necessary).
7. You may write your answers on the examination question page or on a separate sheet of paper. USE ONLY THE PAPER PROVIDED AND DO NOT WRITE ON THE BACK SIDE OF THE PAGE.
8. If you write your answers on the examination question page and you need more space to answer a specific question, use a separate sheet of the paper provided and insert it directly after the specific question. DO NOT WRITE ON THE BACK SIDE OF THE EXAMINATION QUESTION PAGE.
9. Print your name in the upper right-hand corner of the first page of answer sheets whether you use the examination question pages or separate sheets of paper. Initial each of the following answer pages.
10. Before you turn in your examination, consecutively number each answer sheet, including any additional pages inserted when writing your answers on the examination question page.
11. If you are using separate sheets, number each answer and skip at least 3 lines between answers to allow space for grading.
12. Write "Last Page" on the last answer sheet.
13. Use abbreviations only if they are commonly used in facility literature. Avoid using symbols such as < or > signs to avoid a simple transposition error resulting in an incorrect answer. Write it out.

14. The point value for each question is indicated in parentheses after the question. The amount of blank space on an examination question page is NOT an indication of the depth of answer required.
15. Show all calculations, methods, or assumptions used to obtain an answer.
16. Partial credit may be given. Therefore, ANSWER ALL PARTS OF THE QUESTION AND DO NOT LEAVE ANY ANSWER BLANK. NOTE: partial credit will NOT be given on multiple choice questions.
17. Proportional grading will be applied. Any additional wrong information that is provided may count against you. For example, if a question is worth one point and asks for four responses, each of which is worth 0.25 points, and you give five responses, each of your responses will be worth 0.20 points. If one of your five responses is incorrect, 0.20 will be deducted and your total credit for that question will be 0.80 instead of 1.00 even though you got the four correct answers.
18. If the intent of a question is unclear, ask questions of the examiner only.
19. When turning in your examination, assemble the completed examination with examination questions, examination aids and answer sheets. In addition, turn in all scrap paper.
20. To pass the examination, you must achieve an overall grade of 80% or greater.
21. There is a time limit of (4 1/2) hours for completion of the examination. (or some other time if less than the full examination is taken.)
22. When you are done and have turned in your examination, leave the examination area as defined by the examiner. If you are found in this area while the examination is still in progress, your license may be denied or revoked.

QUESTION: 001 (1.00)

An Emergency Feedwater Pump should not be operated at > 500gpm in accordance with procedure. Which ONE of the following is the reason for this precaution?

- a. To prevent overcooling the RCS.
- b. To reduce the possibility of Emergency Feedwater Pumps being disabled by backleakage.
- c. To prevent Emergency Feedwater Pump cavitation.
- d. To prevent overfeeding the OSTG.

QUESTION: 002 (1.00)

The Main Steam Line Area Radiation Monitors are Geiger-Mueller detectors. Which ONE of the following describes why the Main Steam Line Area Radiation Monitors are NOT Ion Chamber detectors like all the other Area Radiation Monitors ?

- a. Ion Chamber detector accuracy degrades significantly in a high temperature environment. Therefore, they are not environmentally qualified for this application.
- b. The high level of neutron flux at high power levels would cause Ion Chamber detectors to saturate, thereby masking a tube leak.
- c. Ion Chamber detectors deplete rapidly in a neutron flux and would require frequent replacement.
- d. Gamma sensitive Ion Chamber detectors would avalanche due to N_{16} gammas, indicating a tube leak.

QUESTION: 003 (1.00)

Which ONE of the following conditions correctly describes the requirements for a 230KV Switchyard Isolation to occur?

- a. Undervoltage on 4 of the 6 phases monitored between the Red and Yellow Buses on EITHER Channel of UV protection.
- b. Undervoltage on 4 of the 6 phases monitored between the Red and Yellow Buses on BOTH Channels of UV Protection.
- c. Undervoltage on 2 of 3 phases on BOTH the Red and Yellow Buses on BOTH Channels of UV Protection.
- d. Undervoltage on 2 of 3 phases on BOTH the Red and Yellow Buses on EITHER Channel of UV Protection.

QUESTION: 004 (1.00)

Which ONE of the following correctly describes how control of ES components is obtained on an RZ Module, assuming an emergency signal is still present ?

- a. Control can NOT be obtained until the ES signal clears.
- b. Depress the Manual pushbutton for the component, which will restore the component to its state prior to the ES, and then control may be obtained at the control room switch only.
- c. Depress the Manual pushbutton for the component, and then control may be obtained at the control room switch.
- d. Depress the Manual pushbutton for the component, and then control may be obtained locally only [i.e. outside the control room].

QUESTION: 005 (1.00)

Which ONE of the following methods, contained within the Emergency Procedures, is the best method for removal of RCS voids that are due to the presence of Non-condensable gases?

- a. Repressurization of the RCS.
- b. RCP Restart.
- c. RCP Bumping.
- d. Vessel or Hot Leg venting.

QUESTION: 006 (1.00)

Which ONE of the following criteria must be met in order to utilize OP/1/A/1102/02, "Reactor Trip Recovery".

- a. The Rx startup must begin within 24 hours after the trip.
- b. The Rx startup must begin within 12 hours after the trip.
- c. The Rx startup must begin within 8 hours after the trip.
- d. The Rx startup must begin within 4 hours after the trip.

QUESTION: 007 (1.00)

Which ONE of the following will cause the greatest biological damage to man from an external source ?

- a. 0.1 Rad of fast neutron
- b. 1.0 Rem of gamma
- c. 10 Rem of beta
- d. 0.05 Rad of alpha

QUESTION: 008 (1.00)

Which ONE of the following correctly describes the required actions to retrieve a Red Tag Stub, if the Work Supervisor responsible for the job can NOT be located?

- a. Another Work Supervisor in that group may authorize retrieval, as long as he has phone approval from the responsible Work Supervisor.
- b. The Group Superintendent is the only individual who may sign authorizing removal, and he must inform the Work Supervisor responsible for the work when he returns to the site.
- c. The Group Superintendent must approve tag retrieval, but he may authorize this based on verbal approval and having another individual sign his name and initial authorizing tag removal.
- d. The Shift Supervisor is the only individual who can authorize tag retrieval in this situation.

QUESTION: 009 (1.00)

Following a station blackout AP/1/A/1700/11 informs the operator that the Turbine Bypass Valves may cycle on and off at the 7 inch Hg condenser vacuum low limit. Which ONE of the following may cause this to occur ?

- a. Condenser Hotwell Level cycling at the High setpoint.
- b. Low CCW flow as a result of gravity flow only.
- c. Main Steam Relief Valves unable to relieve OTSG Pressure.
- d. Oscillating RCS Pressure and Natural Circulation due to cycling of the PORV.

QUESTION: 010 (1.00)

EP/1/A/1800/01 Section 506 "Unanticipated Nuclear Power Production", has the operator "Verify open 1HP-5 (Letdown Isolation)" prior to initiation of Emergency Boration. Which One of the following describes the reason for this action ?

- a. Initiation of Letdown concentrates the boron that is already in the RCS.
- b. Initiation of Letdown promotes mixing of the boron in the RCS.
- c. Initiation of Letdown increases heat removal from the RCS.
- d. Initiation of Letdown offsets the increase in RCS inventory due to emergency boration.

QUESTION: 011 (1.00)

Which ONE of the following is NOT a design difference between the safety/regulating control rods and the APSRs ?

- a. APSR drives have a small button on the lower portion of the segment arm which prevents the lead screw from being disengaged when power is lost.
- b. APSR couplings have larger diameters and shorter keys to prevent coupling an APSR drive to a safety or regulating rod or vice-versa.
- c. APSR drives have ball valves and bypass ports.
- d. APSR Buffer Springs have been removed from the Buffer Assembly.

QUESTION: 012 (1.00)

Which ONE of the following correctly describes the accident that was assumed to exist, necessitating the installation of HP-409 and HP-410?

- a. Failure of one HPI header with the opposite header HPI pump out of service above 50% power.
- b. Failure of two HPI pumps with a break of the RCS piping downstream of a Reactor Coolant Pump [RCP] at 100% power.
- c. An RCS piping break downstream of a RCP with failure of the opposite side HPI header at greater than 60% power.
- d. An RCS piping break anywhere in a cold leg, with a failure of the opposite side HPI header at any power level.

QUESTION: 013 (1.00)

The power-imbalance limits defined in Tech Spec 3.5.2, "Control Rod Group and Power Distribution Limits", are based upon which ONE of the following ?

- a. Assures that an acceptable power distribution is maintained for control rod misalignment analysis.
- b. Assures that the potential effects of control rod misalignment on steam line break accident analyses are minimized.
- c. Assures LOCA analysis limits on maximum linear heat rate for maximum cladding temperature are not exceeded.
- d. Assures that the nuclear uncertainty factor in LOCA analyses will not exceed the Final Acceptance Criteria.

QUESTION: 014 (1.00)

The following plant conditions exist:
Rx Power 100%
Motor Driven EFW Pump A is out of service.

Which ONE of the following is a correct interpretation of the Limiting Condition for Operation for the Emergency Feedwater System, in the event all EFW Flow Instrumentation for B OTSG becomes inoperable. [All other attendant controls and instrumentation are assumed to be operable.]

[APPLICABLE TECH SPECS ATTACHED]

- a. Apply specification 3.4.2.a.
- b. Apply specification 3.4.2.b.
- c. Apply specification 3.4.2.c.
- d. Apply specification 3.4.2.d.

QUESTION: 015 (1.00)

Which ONE of the following has an associated Tech Spec Limiting Condition for Operation under 3.10 Radioactive Gaseous Effluents?

- a. Waste Gas Holdup Tank oxygen concentration.
- b. Auxiliary Building Exhaust System gaseous effluent.
- c. Contaminated oil incineration.
- d. Gaseous effluent air dose due to particulates.

QUESTION: 016 (1.00)

QUESTION

Which ONE of the following describes the BWST minimum volume and boron concentration bases as explained in Tech Specs?

- a. Sufficient borated water is available within containment to absorb 99% of the iodine released in a LOCA.
- b. The 2 hour thyroid dose at the site boundary will be consistent with the analysis presented in the FSAR for postulated steam generator tube rupture.
- c. The RCS can be cooled down to less than 280 deg. F from normal operating conditions in the event of a Total Loss of Offsite Power concurrent with a LOCA.
- d. A sufficient volume of borated water is available for refueling requirements and the concentration is high enough to ensure that the reactor will remain 1% subcritical at 70 deg. F without any control rods in the core following a LOCA.

QUESTION: 017 (1.00)

The following plant conditions exist:

Rx Power 90%

Reactor Coolant System pressure is decreasing rapidly

Pressurizer Level and Makeup Tank Level are unchanged

Which ONE of the following events would produce these indications?

- a. Small break LOCA
- b. RCP trip
- c. Spray valve failed open.
- d. Letdown isolated

QUESTION: 018 (1.00)

A complete Loss of Instrument Air will result in which ONE of the following ?

- a. RCS Normal Makeup is lost, RCP seal injection increases
- b. RCS Normal Makeup increases, RCP seal injection increases
- c. RCS Normal Makeup is lost, RCP seal injection is lost
- d. RCS Normal Makeup increases, RCP seal injection is lost

QUESTION: 019 (1.00)

Which ONE of the following Seal Failure[s] would result in a decreased Seal Return Flow for the Bingham style RCPs [Units 2 and 3] ?

- a. Failure of all three seals
- b. Failure of # 3 seal [upper]
- c. Failure of # 2 seal [middle]
- d. Failure of # 1 seal [lower]

QUESTION: 020 (1.00)

Which One of the following statements is correct if a High Pressure Feedwater Heater is removed from service while operating at 90 % power ?

- a. The unit will be placed in Track due to BTU Limits.
- b. The FDW demand signal will be modified for increased FDW.
- c. The FDW demand signal will be modified for decreased FDW.
- d. The FDW demand signal will not be affected.

QUESTION: 021 (1.00)

If ALL RCP's are tripped but the Main FDW Pump(s) remains on, SG levels are maintained via which ONE of the following ?

- a. The Startup Control Valves and Main Feed Nozzles
- b. TDEFWP through the Startup Control Valves
- c. The Main Control Valves and Main Feed Nozzles
- d. The Startup Control Valves and Aux Feed Nozzles

QUESTION: 022 (1.00)

Which ONE of the following is the proper sequence of valve operation to transfer suction of the LPI pumps from the BWST, to the RB Emergency Sump, during ECCS operation of the LPI system on Unit 3?

- a. Close 3LP-19 and 3LP-20 then open 3LP-21 and 3LP-22
- b. Open 3LP-19 and 3LP-20 then close 3LP-21 and 3LP-22
- c. Open 3LP-21 and 3LP-22 then close 3LP-19 and 3LP-20
- d. Close 3LP-21 and 3LP-22 then open 3LP-19 and 3LP-20

QUESTION: 023 (1.00)

The maximum run time, per precautions and limitations, for a LPI pump at shut-off head [no indicated flow] is: [SELECT ONE]

- a. 15 minutes
- b. 30 minutes
- c. 45 minutes
- d. 60 minutes

QUESTION: 024 (1.00)

During a reactor start-up, power is being raised above the point of adding heat [POAH]. Assume a linear reactor power increase to about 3% power.

Which ONE of the following statements is correct ?

- a. Since header pressure is 885 psig, Tave will not rise above the corresponding saturation temperature of 532 deg F.
- b. Since the OTSGs are low level limited and header pressure is being maintained at 885 psig, Tave will rise and the steam temperature will tend to follow Th.
- c. With the header pressure being maintained at 885 psig, the OTSGs will remain at saturated conditions, and no superheat will be added.
- d. Since the OTSGs are low level limited, the steam is superheated at zero power conditions and the superheat rises proportionally with power.

QUESTION: 025 (1.00)

Which ONE of the following is NOT a basis for the Minimum Temperature for Criticality LCO ?

- a. The moderator temperature coefficient is within its analyzed temperature range.
- b. The reactor boron concentration is at the critical concentration with a negative MTC.
- c. The pressurizer is capable of being in an operable status with a steam bubble.
- d. The reactor pressure vessel is above its minimum NDTT temperature.

QUESTION: 026 (1.00)

Which ONE of the following statements describes the behavior of RCS pressure, if a Small Break LOCA were to occur without Feedwater available? [Assume no ESF/ECCS actuation]

- a. Pressure initially decreases slowly, then rapidly drops when the OTSGs are boiled dry.
- b. Pressure initially decreases, then increases when the OTSGs boil dry.
- c. Pressure initially decreases, then when OTSGs boil dry, continues to decrease, but at a much slower rate.
- d. Pressure initially increases, then rapidly drops when the OTSGs are boiled dry.

QUESTION: 027 (1.00)

Which ONE of the following describes the condition that exists if the Sync Verification Indicator lamp on a Static Inverter stays on continuously, but at half brightness ?

- a. There is a mismatch between AC Line Voltage and Inverter Output Voltage.
- b. There is a mismatch between AC Line Frequency and Inverter Output frequency.
- c. Voltage and Frequency are properly matched between the Inverter and the AC Bus.
- d. DC Voltage supplying the Static Inverter is LOW.

QUESTION: 028 (1.00)

Which ONE of the following describes the possible consequences of improperly venting a Control Rod Drive Mechanism ?

- a. Loss of the hydraulic buffer.
- b. Loss of cooling to the drive stator.
- c. Uncoupling of the stator and rotor field.
- d. Erosions of the thermal barrier.

QUESTION: 029 (1.00)

During an emergency situation [i.e. LOCA, OTSG tube rupture etc.] where the SPDS was sensing an invalid input affecting parameter determination, Which ONE of the following would be correct?

- a. The function block color would remain the same and flash.
- b. An alarm indicating an invalid input for that function would be output.
- c. An alarm indicating invalid input and an alarm indicating function indeterminate would be output.
- d. The function block color would change to red and flash intermittently.

QUESTION: 030 (1.00)

Which ONE of the four Critical Safety Functions below would require immediate response ?

- a. Heat Sink -- Orange
- b. Containment Integrity -- Red
- c. RCS inventory -- Yellow
- d. Inadequate Core Cooling -- White

QUESTION: 031 (1.00)

Which ONE of the following actions is required to be performed by the Shift Supervisor, in accordance with the Emergency Plan Section F, in the following situation: During normal working hours, an emergency occurs that requires the activation of the Emergency Response Organization.

- a. Alert Security to recall all duty personnel.
- b. Announce over the PA system that the TSC and OSC are to be staffed and initiate a Site Assembly.
- c. Announce over the Emergency Radio Network that the TSC and OSC are to be staffed and initiate a Site Assembly.
- d. Utilize the beeper paging system to notify all emergency response personnel.

QUESTION: 032 (1.00)

Which ONE of the following shall the Shift Supervisor notify in the event the Safe Shutdown Facility is inoperable per Technical Specification 3.18 As stated in Operation Management Procedure 2-7, "SSFLCO Required Action" ?

- a. NRC Headquarters
- b. Region II Offices
- c. Duke Power Headquarters
- d. Security

QUESTION: 033 (1.00)

Which ONE of the following is NOT a function of the Isolating Diode Assembly in the DC Power Distribution System ?

- a. Block DC voltage spikes to the panel board connected to the output of the diode assemblies.
- b. To discriminate between the voltage level of the two DC distribution systems.
- c. Pass current from the system of higher potential to the panel board connected to the output of the diode assemblies.
- d. Block the flow of current from one DC distribution system to the other.

QUESTION: 034 (1.00)

Prior to reaching 150 psig RCS pressure during a heatup, a vacuum is drawn on the OTSG's. Which ONE of the following is the correct basis for this action ?

- a. There is a danger of oxygen pitting of the OTSG tubes during heatup; therefore all air must be removed from the OTSG's.
- b. Ensures that all nitrogen is removed from the OTSGs prior to reaching 212 deg. F.
- c. Promotes early boiling of the OTSG water inventory; therefore, promotes even heating of the OTSG shell.
- d. Minimizes the possibility of water hammer in the Steam Piping by reducing the moisture content of the steam.

QUESTION: 035 (1.00)

Which ONE of the following describes the conditions that must be verified, in accordance with EP/1/A/1800/1, prior to throttling HPI during an HPI cooldown ?

- a. Unit TAVE decreasing and PORV/PORV Block Valve are open.
- b. At least one RCP is operating and CETCs are <640 Deg F.
- c. A Steam Generator Tube Rupture is indicated and RCS P/T is greater than RCP minimum NPSH limit.
- d. At least a 50 Deg F subcooled margin exists and CETCs are decreasing.

QUESTION: 036 (1.00)

In accordance with EP/1/A/1800/01, Sec. 503, "Excessive Heat Transfer", which ONE of the following concerns the possible Personnel Safety Hazard that may exist with establishing feedwater to an affected Steam Generator that has no pressure control ?

- a. It could present a danger if a line rupture existed outside of the Reactor Building.
- b. It could result in excessive thermal shock to the Lower Tube sheet, resulting in tube failures and increased activity release rates.
- c. High radiation exposures could result due to the release of N16 gammas with the introduction of feedwater.
- d. A steam explosion could result due to the introduction of cold feedwater to a boiled dry OTSG.

QUESTION: 037 (1.00)

A fire suppression spray/sprinkler system is declared inoperable for the Unit 2 Turbine Driven Emergency FDW pump. Which ONE of the following actions is required by Technical Specifications ?

- a. Commence a unit shutdown within one hour.
- b. Establish an hourly fire watch patrol for the affected area with backup water fire suppression equipment within one hour.
- c. Establish a continuous fire watch for the affected area with backup fire suppression equipment within one hour.
- d. Log ambient temperature readings for the affected area hourly and route an equivalent capacity fire hose to the area.

QUESTION: 038 (1.00)

Which ONE of the following requires activation of the Technical Support Center [TSC] ?

- a. Either an unusual event, alert, site area emergency or general emergency.
- b. Only an alert, site area emergency or general emergency.
- c. Only a site area emergency or general emergency.
- d. Only a general emergency.

QUESTION: 039 (1.00)

Which ONE of the following describes ALL of the requirements which must be met for a non-licensed person to operate plant controls within the Control Room ?

- a. Must be engaged in a formal OJT program as part of the RO/SRO licensing process and have the Shift Supervisor permission.
- b. Must be directly supervised by an active licensed operator and the individual must be engaged in a formal training program.
- c. Must be supervised by any licensed operator and have the permission of the Shift Supervisor.
- d. Must be engaged in a formal OJT program as part of the RO/SRO licensing process and have completed training on systems to be operated.

QUESTION: 040 (1.00)

EP/1/A/1800/01, Section 502, "Loss of Heat Transfer," requires that the number of reactor coolant pumps [RCPs] be reduced to one/loop. Which ONE of the following statements describes the reason for this requirement ?

- a. To remove the heat being added by the operating RCPs.
- b. To prevent loss of all the RCPs due to cavitation.
- c. To reduce the potential for core uncover and mass inventory loss due to a LOCA.
- d. To reduce RCS pressure by removing the pressure head created by the RCPs.

QUESTION: 041 (1.00)

According to AP/1/A/1700/21, "High Activity in the RC System," if the unit is shutdown and RCS cooldown is to be performed during operations with failed fuel, reactor building [RB] air temperatures are to be maintained greater than 100 degrees F. Which ONE of the following is the reason for this requirement ?

- a. To keep Iodine in gaseous form and enable its removal with the RB purge.
- b. To reduce the amount of fission product gas released from the RCS coolant.
- c. To increase the relative humidity in the RB which enhances the removal of fission product particulates from the atmosphere.
- d. To prevent Cobalt 60 from being released and absorbed in the concrete of the RB.

QUESTION: 042 (1.00)

Assume the reactor is operating at 100% power, steady state conditions when component cooling valve CC-8 fails closed. Which ONE of the components, which if left without component cooling, would require manually tripping the Reactor within four [4] minutes ?

- a. Letdown Cooler
- b. RCP Cooling Jacket and Seal Cooler
- c. CRD Stator Cooling Coil
- d. Quench Tank Cooler

QUESTION: 043 (1.00)

Which ONE of the following should NOT be done if RC Pump Seal Injection is lost due to a line break on the Seal Injection Header ?

- a. Close 1HP-115, the cross connect between pumps "1A" and "1B".
- b. Trip the "1B" pump
- c. Trip the "1A" pump
- d. Isolate letdown by closing 1HP-5

QUESTION: 044 (1.00)

Which ONE of the following describes the effect of a loss of compensating voltage on the Intermediate Range indication?

- a. Results in a higher gamma induced current from the inner chamber.
- b. Results in an indicated neutron level higher than actual.
- c. Results in a greater indicated startup rate [SUR].
- d. Results in a decrease in the amount of overlap between nuclear instruments.

QUESTION: 045 (1.00)

Following damage to a spent fuel assembly in the reactor building, RIA-49, the "RB Gas" channel, alarms due to its "ALERT" setpoint being exceeded. According to AP/1/A/1700/09, "Spent Fuel Damage," which ONE of the following must be done manually ?

- a. Sound the local evacuation alarm
- b. Trip the RB purge fan
- c. Close 1 LWD-2, the RB normal sump isolation valve
- d. Start fans F-1 and F-2 on the spent fuel pool [SFP] filtered exhaust system

QUESTION: 046 (1.00)

Which One of the following would NOT require that the Standby Shutdown Facility [SSF] CO-2 Fire Suppression System be isolated and red tagged ?

- a. The CO-2 discharge alarms are out of service, but a person is standing by to inhibit [delay] CO-2 discharge if the system actuates.
- b. Work is being performed inside the Diesel Generator Room at a location requiring 75 seconds for egress from the area.
- c. Work is being being performed on the Diesel Generator Room catwalk.
- d. Work is being performed on scaffolding immediately inside the double doors on the south end of the Diesel Generator Room.

QUESTION: 047 (1.00)

Which ONE of the following is a valid method of performing an independent verification ?

- a. Two individuals independently verifying valve position from a remote position indicator only [such as valve stem position limit switch indication].
- b. One individual actually placing a breaker in its required position, then the same individual verifying from a remote indicator that the breaker is in the correct position.
- c. One individual observing that a control valve is in the correct position locally, and another individual verifying that the valve's controller output is correct.
- d. One individual checking that a valve is in the correct position, and the a second individual obtaining a report from the first individual that the position is correct.

QUESTION: 048 (1.00)

With regard to an Inadequate Core Cooling transient, which ONE of the following is the major concern with T-clad reaching 1800 degrees F ?

- a. Melting of the cladding.
- b. Excessive hydrogen generation.
- c. Fuel melting.
- d. Structural failure of core supports.

QUESTION: 049 (1.00)

Assume a SG Tube Leak exists in the "B" OTSG on Unit 2, with RCP's B1 and A1 operating, and cooldown being accomplished using the "A" OTSG ["B" OTSG is isolated]. Station Management has directed the operating crew to go to one RCP operating, to obtain an acceptable cooldown rate.

The operating crew should trip RCP: [Select ONE]

- a. A1, so that RCP B1 remains available for any further required RCS depressurization.
- b. B1, and then use the pressurizer PORV for any further required RCS depressurization.
- c. B1, but only after further RCS depressurization will no longer be required.
- d. B1, restarting it for short periods of time, for any further required RCS depressurization.

QUESTION: 050 (1.00)

Which One of the following represents the correct order of importance for the listed Emergency Procedure sections, when performing EP/1/A/1800/01 ? [Assume a Steam Generator Tube Rupture was NOT the initial entry condition.]

PROCEDURES:

1. Excessive Heat Transfer
2. Loss of Heat Transfer
3. Loss of Subcooling
4. Steam Generator Tube Leak

SELECTIONS:

- a. 3, 2, 1, 4.
- b. 2, 1, 4, 3.
- c. 3, 1, 2, 4.
- d. 4, 3, 2, 1.

QUESTION: 051 (1.00)

During a post-accident situation , if a cooldown is being performed using procedure CP-604, "Solid Plant Cooldown," the operators are directed to go to CP-602, "SG Cooldown With Saturated RCS", whenever ANY subcooling margin equals zero degrees F, and subcooling cannot be restored to greater than: [Select ONE]

- a. 0 degrees F, within 2 minutes.
- b. 5 degrees F, within 5 minutes.
- c. 5 degrees F, within 10 minutes.
- d. 10 degrees F, within 10 minutes.

QUESTION: 052 (1.00)

AP/1/A/1700/21, "High Activity in RC System", requires a determination of the SOURCE of high activity [failed fuel, or corrosion products]. Which ONE of the following is the reason for this requirement?

- a. The reactor must be shutdown within 24 hours, if there is any confirmed indication of failed fuel.
- b. While operating with failed fuel, normal power level changes must be limited to less than 3% FP/hr.
- c. Extended cleanup actions must commence within one hour, if the activity is due to crudburst.
- d. If activity due to nuclides with half-lives greater than 30 minutes approaches 165/E-bar, the reactor must be shutdown.

QUESTION: 053 (1.00)

Which ONE of the following is the most desirable method of fighting a high voltage electrical fire with water ?

- a. Straight stream directly on fire from at least 50 ft.
- b. Wide fog pattern from at least 10 ft.
- c. Fog/stream combination from as close as possible.
- d. Narrow fog pattern from at least 40 ft.

QUESTION: 054 (1.00)

Assuming there is a completed NRC Form-4 on file, and there has been no previous exposure, 10CFR20 states that the maximum allowable Whole-body dose a woman 21 years of age may receive in one year while performing non-emergency work is: [Select One]

- a. 0.5 REM unless shown NOT to be pregnant.
- b. 3 Rem per quarter not to exceed an annual dose of 5 Rem.
- c. 5 Rem.
- d. 12 Rem.

QUESTION: 055 (1.00)

Which ONE of the following describes the required actions to remove a Red Tag, if the Red Tag Stub has been lost ?

- a. Another Work Supervisor in that group may authorize retrieval, as long as he checked the work documentation.
- b. The Group Superintendent is the only individual who may sign authorizing removal, and he must inform the Work Supervisor responsible for the work when he returns to the site.
- c. The Work Supervisor shall fill out the Tag Occurrence Report form and verify the work requiring the tag is completed.
- d. The Shift Supervisor is the only individual who can authorize tag retrieval in this situation.

QUESTION: 056 (1.00)

Which ONE of the following describes the prescribed method for causing the Keowee Hydro Generator to produce a voltage output, once the Wicket Gate position is established ?

- a. Close the field breaker, then close the generator supply breaker, then close the field flashing breaker.
- b. Close the field breaker, then close the field flashing breaker, then close the generator supply breaker.
- c. Close the field flashing breaker, then close the field breaker, then close the generator supply breaker.
- d. Close the field flashing breaker, then close the generator supply breaker, then close the field breaker.

QUESTION: 057 (1.00)

The reactor is producing 100% rated thermal power at a core Delta-T of 60 degrees and a total mass flow rate of 100% when a Station Blackout occurs. If total mass flow rate [on Natural Circulation] has been determined to be 3.0% and reactor decay heat is 2% , which ONE of the following is the new Core Delta-T ?

- a. 30 degrees F
- b. 40 degrees F
- c. 60 degrees F
- d. 90 degrees F

QUESTION: 058 (1.00)

If the ICS Auto/Manual Tave Transfer Switch was initially in "Unit Tave" position with all systems in automatic, and then less than 95% full flow is sensed in BOTH loops [simultaneously], the system will: [Select ONE]

- a. Allow the operator to select either Loop-A, Loop-B, or UNIT Tave.
- b. Allow the operator to select only UNIT Tave.
- c. Automatically select the loop with the LOWEST flow.
- d. Automatically select the loop with the HIGHEST flow.

QUESTION: 059 (2.00)

MATCH the Engineered Safety Features in Column A with the Actuation Setpoints in Column B.

[NOTE: The items in Column B may be used once, more than once, or not at all, and only a single answer may occupy one answer space.]

COLUMN A

COLUMN B

- | | |
|--|--|
| <p>___ a. High Pressure Injection</p> <p>___ b. Low Pressure Injection</p> <p>___ c. Reactor Building Isolation</p> <p>___ d. Reactor Building Spray</p> | <p>1. 3 psig Rx Bldg.</p> <p>2. 3 psig Rx. Bldg AND
1600 psig RCS pressure</p> <p>3. 3 psig Rx. Bldg OR
1600 psig RCS pressure</p> <p>4. 10 psig Rx Bldg.</p> <p>5. 3 psig Rx Bldg. OR
550 psig RCS pressure</p> <p>6. 3 psig Rx Bldg. AND
550 psig RCS pressure</p> |
|--|--|

QUESTION: 060 (2.00)

List the FOUR loads cooled by the Component Cooling [CC] System.

QUESTION: 061 (3.00)

List SIX valves which must be closed in order to isolate the "A" OTSG if it is ruptured.

QUESTION: 062 (2.50)

LIST the FIVE automatic actions that should occur for a reactor trip according to Emergency Procedures, EP/1A/1800/01.

QUESTION: 063 (3.00)

- a. LIST the FOUR trips that are bypassed by the shutdown bypass switch in the RPS cabinets? [2.0]
- b. WHAT new limits, AUTOMATIC and ADMINISTRATIVE, are imposed when going to shutdown bypass? (IDENTIFY which are automatic and which are administrative limits.) [1.0]

QUESTION: 064 (2.00)

During an inadvertent Emergency Safeguards actuation [ES channels 1 thru 8], the operator must take manual control of individual components as soon as possible. LIST the FOUR areas of concern that must be controlled to stabilize the plant.

QUESTION: 065 (2.00)

LIST the FOUR displays where core exit thermocouple [CETC] temperature may be read for Unit 1?

QUESTION: 066 (2.00)

LIST ALL the Immediate MANUAL Actions associated with AP/1/A/1700/10, "Uncontrolled Flooding of the Turbine Building".

QUESTION: 067 (1.00)

LIST the TWO Automatic Actions, including their initiating signals, which AP/1/A/1700/20, "Loss of Component Cooling", requires the operator to verify, following a loss of Component Cooling.

QUESTION: 068 (1.00)

Recently, during testing of the Emergency CCW siphon flow, problems developed resulting in loss of siphon. Among the corrective actions were some procedural changes. Provide the basis for the following procedural steps in AP-11, "Loss of Power":

- a. Steam is isolated to the Condenser Steam Air Ejector first stages.
- b. TDEFW Pump suction is aligned to the hotwell from the UST as level in the UST decreases.

QUESTION: 069 (1.00)

EP/1/A/1800/1, Section 504, "S/G Tube Leak", has the operator initially cool down to 532 degrees while maintaining pressurizer level greater than 80 inches.

- a. What is the basis for the 532 degree setpoint? [0.50]
- b. What is the basis for the 80 inch setpoint? [0.50]

QUESTION: 070 (1.00)

Should a control rod "in" movement signal be generated and the rods run in the out direction, what Diamond Control Panel Lamp would illuminate AND what auto action would result from this condition?

QUESTION: 071 (2.50)

During operation at 25% power with three Reactor Coolant Pumps [RCP] in operation, the fourth RCP [loop A] is started. Assuming the ICS is in automatic, HOW will the FINAL value of the parameters listed below change as compared to the INITIAL values ?

- a. Feed flow [each OTSG] [1.0]
- b. OTSG level [each OTSG] [1.0]
- c. RCS delta Tc [0.5]

QUESTION: 072 (1.00)

In accordance with EP/1/A/1800/01, Sec. 503, "Excessive Heat Transfer":

- a. Why is feedwater controlled when reestablishing feedwater flow to an intact steam generator that is dry? [0.5]
- b. When establishing flow initially to an intact steam generator that is dry, what is the maximum flow limitation? [0.5]

QUESTION: 073 (1.50)

- a. STATE the entry conditions for Section 506 of the Emergency Operating Procedure, "Unanticipated Nuclear Power Production". [1.0]
- b. EXPLAIN the basis behind having these conditions require entry into section 506. [0.5]

QUESTION: 074 (1.00)

In accordance with EP/1/A/1800/01, CP-605, "Subcooled Cooldown", steps 7.6 and 7.7 state:

- | | | |
|-----|------|--|
| 7.6 | IF | Th and CETCs > 450 deg. F |
| | THEN | establish and maintain RCS pressure at 2155 psig. |
| 7.7 | IF | Th and CETCs < or = 450 deg. F |
| | THEN | establish and maintain subcooling margin
(based on Th) > 150 deg. F |

EXPLAIN the bases for the above pressure/subcooling limits associated with a natural circulation cooldown. [Refer to EP/1/A/1800/01, CP-605 in attachments]

QUESTION: 075 (1.50)

Procedure AP/D/A/1700/19, " Loss of Main Feedwater ", requires that FDW-315 and 316 controllers [EFW control valves] have their manual loader output matched with the automatic output AND placed in MANUAL prior to resetting a Main Feedwater Pump.

- a. WHY is this action necessary prior to resetting a main FDWP? [1.0]
- b. WHAT undesirable consequence(s) is this requirement protecting against? [0.5]

(***** END OF EXAMINATION *****)

ANSWER: 001 (1.00)

c

REFERENCE:

OP-OC-CF-EF pg 42 LO 48
3.5/3.6
061000G010 ..(KA's)

ANSWER: 002 (1.00)

d

REFERENCE:

OP-OC-SPS-IC-ARM pp 10/11, LO 1a, 1f
3.9/4.1
000038G005 ..(KA's)

ANSWER: 003 (1.00)

d

REFERENCE:

OP-OC-SPS-EL-EPD, LO 3.g
2.6/3.2
062000K401 ..(KA's)

ANSWER: 004 (1.00)

c

REFERENCE:

OP-OC-SPS-IC-ES , LO 4
3.3/3.7
013000K410 ..(KA's)

ANSWER: 005 (1.00)

d

REFERENCE:

DPC EPB pp 2-77/79;

4.0/4.4

000074K311 ..(KA's)

ANSWER: 006 (1.00)

b

REFERENCE:

Ocone DP/1/A/1102/02, pp 1

3.3/3.5

001050G010 ..(KA's)

ANSWER: 007 (1.00)

c

REFERENCE:

10CFR20.5

2.8/3.4

194001K103 ..(KA's)

ANSWER: 008 (1.00)

c

REFERENCE:

Ocone Station Directive 3.1.1, pp 11

3.7/4.1

194001K102 ..(KA's)

ANSWER: 009 (1.00)

b

REFERENCE:

Ocone AP-11 3.6/3.7
000055K007 ..(KA's)

ANSWER: 010 (1.00)

d

REFERENCE:

Ocone EP/1A/1800/01 4.4/4.7
000029K312 ..(KA's)

ANSWER: 011 (1.00)

c

REFERENCE:

Ocone OP-OC-PNS-CRD pp. 14 Obj. 1.b. 3.4/3.6
001000K103 ..(KA's)

ANSWER: 012 (1.00)

c

REFERENCE:

OP-OC-SPS-SY-HPI , LD 3
3.8/3.9
006050G007 ..(KA's)

ANSWER: 013 (1.00)

c

REFERENCE:

Ocone Tech Specs bases 3.5.2.6 2.6/3.8
002000G006 ..(KA's)

ANSWER: 014 (1.00)

a

REFERENCE:

Ocone Tech Specs 3.4.2 2.7/3.8
061000G006 ..(KA's)

ANSWER: 015 (1.00)

c

REFERENCE:

Ocone Tech Specs 3.10 2.8/3.4
194001K103 ..(KA's)

ANSWER: 016 (1.00)

d

REFERENCE:

Ocone TS 3.3.4 2.9/4.0
006000G006 ..(KA's)

ANSWER: 017 (1.00)

c

REFERENCE:

Ocone: Thermodynamics, Fluid Flow, and Heat Transfer for Nuclear
Power Plants.
010000A401 ..(KA's)

ANSWER: 018 (1.00)

a

REFERENCE:

Ocone: OP-OC-SPS-SY-HPI, p. 29 of 43.
3.4/3.6
078000K302 ..(KA's)

ANSWER: 019 (1.00)

b

REFERENCE:

Ocone: OP-OC-SPS-CM-CPS, p. 32 of 41.
3.5/3.9
003000A201 ..(KA's)

ANSWER: 020 (1.00)

c

REFERENCE:

STG-8-ICS-R [OQB]
3.2/3.2
059000K107 ..(KA's)

ANSWER: 021 (1.00)

d

REFERENCE:

CF-1-FDW-N [OQB]
3.4/3.4 2.9/2.9
059000K102 059000K413 061000K104 ..(KA's)

ANSWER: 022 (1.00)

b

REFERENCE:

PNS-32-LPI-R [0QB]
3.9/3.8 4.4/4.4
006020A402 006030A402 ..(KA's)

ANSWER: 023 (1.00)

b

REFERENCE:

Ocone: OP-OC-SPS-SY-LPI, p. 14 of 26.
2.8/3.1
006020K601 ..(KA's)

ANSWER: 024 (1.00)

b

REFERENCE:

ONS OP 1102/01, encl 4.3, p 6; IC-ICS, p 85;
ONS Training Lesson Plan, OP-OC-SPS-CM-SG, p 19.
4.2/4.5 3.8/4.0
035010K101 035010K109 ..(KA's)

ANSWER: 025 (1.00)

b

REFERENCE:

ONS TS, p. 3.1-8 & 3.1-9
3.4/3.7 3.4/4.0
001000K515 001000K516 ..(KA's)

ANSWER: 026 (1.00)

b

REFERENCE:

OP-OC-SPS-PTR-AT pp 13/14; LO 1a
4.1/4.7
000074A207 ..(KA's)

ANSWER: 027 (1.00)

a

REFERENCE:

ONS Training Lesson Plan, OP-OC-SPS-EL-VPS, p. 13
3.1/3.1
062000A407 ..(KA's)

ANSWER: 028 (1.00)

a

REFERENCE:

ONS Training Lesson Plans, OP-OC-PNS-CRD, p. 17
LPSO Training Objective, OP-OC-PNS-CRD, 1. g.
3.2/3.4
001000K104 ..(KA's)

ANSWER: 029 (1.00)

c

REFERENCE:

ONS Training Lesson Plan OP-OC-SPS-IC-SPDS Page 10
ONS LPSO Training Objective OP-OC-SPS-IC-SPDS, 1.g.
3.1/3.4
194001A115 ..(KA's)

ANSWER: 030 (1.00)

b

REFERENCE:

ONS Training Lesson Plan, OP-OC-SPS-IC-SPDS, p. 9
3.8/4.2
000069K301 ..(KA's)

ANSWER: 031 (1.00)

b

REFERENCE:

ONS Emergency Plan section F., Emergency Communications, P. F-3
3.1/4.4
194001A116 ..(KA's)

ANSWER: 032 (1.00)

d

REFERENCE:

ONS OMP 2-7, p. 2
4.1/3.9
194001A102 ..(KA's)

ANSWER: 033 (1.00)

a

REFERENCE:

OP-OC-SPS-EL-DCD. p.17
3.1/3.2
063000G004 ..(KA's)

ANSWER: 034 (1.00)

c

REFERENCE:

OP-DC-CP-011, p. 20
LSO 5c
LRD 4c
OP/1/A/1102/01, Encl. 4.1
3.5/3.8 3.4/3.9
035010A102 035010K501 ..(KA's)

ANSWER: 035 (1.00)

d

REFERENCE:

OP-DC-EAP-E33 p.8
LRD 16
3.6/4.2
000009A234 ..(KA's)

ANSWER: 036 (1.00)

a

REFERENCE:

EP/1/A/1800/01 Sec 503 P. 50
OP-DC-EAP-E23 p. 9
LSO 1b
LRD 1b
3.7/3.8
000040K106 ..(KA's)

ANSWER: 037 (1.00)

c

REFERENCE:

OC Tech. Spec. 3.17.3
3.0/3.6
0B6000G005 ..(KA's)

ANSWER: 038 (1.00)

b

REFERENCE:

RP/O/B/1000/02-5
3.1./4.4
194001A116 ..(KA's)

ANSWER: 039 (1.00)

b

REFERENCE:

OC OMP 1-2, sec. 4.13.1
2.8/4.1
194001A111 ..(KA's)

ANSWER: 040 (1.00)

a

REFERENCE:

1. Ocone: EP/1/A/1800/01, Section 502.
2. Ocone: Lesson Plans Vol. VII, OP-OC-EAP-E22, LO 1.6
4.4/4.6
000054K304 ..(KA's)

ANSWER: 041 (1.00)

a

REFERENCE:

1. Ocone: AP/1/A/1700/21, "High Activity in the RC System,"
p. 5.
2.9/3.6
000076K305 ..(KA's)

ANSWER: 042 (1.00)

c

REFERENCE:

1. Ocone: Lesson Plans Vol IV, OP-OC-PNS-CC, p. 13.
3.6/3.5 4.0/4.2
000026G010 000026K303 ..(KA's)

ANSWER: 043 (1.00)

c

REFERENCE:

- Ocone: AP/1/A/1700/14, p. 2.
2.9/3.2
004000K11B ..(KA's)

ANSWER: 044 (1.00)

b

REFERENCE:

- Ocone: Lesson Plan, "Nuclear Instrumentation,"
OP-OC-IC-NI, pp. 20-21.
3.3/3.6
000033A202 ..(KA's)

ANSWER: 045 (1.00)

b

REFERENCE:

Ocone: AP/1/A/1700/09, pp. 1 and 2.
3.7/4.1
000036K303 ..(KA's)

ANSWER: 046 (1.00)

a

REFERENCE:

SD 4.1.3, p. 5.
3.3/3.6
194001K113 ..(KA's)

ANSWER: 047 (1.00)

a

REFERENCE:

SD 2.2.2, p. 5.
3.6/3.7
194001K101 ..(KA's)

ANSWER: 048 (1.00)

b

REFERENCE:

OP-OC-TA-AM1, p. 26; LO B.15.b.
4.6/4.8
000074K102 ..(KA's)

ANSWER: 049 (1.00)

b

REFERENCE:

OP-DC-EAP-E24, p. 17.
4.1/4.3
000037K308 ..(KA's)

ANSWER: 050 (1.00)

a

REFERENCE:

EP/1/A/1800/1, pp. 11-12.
3.8/3.9
000007G012 ..(KA's)

ANSWER: 051 (1.00)

a

REFERENCE:

EP/1/A/1800/01, CP-604, p. 186.
4.2/4.8
000009A201 ..(KA's)

ANSWER: 052 (1.00)

b

REFERENCE:

AP/1/A/1700/21, pp. 2-6.
3.2/3.8
000076K306 ..(KA's)

ANSWER: 053 (1.00)

b

REFERENCE:

3.9/3.9
000067K102 ..(KA's)

ANSWER: 054 (1.00)

d

REFERENCE:

10CFR20
DPCo GET Handbook, p. 3.
2.8/3.4
194001K103 ..(KA's)

ANSWER: 055 (1.00)

c

REFERENCE:

Oconee Station Directive 3.1.1, p. 11.
3.7/4.1
194001K102 ..(KA's)

ANSWER: 056 (1.00)

a

REFERENCE:

OP-DC-SPS-CM-KHG pp 20; LO 1k
4.0/4.3
064000A401 ..(KA's)

ANSWER: 057 (1.00)

b

REFERENCE:

DPC Thermodynamics, pp. 188-192.
3.1/3.4
002000K501 ..(KA's)

ANSWER: 058 (1.00)

a

REFERENCE:

OP-OC-IC-RCI, p. 46; LRD 75, LSD 76.
3.7/3.8
002000A109 ..(KA's)

ANSWER: 059 (2.00)

- a) 3
- b) 5
- c) 1
- d) 4

REFERENCE:

ONS Training Lesson Plans, OP-OC-SPS-IC-ES, p. 26
4.3/4.4 3.6/4.0
006000K405 022000K403 ..(KA's)

ANSWER: 060 (2.00)

- 1. CRD Stators
- 2. Letdown Heat Exchangers
- 3. Quench Tank Cooler
- 4. RCP Seals (either Thermal Barrier or seal coolers)

[0.5 each]

REFERENCE:

OP-OC-SPS-SY-CC pp 8; LO 1
3.4/3.5
008000K3.0 ..(KA's)

ANSWER: 061 (3.00)

1. SU Cntrl Valve [FDW-35]
2. EFDW Cntrl Valve [FDW-315]
3. TBV Block Valve [MS-17]
4. MS to SSRH [MS-79]
5. MFW Block Valve [FDW-31]
6. SU BLock Valve [FDW-33]
7. Main FDW Control Valve [FDW-32] [any six at 0.5 each]

REFERENCE:

Oconee OMP 2-1, pp 1 encl 4.4
4.1/4.2
000040G010 ..(KA's)

ANSWER: 062 (2.50)

1. Control Rod Groups 1-7 drop into core.
2. Turbine - generator trips.
3. Unit auxiliaries transfer to CT1.
4. Turbine bypass valves open (at approximately 1010 psig).
5. Feedwater runback to control S/G level. [0.5 each]

REFERENCE:

Oconee: Emergency Procedures, EP/1A/1800/01, p. 2.
4.0/4.6
000007K301 ..(KA's)

ANSWER: 063 (3.00)

- a.
 1. Flux/flow imbalance [0.5]
 2. Power/pump [0.5]
 3. Low pressure [0.5]
 4. Variable low pressure [0.5]
- b. AUTOMATIC: new high pressure trip of 1720 [0.5]

ADMINISTRATIVE: nuclear over power trip setpoint reduced to \leq
5% (4.00%) of rated power during reactor shutdown
[0.5]

REFERENCE:

ONS Training Lesson Plans, IC-RPS-RO-1e, QB.
OP-OC-SPS-1C-RPS, p. 34

3.2/3.5 3.3/3.6
012000K406 012000K604 ..(KA's)

ANSWER: 064 (2.00)

1. Limit boration of the RCS
2. Limit pressurization transient
3. Insure cooling water restored to necessary components [ie. RCP's CRDM's]
4. Limit chemical spray hazard to RB equipment. [0.5 each]

REFERENCE:

OP-OC-IC-ES p.13
LSD 6
LRD 6
4.5/4.7
013000A403 ..(KA's)

ANSWER: 065 (2.00)

1. Computer
2. Plasma Display [RVLIS] or ICCM
3. RCS Pressure/Temperature display
4. Unit Control panel at the SSF [0.5 each]

REFERENCE:

OP-OC-IC-ICI p. 15
LSD 7,
LRD 7
3.7/3.9 3.4/3.1
017020A101 017020A302 ..(KA's)

ANSWER: 066 (2.00)

1. Manually trip the Reactor [refer to EP/1/A/1800/01]
 2. Actuate ES channels 1 & 2
 3. Manually trip all CCW pumps
 4. Close all CCW pump discharge valves
- [0.5 each]

REFERENCE:

AP/1/A/1700/10 p. 2
OMP 2-1, ENCL. 4.5
4.1*/3.9
194001A102 ..(KA's)

ANSWER: 067 (1.00)

- standby CC pump starts [.25] if system flow decreases to 575 gpm [.25]
- letdown isolates [1HP-5] [.25] if letdown temp. > 135 degrees F [.25]

REFERENCE:

AP/1/A/1700/20 p.1
4.0/4.2
000026K303 ..(KA's)

ANSWER: 068 (1.00)

- a. Allows the system to keep a vacuum on the condenser [0.5]
- b. Allows more UST water available to cool CSAEs [0.5]

REFERENCE:

*REFERENCE
Ocone LER 86-011; AP-11;
4.3/4.6
000055K302 ..(KA's)

ANSWER: 069 (1.00)

- a. 532 degrees ensures that the saturation pressure is well below [0.25] the lift setpoint of the lowest set MSR/V [0.25]
- b. 80 inches ensures that you are above the heater level [0.25] so that normal RCS pressure control can be used [0.25] [and so subcooled margin cannot be lost]

REFERENCE:

Ocone EPG Reference Document, pp 3-37
 4.2/4.5
 000038K306 ..(KA's)

ANSWER: 070 (1.00)

The Motor Fault Lamp illuminates [0.5] and the Diamond Station shifts to manual [0.5]

REFERENCE:

Ocone OP-OC-SPS-IC-CRI 1.1/1.g
 3.8/3.8
 001402K402 ..(KA's)

ANSWER: 071 (2.50)

- a. "A" OTSG feed flow will increase [0.5]
 "B" OTSG feed flow will decrease [0.5]
- b. "A" OTSG level will increase [0.5]
 "B" OTSG level will decrease [0.5]
- c. RCS delta Tc will return to zero [0.5]

REFERENCE:

ONS Training Lesson Plan, OP-OC-SPS-CM-ICS
 4.0/4.2
 002000K511 ..(KA's)

ANSWER: 072 (1.00)

- a. FDW should be controlled to minimize the thermal shock [0.25] to the lower tube sheet. [0.25]
- b. ~100 gpm [0.05 E & 1bm/hr] [0.5]

REFERENCE:

OP-OC-EAP-E23 p. 9
EP/1/A/1800/01, Sec. 503 P. 45
LSO 1c
LRD 1c
3.4/4.2
000040K107 ..(KA's)

ANSWER: 073 (1.50)

- a. A manual or automatic trip has occurred [.5] [or is indicated] but reactor power has remained >5%. [0.5]
- b. The ability of the ES and EFW systems to adequately handle post-trip power levels > 5% may be compromised [0.5] [since their design was based on decay heat loads].

REFERENCE:

OP-OC-EAP-E26 p.5
LSO 1.a,b
4.4/4.6
000029G011 ..(KA's)

ANSWER: 074 (1.00)

These pressure limits assist in keeping the reactor vessel head subcooled [0.5] as well as providing sufficient back pressure to maintain flow through the vent. [0.5]

REFERENCE:

EP/1/A/1800/01 CP-605 "Subcooled Cooldown" P. 179

OP-OC-SPS-PRC-E35 p. 10

LSO 1d

LRO 1d

(4.2/4.8) (4.1/4.3) (4.2/4.5) (4.4/4.5)

000009G012 000009K321 000009K326 000009A201 ..(KA's)

ANSWER: 075 (1.50)

a. FDW 315/316 automatically close when a main FDWP is reset
[0.5] if their controllers are in "AUTO" [0.5].

b. Loss of feedwater injection to the S/G's. [0.5]

REFERENCE:

Ocone: EP/D/A/1700/14; OP-OC-SPS-SY-EF, pp. 66 and 68, L.O. 4.n.
3.5/3.7

061000K414 ..(KA's)

(***** END OF EXAMINATION *****)

TEST CROSS REFERENCE

<u>QUESTION</u>	<u>VALUE</u>	<u>REFERENCE</u>
001	1.00	9000659
002	1.00	9000660
003	1.00	9000661
004	1.00	9000663
005	1.00	9000664
006	1.00	9000668
007	1.00	9000669
008	1.00	9000670
009	1.00	9000671
010	1.00	9000672
011	1.00	9000673
012	1.00	9000675
013	1.00	9000676
014	1.00	9000677
015	1.00	9000678
016	1.00	9000679
017	1.00	9000680
018	1.00	9000681
019	1.00	9000682
020	1.00	9000683
021	1.00	9000684
022	1.00	9000685
023	1.00	9000686
024	1.00	9000688
025	1.00	9000689
026	1.00	9000691
027	1.00	9000693
028	1.00	9000695
029	1.00	9000696
030	1.00	9000697
031	1.00	9000698
032	1.00	9000699
033	1.00	9000700
034	1.00	9000705
035	1.00	9000706
036	1.00	9000709
037	1.00	9000711
038	1.00	9000712
039	1.00	9000713
040	1.00	9000714
041	1.00	9000715
042	1.00	9000716
043	1.00	9000718
044	1.00	9000719
045	1.00	9000720
046	1.00	9000721
047	1.00	9000722
048	1.00	9000723
049	1.00	9000724
050	1.00	9000725
051	1.00	9000726
052	1.00	9000727
053	1.00	9000728
054	1.00	9000729

TEST CROSS REFERENCE

QUESTION	VALUE	REFERENCE
055	1.00	9000730
056	1.00	9000731
057	1.00	9000732
058	1.00	9000733
059	2.00	9000692
060	2.00	9000662
061	3.00	9000665
062	2.50	9000687
063	3.00	9000694
064	2.00	9000701
065	2.00	9000702
066	2.00	9000704
067	1.00	9000707
068	1.00	9000666
069	1.00	9000667
070	1.00	9000674
071	2.50	9000690
072	1.00	9000703
073	1.50	9000708
074	1.00	9000710
075	1.50	9000717

	88.00	

	88.00	

3.4 SECONDARY SYSTEM DECAY HEAT REMOVAL

Applicability

Applies to the secondary system requirements for removal of reactor decay heat.

Objective

To specify minimum conditions necessary to assure the capability to remove decay heat from the reactor core.

Specification

3.4.1 Emergency Feedwater System

The reactor shall not be heated above 250°F unless the following conditions are met:

- a. Three emergency feedwater pumps (one steam driven pump capable of being powered from an operable steam supply system and two motor driven pumps) and associated initiation circuitry shall be operable.
- b. Two 100% emergency feedwater flow paths shall be operable. Each flow path shall have at least one flow indicator operable.

3.4.2 During operation greater than 250°F, the provisions of 3.4.1 may be modified to permit the following conditions:

- a. One motor driven emergency feedwater pump may be inoperable for a period of up to seven days. If the inoperable pump is not restored to operable status within 7 days, the unit shall be brought to hot shutdown within an additional 12 hours and below 250° in another 12 hours.
- b. One turbine driven emergency feedwater pump or one emergency feedwater flow path may be inoperable for a period of up to 72 hours. If the inoperable pump or flow path is not restored to operable status within 72 hours the unit will be at hot shutdown within an additional 12 hours and below 250°F in another 12 hours.
- c. Two motor driven emergency feedwater pumps may be inoperable for a period of up to 12 hours. If an inoperable pump is not restored to operable status within 12 hours, the unit shall be brought to hot shutdown within an additional 12 hours and below 250° in another 12 hours.
- d. With three emergency feedwater pumps and/or both emergency feedwater flow paths inoperable, immediately initiate corrective action to restore at least one emergency feedwater pump and associated emergency feedwater flowpath to operable status. The unit shall be at hot shutdown within 12 hours and below 250°F in another 12 hours.

- 3.4.3 The 16 main steam safety relief valves shall be operable.
- 3.4.4 A minimum of 72,000 gallons of water per operating unit shall be available in the upper surge tank, condensate storage tank, and hotwell. A minimum of 5 ft. (=30,000 Gal.) shall be available in the upper surge tank.
- 3.4.5 Emergency Condenser Cooling Water (ECCW) System
- a. The RCS shall not be heated above 250°F unless the ECCW System is operable.
 - b. If the ECCW System becomes inoperable during operation above 250°F, and the system is not restored to operable status in seven days, then the unit shall be brought to hot shutdown within an additional 12 hours and below 250°F in another 12 hours.
- 3.4.6 The controls of the emergency feedwater system shall be independent of the Integrated Control System.

Bases

The Main Feedwater System and the Turbine Bypass System are normally used for decay heat removal and cooldown above 250°F. Feedwater makeup is supplied by operation of a hotwell pump, condensate booster pump, and a main feedwater pump.

Operability of the Emergency Feedwater System (EFW) assures the capability to remove decay heat and cool down the Reactor Coolant System to the operating conditions for switch over to decay heat removal by the Decay Heat Removal System, in the event that the Main Feedwater System is inoperable. The EFW system consists of a turbine driven pump (880 gpm), two motor driven pumps (450 gpm each), and associated flow paths to the steam generators.

The decay heat and the reactor coolant pump heat following a reactor trip from 102% power, and the EFW flow rate (90°F feedwater) required to remove this heat demand are as follows:

<u>Time</u>	<u>Heat Demand (% of 2568 MWT)</u>	<u>EFW Flowrate (gpm)</u>
1 min	4.65	721
2 min	4.17	647
5 min	3.64	564
10 min	3.28	509
30 min	2.70	419
1 hour	2.35	365
2 hours	2.07	322

The limiting transient requiring maximum EFW flow is the loss of main feedwater with offsite power available. For this transient, a minimum EFW flow rate equivalent to 405 gpm at 1065 psia is adequate. Each of the three EFW pumps is capable of delivering this flow.

A 100% flowpath is defined as: The flowpath to either steam generator including associated valves and piping capable of being supplied by either the turbine driven pump or the associated motor driven pump.

One flow indicator or steam generator level indicator per steam generator is sufficient to provide indication of emergency feedwater flow to the steam generators and to confirm emergency feedwater system operation. In the event that at least one indicator per steam generator is not available, then the flowpath to this steam generator is considered to be inoperable.

The EFW System is designed to start automatically in the event of loss of both main feedwater pumps or low main feedwater header pressure. All automatic initiation logic and control functions are independent from the Integrated Control System (ICS).

Normally, decay heat is removed by steam relief through the turbine bypass system to the condenser. Condenser cooling water flow is provided by a siphon effect from Lake Keowee through the condenser for final heat rejection to the Keowee Hydro Plant tailrace. Decay heat removal via recirculation

flowpath may be maintained for up to 11 hours per unit, assuming the minimum amount of water in the upper surge tanks, condensate storage tank, and hotwell is available. This is based on the conservative estimate of normal makeup being 0.5% of throttle flow. Throttle flow at full load, 11,200,000 lbs/hr., was used to calculate the operation time. For decay heat removal the operation time with the volume of water specified would be considerably increased due to the reduced throttle flow.

Decay heat can also be removed from the steam generators by steam relief through the main steam safety relief valves. The total relief capacity of the 16 main steam safety relief valves is 13,105,000 lbs/hr. In this case the minimum amount of water in the upper surge tank, condensate storage tank, and hotwell is sufficient to remove decay heat and reactor coolant pump heat for 3 hours per unit at hot shutdown conditions.

REFERENCE

FSAR, Section 10.

GEOMETRIC FUNDAMENTALS EXAMINATION SECTION
EQUATIONS AND CONVERSIONS HANDOUT SHEET

EQUATIONS

$$\dot{Q} = \dot{m} c_p \Delta T$$

$$\text{Cycle Efficiency} = \frac{\text{Net Work (out)}}{\text{Energy (in)}}$$

$$\dot{Q} = \dot{m} \Delta h$$

$$\text{SCR} = S/(1 - K_{\text{eff}})$$

$$\dot{Q} = UA \Delta T$$

$$\text{CR}_1 (1 - K_{\text{eff}})_1 = \text{CR}_2 (1 - K_{\text{eff}})_2$$

$$\text{SUR} = 26.06/\tau$$

$$M = 1/(1 - K_{\text{eff}}) = \text{CR}_1/\text{CR}_0$$

$$\text{SUR} = \frac{26.06 (\lambda_{\text{eff}} \rho)}{(\bar{\beta} - \rho)}$$

$$M = \frac{(1 - K_{\text{eff}})_0}{(1 - K_{\text{eff}})_1}$$

$$P = P_0 10^{\text{SUR}(t)}$$

$$\text{SDM} = (1 - K_{\text{eff}})/K_{\text{eff}}$$

$$P = P_0 e^{(t/\tau)}$$

$$\text{Pwr} = W_f \dot{m}$$

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

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

$$\rho = (K_{\text{eff}} - 1)/K_{\text{eff}}$$

$$l^* = 1 \times 10^{-5} \text{ seconds}$$

$$\rho = \Delta K_{\text{eff}}/K_{\text{eff}}$$

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

CONVERSIONS

$$1 \text{ Curie} = 3.7 \times 10^{10} \text{ dps}$$

$$1 \text{ kg} = 2.21 \text{ lbm}$$

$$1 \text{ hp} = 2.54 \times 10^3 \text{ BTU/hr}$$

$$1 \text{ Mw} = 3.41 \times 10^6 \text{ BTU/hr}$$

$$1 \text{ BTU} = 778 \text{ ft-lbf}$$

$$^\circ\text{F} = 9/5 \text{ }^\circ\text{C} + 32$$

$$^\circ\text{C} = 5/9 (^\circ\text{F} - 32)$$