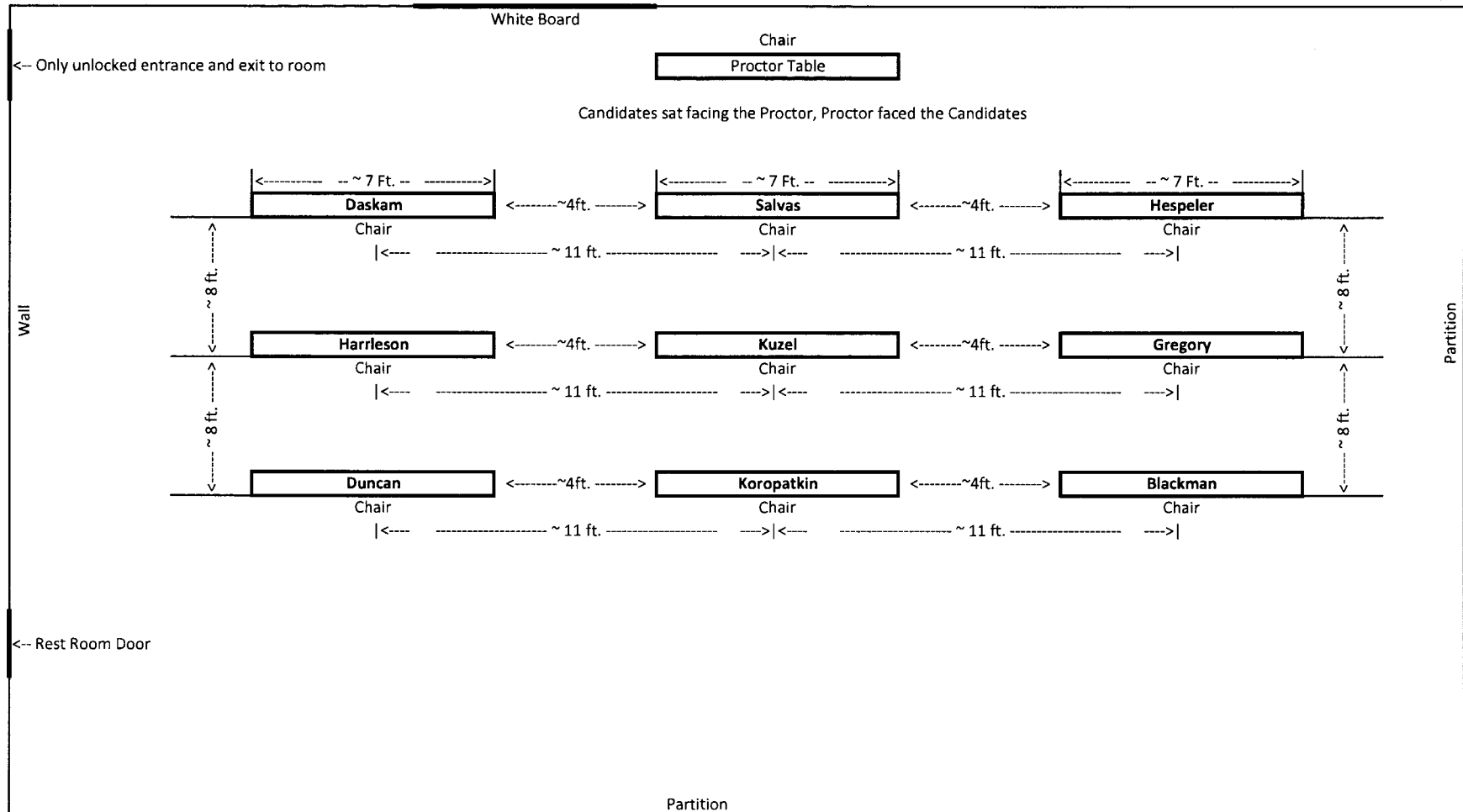


## 2016 Millstone Unit Two NRC Initial License

### Exam Proctor Notes

	Time	Ques. #	Candidate	Question/Answer
Question	10:45	23	Kuzel	Candidate read the 4 <sup>th</sup> bullet "Containment Purge is in operation using..." and asked, "Using what?"
Answer				After conferring with Lead Examiner, we told the candidates (and wrote on the board) that the 4 <sup>th</sup> bullet should read, "Containment Purge is in operation using Main Exhaust". [Missing words was a typographical error and has been corrected on the Exam hard copies and database.]
Question	10:46	24	Duncan	In reference to Choice D, "restore level in one S/G to what..."
Answer				Answer the question as written. [This is one of the concepts solicited by Question #27]
Question	10:47	25	Blackman	Candidate read the 14 <sup>th</sup> bullet ("#2 MSL rad monitor...") and asked for clarification as to whether "#2 MSL rad monitor" means "#2 S/G" or "RM-4299B".
Answer				Answer the question as written. [MSL is common acronym for Main Steam Line, which are normally referred to by "A" or "B". However, since #2 MSL must come from the #2 S/G and the only MSL rad monitor on the line is RM-4299B, the question was irrelevant. There were 0 misses on the question.]
Question	10:48	26	Gregory	Candidate informed proctor that both units are required to have a Fire Brigade Leader.
Answer				Answer the question with the given information. [Question had 0 misses but the provided information will be evaluated for a possible future modification to the question.]
Question	10:49	27	Duncan	Candidate asked for clarification of the word "DIRECTLY" in the stem.
Answer				Answer the question as written. [Future enhancement; In Choice "C" spell out the word "press" as "pressure".]
Question	10:50	28	Kuzel	Candidate asked for clarification of the wording of Choice "C".
Answer				Answer the question as written. [Future enhancement; In choice "C" add the word "Margin" between "Thermal" and "Low".]
Question	10:51	29	Kuzel	Candidate expressed confusion and frustration over how Choice "C" was worded, that it did not look correct, and that Choice "B" looked more correct but not exactly right. [Note: Choice "B" is the correct answer in the key, but it did not appear that the candidate had yet made a selection.]
Answer				Answer the question as written and state your assumptions as necessary. [The option to "state any assumptions" is mentioned before the start of all exams, as an aid to possibly justifying a different or additional correct answer. Review of the candidate's exam show choice "B" as being circled and erased, with "C" as the final selection. During the exam review the candidate stated he continued to analyze his initial answer selection and eventually changed it from "B" to "C".]

Seating Plan for NRC Initial License Exam (NOT to scale)



## Millstone Unit 2 2016 Initial License Exam Completion Report

The following questions are attached with the applicable comments, corrections or enhancements. Any misconceptions uncovered during the review were corrected at that time.

Question	Comment
2	Enhancement and clarification of choices. Also missed due to candidates not reading Choice "B" in its entirety. Most missed that it referred to "core heat transfer <b>to the SGs.</b> " ( <b>Emphasis</b> not on exam). No specific knowledge deficiencies were uncovered during the review.
9	Reword question to make Choice "D" more wrong. Several candidates assumed AMSAC <u>must</u> have triggered if the PORVs opened due to the close proximity of their setpoints. Knowledge deficiencies uncovered by wrong choices were corrected during the exam review.
28	Clarification of wording to focus question on concept being evaluated. (However, the K/A is a poor discriminator that should have been rejected and the specific system resample.) Knowledge deficiencies uncovered by wrong choices were corrected during the exam review.
29	Enhancement (several candidates focused on Choice "D" because it was the only one of the two that had the correct system response and stated actions were per the ARP.) Knowledge deficiencies uncovered by wrong choices were corrected during the exam review.
32	Clarification (Candidates assumed Maintenance mentioned in correct answer was not required or emergent, but scheduled, and could therefore be delayed.) Knowledge deficiencies uncovered by wrong choices were corrected during the exam review.
39	Reword the question to more clearly ask, "IAW the LSSS Tech. Spec. Basis, what plant design feature is credited in the analysis used to develop the RPS power trip setpoint values?" Knowledge deficiencies uncovered by wrong choices were corrected during the exam review.
49	Concept demonstrated a knowledge weakness of a specific control power system failure mode. Candidates noted the control power systems and their applicable Abnormal Operating Procedures were covered relatively early in the Initial License Program, with minimal review toward the program's end. The program is reevaluated after every license exam for changes that may be necessary. The suggested increase in the review of control power systems and failures is now part of this report, for inclusion in the program's post-exam review.
54	Concept was not understood (effect of RCP bleedoff being diverted to the PDT). Knowledge deficiencies uncovered by wrong choices were corrected during the exam review.
82	Choice "C" is too close to being correct. Reword to make more wrong before reuse. Question will not be challenged for this exam as it would have no bearing on the outcome. Knowledge deficiencies uncovered by wrong choices were corrected during the exam review.
93	Added missing words "Main Exhaust" to last bullet in the stem. Wrote the correction on the white board at the front of the room and called attention to the correction during the exam. Knowledge deficiencies uncovered by wrong choices were corrected during the exam review.

In addition, future Initial License Programs will incorporate additional self-guided reviews of various administrative topics, with an associated increase in exposure to exam questions. In addition, scheduled exams given throughout the program will contain an increasing number of questions (as the program time line progresses) at or above the difficulty level of questions used on an NRC Initial License Exam.

## RO and SRO Exam Questions (No "Parents" Or "Originals")

Question #: **2**

**Question ID: 2016034**

☒ **RO**

☐ **SRO**

☐ Student Handout?

☐ Lower Order?

Rev. 0

☒ Selected for Exam

**Origin: New**

☐ Past NRC Exam?

The reactor was tripped from 100% power due to a Pressurizer Safety valve failed OPEN.

The crew has transitioned to EOP 2532, Loss of Coolant Accident.

Which of the following describes the bases for the HPSI Throttle/Stop criteria, as it would pertain to this accident?

- .....
- 1 ☒ **A** RCS subcooling margin is required to ~~verify adequate Inventory Control.~~  
ensure reactor vessel level will meet RCS Inventory criteria.
- 8 ☐ **B** RCS subcooling margin is required to ~~verify core heat transfer to the SGs.~~  
ensure SGs will meet Core Heat Removal criteria.
- ☐ **C** Pressurizer level is required to ~~verify adequate Inventory Control.~~  
ensure reactor vessel level will meet RCS Inventory criteria.
- ☐ **D** Pressurizer level is required to ~~verify core heat transfer to the SGs.~~  
ensure SGs will meet Core Heat Removal criteria.

**Question Misc. Info:** MP2\*LOIT EOP, 2532, NRC-2016

### Justification

"A" - CORRECT; Subcooling is a key parameter that is lost in a vapor space accident, but it is still required to ensure indications of PZR level are correctly interpreting RCS inventory.

"B" - WRONG; In a worse case vapor space accident, core heat transfer to the SGs will be accomplished through reflux cooling, which makes subcooling irrelevant.  
Plausible; Examinee may recall that adequate subcooling is a requirement in the EOP to verify Natural Circulation, for the purpose of ensuring adequate heat transfer from the core to the SGs.

"C" - WRONG; Pressurizer level will be artificially high in this type of accident, giving false indication of actual RCS inventory.  
Plausible; Examinee may recall that Pressurizer level is a requirement of the safety function for verification of Inventory Control.

"D" WRONG; Although pressurizer level is used to indicate in some events that there is enough water in the RCS to utilize the SGs as a heat sink, in this event it will be a false indication due to the bubble formation in the core.  
Plausible; Examinee may recall that pressurizer level is a criteria for ECCS flow throttling, and that OP 2260 Attachment 4 EOP 2532, "Loss of Coolant Accident Implementation Guide", allows for throttling injection flow when approaching the upper control band for the PZR (but only in the case of Shutdown Margin).

### References

TG2532 r29

**NO Comments or Question Modification History at this time.**

**NRC K/A System/E/A** System 008 Pressurizer (PZR) Vapor Space Accident (Relief Valve Stuck Open)

**Number** AK3.05 **RO** 4.0 **SRO** 4.5 **CFR Link** (CFR 41.5,41.10 / 45.6 / 45.13)

Knowledge of the reasons for the following responses as they apply to the Pressurizer Vapor Space Accident: ECCS termination or throttling criteria

# RO and SRO Exam Questions (No "Parents" Or "Originals")

Question #: 9

Question ID: 8000009

☒ RO

☐ SRO

☐ Student Handout?

☒ Lower Order?

Rev. 1

☒ Selected for Exam

Origin: Bank

☐ Past NRC Exam?

The plant is at 100% power, steady state, when a grid disturbance causes the main turbine to trip. Before the RO can trip the reactor, he notices that all CEAs are inserting.

Which one of the following indications, ~~observed less than 20 seconds after the turbine trip~~, would indicate that the ATWS Mitigation Circuit (i.e.; Diverse SCRAM System) triggered to mitigate the ATWS? <sup>be a result of</sup>

- .....ing ..... an .....
- 1 ☐ A All eight of the Trip Circuit Breakers are open.
- 1 ☐ B Both of the MG Set 480 VAC supply breakers are open.
- 3 ☒ C Both AFW pumps are running and both AFRVs are open. AFAS has triggered less than 20 seconds after the trip.
- 6 ☐ D Both PORVs indicate they opened and closed.

**Question Misc. Info:** MP2\*LOIT\*3061 [061 AFW-01-C 2530] (8/19/96) ATWS, 2322, AFW, APP, NRC-2008, NRC-2016

## Justification

A - WRONG; The TCBs are tripped open, normally, by the RPS, NOT the DSS. This would be "normal" indication that the reactor tripped. Plausible; If the student believes the DSS is an alternate means of tripping the TCBs to shut down the reactor.

B - WRONG; The DSS actuating trips both MG set output contactors as an additional way to shutdown the reactor, separate from RPS. Plausible; If the student remembers the MG set power is removed by the DSS, but not how.

C - CORRECT; Although the load reject would cause a spike in SG pressure and result in a higher than expected shrink in SG level, the AFAS has a time delay to trigger on low SG level of 3 minutes and 25 seconds. However, if the DSS senses a high RCS pressure (>2400 psia) combined with NI control channel power > 20%, the time delay to trigger is reduced to 10 seconds.

D - WRONG; The PORVs are triggered by a high RCS pressure, as seen by the PZR safety channels. The setpoint for the PORV trigger on high pressure is lower than the setpoint for the DSS trigger. A plant trip on load reject would cause a substantial rise in RCS pressure, which could easily result in the PORVs being triggered, regardless of whether the DSS actuated. Plausible; The RPS setpoint to open the PORVs is within a couple pounds of the DSS trigger value. Therefore, seeing that the PORVs have opened could be construed that the DSS actuated.

## References

LP diverse scram DRW

NO Comments or Question Modification History at this time.

**NRC K/A System/E/A System** 029 Anticipated Transient Without Scram (ATWS)

**Number** EA2.05 **RO** 3.4\* **SRO** 3.4\* **CFR Link** (CFR 43.5 / 45.13)

Ability to determine or interpret the following as they apply to a ATWS: System component valve position indications

## RO and SRO Exam Questions (No "Parents" Or "Originals")

Question #: **28**

Question ID: **1100053**

☒ **RO**

☐ **SRO**

☐ Student Handout?

☐ Lower Order?

Rev. **1**

☒ Selected for Exam

Origin: **Bank**

☒ Past NRC Exam?

The plant is operating at 100% power, steady state when both 6.9 kV buses are de-energized due to an internal fault on the NSST.

Assuming all other systems function as designed, which of the following describes the ~~parameter change~~ <sup>the effects of RCP coastdown</sup> from the 100% power value, within the first 5 seconds after the loss of the 6.9 kV buses?

- .....
- 4 ☒ **A** The difference between Th and Tc will be lowering; S/G pressure will be stable or rising slightly.
- 1 ☐ **B** The difference between Th and Tc will be rising; S/G pressure will be stable or rising slightly.
- ☐ **C** The difference between Th and Tc will be lowering; S/G pressure will continue to lower.
- 4 ☐ **D** The difference between Th and Tc will be rising; S/G pressure will continue to lower.

**Question Misc. Info:** MP2\*LOIT, RCS, RCP, RPS, NRC-2011, NRC-2016

### Justification

A - CORRECT; The response of Th and Tc is due to the design coast down of the RCPs which lasts approximately 1-1.5 minutes. Although both temperatures will be lower, Th will lower faster than Tc due to the sudden, significant reduction in heat generated by the reactor. Tc will stop lowering when the quick open signal is removed (within one minute). S/G pressure will be relatively stable. The Atmospheric Dumps will lower S/G pressure initially, but will quickly stabilize or may rise slightly until stable after the quick open signal is removed and the atmospheric dumps modulate to control pressure.

B - WRONG; Th and TC will initially rise on the loss of RCS flow, but when the Reactor trips, RCS temperatures will lower due to the loss of heat input. Delta-T will NOT be higher than 100% power operation. Plausible; If the examinee believes that when RCS flow stops, Th will rise or remain the same while Tc lowers in response to opening of the steam dumps.

C - WRONG; Delta-T will lower; however, S/G pressure will NOT continue to lower. Plausible; The examinee may believe that the opening of the steam dumps and/or safeties will cause S/G pressure to continue to lower.

D - WRONG; Th and TC will initially rise on the loss of RCS flow, but when the Reactor trips, RCS temperatures will lower due to the loss of heat input. Delta-T will NOT be higher than 100% power operation. Plausible; If the examinee believes that when RCS flow stops, Th will rise or remain the same while Tc lowers in response to opening of the steam dumps.

### References

EOP 2528, RCS-00-C

### Comments and Question Modification History

Changed Stem from 1 minute to 30 seconds validator comment. DjJ

Val; Changed Stem from 30 seconds to 5 seconds on based actual short duration of RCP coastdown, and added "from 100% power value" to clearly define "time zero". - rlc

**NRC K/A System/E/A System** 003 Reactor Coolant Pump System (RCPS)

**Number** K5.02 **RO** 2.8 **SRO** 3.2 **CFR Link** (CFR: 41.5 / 45.7)

Knowledge of the operational implications of the following concepts as they apply to the RCPS: Effects of RCP coastdown on RCS parameters

## RO and SRO Exam Questions (No "Parents" Or "Originals")

Question #: **29**

Question ID: **2016011**

☒ **RO**

☐ **SRO**

☐ Student Handout?

☐ Lower Order?

Rev. **1**

☒ Selected for Exam

Origin: **New**

☐ Past NRC Exam?

The plant is operating at 100% power, steady state.

VCT pressure is presently 10 psig and being raised by the addition of hydrogen.

The hydrogen addition is not secured in time and the annunciator C02/03 D-7 "VCT PRES HI/LO" alarms.

IAW the applicable ARP, which

Which of the following statements describes the effect of the above condition on Reactor Coolant Pump seal bleedoff flow and the applicable procedural action to take?

- .....
- 4 ☐ **A** Lowers to a new stable value due to the rise in VCT pressure decreasing the D/P from the Vapor Seal; refer to OP 2304A Volume Control Portion of CVCS to manually restore RCP bleed off flow to normal.
- ☐ **B** Lowers to a new stable value when VCT pressure decreases after the completion of the ARP step to place "LTDN DIVERT, CH 500," in "RWS" (C-02) to restore VCT pressure.
- 4 ☒ **C** Lowers initially due to the increase in VCT back pressure and then returns to previous due to the Bleedoff pressure controller; refer to OP 2304A Volume Control Portion of CVCS and ~~monitor~~ ensure flow returns to normal.
- 5 ☐ **D** Lowers initially due to the increase in VCT back pressure and then returns to normal after the ARP step to place "LTDN DIVERT, CH 500," in "RWS" (C-02) to restore VCT pressure.

**Question Misc. Info:** MP2\*LOIT RCS, RCP, Bleedoff, NRC\*2016

### Justification

"A" WRONG; Bleedoff flow controller uses a pressure setpoint to maintain bleedoff flow which maintains flowrate, any pressure deviation will cause the controller to open or close to restore to the original bleedoff pressure.

Plausible; When placing the system in operation IAW OP 2301C Section 4.1 "Establishing RCP Seal Controlled Bleedoff Flow" the operator manually adjusts the controller output this answer is correct for a controller that is in manual and not for a controller in remote that's adjusting to pressure fluctuations.

"B" WRONG; This action would be correct if the cause of the high VCT pressure was caused by a high level and not a high pressure which was caused by a hydrogen add as describe in the stem of the question.

Plausible; When CH-500 is diverted to Radwaste the VCT level and pressure will drop the examinee may assume that reducing VCT level and pressure will increase bleedoff flow, although the RCP bleedoff pressure controller will restore bleedoff pressure thereby restoring bleedoff flow to its original value.

"C" CORRECT; In normal, Remote Operation for PIC-215 refer to OP 2304A Attachment 2. Before the controller sees a pressure rise, bleedoff flow will lower until the controller restores bleedoff pressure.

"D" WRONG; RCP Bleedoff flow is restored to normal when the bleedoff pressure controller restores back pressure of the RCP bleedoff.

Plausible; A step in the ARP for VCT high pressure requires placing CH-500 to Divert but only in the case that the high pressure in the VCT was cause due to a high level, the examinee may falsely assume this action to reduce VCT pressure.

### References

ARP 2590B-028, OP 2304A

NO Comments or Question Modification History at this time.

**NRC K/A System/E/A System** 003 Reactor Coolant Pump System (RCPS)

**Number** A2.05 **RO** 2.5 **SRO** 2.8 **CFR Link** (CFR: 41.5 / 43.5/ 45.3 / 45/13)

Ability to (a) predict the impacts of the following malfunctions or operations on the RCPS; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Effects of VCT pressure on RCP seal leakoff flows

## RO and SRO Exam Questions (No "Parents" Or "Originals")

Question #: **32**

Question ID: **2016013**

☒ **RO**

☐ **SRO**

☐ Student Handout?

☒ Lower Order?

Rev. **0**

☒ Selected for Exam

Origin: **New**

☐ Past NRC Exam?

The plant is in Mode 6 during a Refueling Outage with the following conditions:

- Reactor Vessel Head removed
- Refuel Pool level at 36' 6".
- Fuel movement suspended

Under which of the following does Technical Specifications allow suspension of Shutdown Cooling flow for up to one hour in an 8 hour period?

.....must be .....

- 3 ☒ **A** Maintenance performed on valves in the common SDC suction line provided any RCS additions have a Boron Concentration greater than refueling concentration.
- 4 ☐ **B** Integrated Emergency Safeguard Actuation testing provided any RCS additions have a Boron Concentration greater than refueling concentration.
- 1 ☐ **C** Shifting of Protected Train facility when Service Water headers are cross-tied provided any RCS additions are less than 44 gallons per minute from any source.
- 1 ☐ **D** Performing local leak rate testing of SI-709 "SDC Suction Isolation" provided any RCS additions are less than 44 gallons per minute from any source.

**Question Misc. Info:** MP2\*LOIT NRC-2016

### Justification

"A" CORRECT; Tech. Spec. 3.9.8.1 The required shutdown cooling train may not be in operation for up to 1 hour per 8 hour period provided no operations are permitted that would cause introduction of coolant into the Reactor Coolant System with boron concentration less than that required to meet the minimum required boron concentration of LCO 3.9.1.

"B" WRONG; Integrated Emergency Safeguard Actuation testing is not listed as an reason to suspend SDC flow. Plausible; The Examinee may assume the allowance for securing the LPSI injection pump (SDC) to allow for integrated testing to verify that the LPSI pump gets an automatic start signal.

"C" WRONG; The LCO does not allow for the suspension of SDC flow even when the Ultimate heat sink is secured to cross tie Service Water headers during an outage. Plausible; The examinee may assume that when securing Service water headers that without a heat sink temporarily securing SDC flow will ensure the RBCCW system will not exceed any limits when the ultimate heat sink flow is stopped.

"D" WRONG; While Local Leak Rate test is correct, no RCS additions allowed less then refueling boron concentration. Plausible; Although Local Leak Rate test is correct, Examinee may recall Dilution requirements when <300°F to be limited to 1 charging pumps without restriction of the source.

### References

TS 3.9.8.1

NO Comments or Question Modification History at this time.

**NRC K/A System/E/A**    **System**    005    Residual Heat Removal System (RHRS)

**Number**    K5.09    **RO** 3.2    **SRO** 3.4    **CFR Link** (CFR: 41.5 / 45.7)

Knowledge of the operational implications of the following concepts as they apply the RHRS: Dilution and boration considerations



## RO and SRO Exam Questions (No "Parents" Or "Originals")

Question #: **39**

Question ID: **2016044**

☒ **RO**

☐ **SRO**

☐ Student Handout?

☐ Lower Order?

Rev. **0**

☒ Selected for Exam

Origin: **New**

☐ Past NRC Exam?

The design function of which of the following components is credited in the Basis of the RPS trip setpoints?

- ☐ **A** Control Channel NI's.
- 9 ☐ **B** RCP speed sensors.
- ☐ **C** AFAS time delay.
- 0 ☒ **D** CEAPDS interlocks.  
CEA Motion Inhibit

Tech. Spec. Basis to help bound the analysis for the development of the RPS power trip setpoint values?

**Question Misc. Info:** LOIT/LORT RPS, TS Basis, LSSS, NRC-2016

### Justification

A - WRONG; Control channel NI's input to the Diverse Scram System, but are not included in the Accident Analysis for generation of the LSSS setpoints.

Plausible; The DSS is required by 10CFR and will directly trip the reactor and initiate AFAS to protect the core.

B - WRONG; The RCP speed sensors are no longer used to trip the reactor on low RCS flow, which is calculated using only core delta-P. Plausible; RCP speed sensors will instantly detect a simultaneous loss of all four RCPs due to a LOOP, much faster than the core delta-P due to RCP coastdown, but are no longer credited in the LSSS Basis.

C - WRONG; AFAS Timer Module is designed to allow the operators time to override an AFAS if an ESD is in progress. However, although this could impact the CTMT peak pressure on an ESD, it is not credited in the LSS Basis for the CTMT High Pressure trip.

D - CORRECT; <sup>CMI</sup>CEAPDS provides an interlock based on the PDIL, which is credited in the generation of the TM/LP and LPD trip setpoints.

**Question References not yet listed.**

### Comments and Question Modification History

NRC; replacement question for #39 (ID# 1654407).

**NRC K/A System/E/A** System 012 Reactor Protection System

**Number** K4.02 **RO** 3.9 **SRO** 4.3 **CFR Link** (CFR: 41.7)

Knowledge of RPS design feature(s) and/or interlock(s) which provide for the following: Automatic reactor trip when RPS setpoints are exceeded for each RPS function; basis for each

# RO and SRO Exam Questions (No "Parents" Or "Originals")

Question #: 49

Question ID: 6055354

☒ RO

☐ SRO

☐ Student Handout?

☐ Lower Order?

Rev. 1

☒ Selected for Exam

Origin: Mod

☐ Past NRC Exam?

With the plant in Mode 5 during a refueling outage with the following conditions:

VA-10 has been placed on it's ALTERNATE source for electrical PM's on Inverter 1 (INV-1). The PMs have been completed and Inverter 1 and its Static Switch are presently being restored to operation with the following conditions existing:

- The "AUTO/MAN" switch inside the Inverter 1 (INV-1) cabinet is in the MANUAL position.
- The "SYNC" switch on the Static Switch is in the ON position.
- The Inverter is energized with all input and output breakers closed.
- Voltage of the two sources are approximately equal.
- Both sources in synch.

Then, INV-5 trips off line due to an internal fault.

Which one of the following describes the status of, or the required actions for, VA-10?

- .....
- ☐ A When INV-5 deenergized, static switch #1 "auto" transferred VA-10 to its normal power source.
- 8 ☐ B Place the "AUTO/MAN" switch inside INV-1 to the "AUTO" position to immediately recover VA-10.
- ☐ C Place the "SYNC" switch on #1 static switch to the "OFF" position to immediately recover VA-10.
- 1 ☒ D When INV-5 deenergized, VA-10 deenergized and cannot be immediately recovered under existing conditions.

**Question Misc. Info:** MP2\*LOIT LVD-01-C, 2345, NRC-2016

## Justification

A - WRONG: The transfer is blocked from happening until both Normal and Alternate power sources are in synch (energized). Plausible; Examinee may think that due to the power seeking circuitry the static switch will auto transfer to inverter 1, which is effectively ready to load.

B - WRONG: This action would place #1 static switch in a "normal seeking" mode, but it would not transfer to INV-1 because INV-1 and INV-5 are not in synch. Plausible; Examinee may think that the static switch is sophisticated enough to sense that the Alternate source is deenergized and ignore the synch fail check.

C - WRONG: Placing the "SYNC" switch to OFF is one of the actions that triggered the actual event that occurred at MP2. Plausible; Examinee may recognize that the AUTO Sync circuit is preventing the static switch from transferring and believe that turning it off would negate the transfer block.

D - CORRECT: The nomenclature of the "AUTO/MAN" switch inside INV-1 is similar to the "AUTO/MAN" switch OUTSIDE the INV-1 cabinet on the Static Switch. However, their functions are quite different. With the INV-1 switch specified in the stem in the applicable position, the Static Switch will NOT transfer to the Normal power supply and VA-10 will be deenergized. Once it is deenergized, it cannot be re-energized, by procedure, until both the Normal (INV-1) and Alternate (INV-5) power supplies are restored, allowing the synch check circuit to transfer VA-10 to INV-1.

## References

AOP 2504C, LVD-00-C

NO Comments or Question Modification History at this time.

**NRC K/A System/E/A** System 063 D.C. Electrical Distribution

**Number** K4.01 **RO** 2.7 **SRO** 3.0\* **CFR Link** (CFR: 41.7)

Knowledge of DC electrical system design feature(s) and/ or interlock(s) which provide for the following: Manual/automatic transfers of control

## RO and SRO Exam Questions (No "Parents" Or "Originals")

Question #: **54**

Question ID: **2016025**

☒ **RO**

☐ **SRO**

☐ Student Handout?

☐ Lower Order?

Rev. **1**

☒ Selected for Exam

Origin: **New**

☐ Past NRC Exam?

The plant is at 100% Power when Instrument Air header pressure inside Containment went to 0 psi.

BOP reports 2-IA-27.1 "IA CTMT ISOL" is CLOSED

Which of the following sets of alarms would also occur as a result of a loss of Instrument Air inside Containment without Operator action over the next several minutes?

- .....
- 0 ☐ **A** C02 "RCP CONTROL BLEED-OFF RELIEF FLOW HI"  
C03 "A/B/C/D RCP BLEED-OFF TEMP HI"
- 4 ☐ **B** C02/03 "PRI DRAIN TANK TEMP HI"  
C03 "A/B/C/D RCP VAPOR SEAL PRESSURE HI"
- 2 ☐ **C** C02 "LETDOWN FLOW LO"  
C03 "A/B/C/D RCP BLEED-OFF FLOW HI"
- 3 ☒ **D** C02 "LETDOWN PRESSURE HI/LO"  
C03 "PZR PRESSURE SELECT CHANNEL DEVIATION HI/LO"

Question Misc. Info: MP2\*LOIT IA, NRC-2016

### Justification

A WRONG; C02/03 "A/B/C/D RCP BLEED-OFF RELIEF FLOW HI" RCP SEAL HDR pressure goes up when the CTMT isolation valve closes due to a loss of air causing bleedoff relief flow to rise, however actual bleedoff flow goes down due to the higher back pressure making Bleedoff Temperature High false.

C03 "A/B/C/D RCP BLEED-OFF TEMP HI" is also WRONG cooling flow from RBCCW does not change.

Plausible; CH-507 fails open on a loss of IA which is the alternate path for RCP bleedoff flow, to the PDT through the relief valve which is at a lower back pressure than the VCT causing a higher flow Examinee may think that bleedoff flow would increase causing temperature to also increase. BLEED-OFF temperature HI is plausible if the Examinee believes that that service header of RBCCW also isolates with a loss of Instrument Air.

B WRONG; C02/03 "PRI DRAIN TANK TEMP HI" Although RCP Bleedoff gets redirected to the PDT the average RCP Bleedoff temperature is 120°F but the alarm setpoint is 200°F therefore the alarm would not come in due to the added input from RCP Bleedoff.

C03 "A/B/C/D RCP VAPOR SEAL PRESSURE HI" is correct due to Containment Isolation for BLEED-OFF will fail closed on a loss of Instrument Air causing bleedoff pressure to rise to the relief valve setting then going to the PDT.

Plausible; Examinee may think that the alarm setpoint for the PDT is the same as the Quench tank which is set at 120°F and that the higher temperature bleed off flow which has been diverted to the PDT due to the CTMT Isolation valve failing closed.

C WRONG; C02 "LETDOWN FLOW LO" is correct due to the CTMT Isolation valve failing closed. C02/03 "A/B/C/D RCP BLEED-OFF FLOW HI" is wrong because RCP SEAL HDR pressure goes up when the CTMT isolation valve closes due to a loss of air diverting flow through the relief valve to the PDT.

Plausible; CH-507 fails open on a loss of IA which is the alternate path for RCP bleedoff flow, to the PDT which is at a lower back pressure than the VCT causing a higher flow examinee may not remember the relief valve in the flow path to the PDT.

D CORRECT; CH-515 and CH-516 fail closed isolating letdown. RCS pressure rises due to a loss of Letdown with charging still in service, raising PZR level, thumb rule 40 gpm charging flow, 65gallons/% PZR lvl, 1.62 mins/%PZR lvl, 15 psi/%PZR lvl, therefore 2.7 minutes to PZR PRESS DEVIATION Alarm.

### References

ARP 2590B-212, ARP 2590B-031, AOP 2563

NO Comments or Question Modification History at this time.

NRC K/A System/E/A System 078 Instrument Air System (IAS)

Generic K/A Selected

NRC K/A Generic System 2.4 Emergency Procedures /Plan

## RO and SRO Exam Questions (No "Parents" Or "Originals")

Question #: **82**

Question ID: **8000032**

☐ RO

☒ SRO

☐ Student Handout?

☐ Lower Order?

Rev. **2**

☒ Selected for Exam

Origin: **Bank**

☐ Past NRC Exam?

The crew has just opened up the TCBs to shut down the reactor for a refueling outage, when the following conditions are noted:

- Pressurizer pressure = ~2248 psia and slowly lowering
- Pressurizer level = ~ 39% and slowly lowering
- Letdown flow = ~ 40 gpm and slowly lowering
- Charging flow = 88 gpm and stable
- "C" charging pump is running in "lead"
- "A" charging pump is running in "manual"
- "B" charging pump is in "Pull-To-Lock".
- The STA has calculated an RCS leak rate of ~ 45 gpm.
- Process Radiation Monitor Hi-Hi/Fail annunciator alarmed
- S/G Blowdown automatically isolated

Based on the existing conditions, which of the following procedures is the US required to use to mitigate the event and continue the plant cooldown?

- .....
- 1 ☒ **A** AOP 2569, Steam Generator Tube Leak, to isolate the affected Steam Generator. Then, complete the plant cooldown to Mode 5 using OP 2207, Plant Cooldown.
  - 1 ☐ **B** EOP 2534, Steam Generator Tube Rupture, to isolate the affected Steam Generator. Then, perform a plant cooldown to Mode 5 using OP 2207, Plant Cooldown.
  - 2 ☐ **C** AOP 2569, Steam Generator Tube Leak, to isolate the affected Steam Generator. Then, complete the plant cooldown to Mode 5 using AOP 2569, Steam Generator Tube Leak. Choice "C" arguably correct. Modify "C" to be more wrong.
  - 1 ☐ **D** EOP 2534, Steam Generator Tube Rupture, to isolate the affected Steam Generator. Then, perform a plant cooldown to Mode 5 using EOP 2541, Appendix 12, SGTR Response.

**Question Misc. Info:** MP2\*LOIT, SGTL, AOP 2569, OP 2205, NRC-2016

### Justification

SRO Justification: Questions meets 10CFR55.43.5, Assessment of facility conditions and selection of appropriate procedures during normal, abnormal and emergency conditions.

A - CORRECT; AOP 2569 contains the required steps to isolate the most affected Steam Generator. When this is accomplished, the AOP directs the crew to OP 2207 to complete the cooldown.

B - WRONG; It would be inappropriate to enter EOP 2534 to isolate the affected S/G because the conditions are indicative of only a tube leak at this time, NOT a tube rupture. Even though the calculated leak rate is greater than the Charging/Letdown flow "mismatch", pressurizer level has NOT lowered enough to reduce letdown flow to the minimum value (28 gpm). With minimum letdown flow, the available charging pumps have the capacity to stabilize pressurizer level.

Plausible; Examinee may consider RCS input/output mismatch an indication of leakage exceeding charging capability, which would require the use of EO 2534.

C - WRONG; AOP 2569, Steam Generator Tube Leak, contains the guidance to start the cooldown, but lacks the guidance to complete the cooldown.

Plausible; Examinee may conclude that the AOP completes the cooldown based on the specific guidance given for tube leak mitigation being very close to that given in EOP 2534 for a SGTR (which does include actions for cooldown to Mode 5).

D - WRONG; EOP 2534 provides the guidance to isolate the most affected S/G; however, there is NO procedural guidance for the transition between EOP 2534 and EOP 2541, Appendix 12. Appendix 12 does NOT provide the guidance for performing a cooldown. It only provides guidance to isolate the affected S/G in the Functional procedures.

Plausible; Examinee may recognize the leak rate as entry conditions for EOP 2534 and, therefore, use of EOP 2541 as the cooldown method.

### References

AOP 2569

### Comments and Question Modification History

VAL; To make choice "B" wrong, replace using "EOP 2534, Steam Generator Tube Rupture" with "OP 2207, Plant Cooldown". - rlc

**NRC K/A System/E/A**    **System**    037    Steam Generator (S/G) Tube Leak

**Number**    AA2.04    **RO** 3.4    **SRO** 3.7    **CFR Link** (CFR: 43.5 / 45.13)

Ability to determine and interpret the following as they apply to the Steam Generator Tube Leak: Comparison of RCS fluid inputs and outputs, to detect leaks

## RO and SRO Exam Questions (No "Parents" Or "Originals")

Question #: **93**

Question ID: **2016036**

☐ RO

☒ SRO

☐ Student Handout?

☐ Lower Order?

Rev. **0**

☒ Selected for Exam

Origin: **New**

☐ Past NRC Exam?

The plant is in MODE 6 with the following conditions:

- Fuel movement is in progress.
- The Personnel Airlock Doors are open
- The Containment Equipment Hatch is removed.
- Containment Purge is in operation using Main Exhaust

"Main Exhaust" correction was annotated on the white board at the front of the room during the exam and pointed out to the candidates.

I&C working on ESAS inadvertently triggers a CIAS

What procedural guidance and action must be taken and why?

- 1 ☒ **A** Refer to OP 2209A "Refueling Operations" and secure fuel movement due to loss of CTMT Purge with equipment hatch removed.
- ☐ **B** Refer to OP 2313A "CTMT Air Recirculation and Cooling System" over-ride and stop CAR fans that do not have RBCCW aligned.
- ☐ **C** Refer to OP 2310 "Shutdown Cooling System" and make manual adjustments to SDC temperature due to valve repositioning.
- 4 ☐ **D** Refer to OP 2332A "Station Air" over-ride and open 2-SA-19 "CTMT Station Air Hdr. Isol." To maintain S/G Nozzle Dams.

**Question Misc. Info:** MP2\*LOIT CTMT, Purge, CPS, SRO, NRC-2016

### Justification

SRO Justification: IAW 10 CFR 55.43 (5), SRO required knowledge to evaluate the impact of a CIAS signal on the current plant conditions, based on (SRO knowledge of) the prerequisites for Fuel movement in CTMT with the Equipment Hatch removed (i.e.; CTMT purge using Main Exhaust).

A - CORRECT; Inadvertent CIAS causes all Main Exhaust Fans to trip causing a loss of Containment Purge, which is required to be in service (per OP 2209A, Refueling Operations) when moving fuel with the CTMT Equipment Hatch removed.

B - WRONG; Inadvertent CIAS does not cause CAR fans to Auto start.

Plausible; If the Examinee thinks that a SIAS and CIAS are generated at the same time they may assume that the CAR fans auto start on a SIAS and that some coolers will not have RBCCW flow for the SDC configuration which they may interpret requiring manual over ride and securing fans.

C - WRONG; CIAS signal does not close or cause any valves in the SDC flow path to re-align or the RBCCW cooling flow path or the Service Water flow path.

Plausible; The Examinee may think that a system change to either SDC, RBCCW or Service Water would affect the RCS temperature requiring an adjustment to SDC system to counter act any system changes in the heat removal flow path.

D - WRONG; Although Station Air to CTMT isolates on a CIAS, the Steam Generator Nozzle Dams do not require any Air pressure to continue operations and will not fail. Also, SA-19 is a manual valve that cannot fail closed.

Plausible; The Examinee may believe that the S/G nozzle dams require air to maintain its continuous function that would be incorrect in that it will continue to function without air. The system will alarm when air pressure does lower.

### References

OP 23209A, "Refueling Operations", Step 4.1.11 (requirements for CTMT Purge with equipment hatch removed) and Step 4.4.1a. (initial requirements for fuel movement).

### Comments and Question Modification History

NRC; changed "A" from "Refer to OP 2314B 'CTMT and Enclosure Bldg Purge' secure CTMT Purge due to the loss of Main Exhaust Fans." to "Refer to OP 2209A 'Refueling Operations' and secure fuel movement due to loss of CTMT Purge with Equipment Hatch removed." [Also added "Containment" to third bullet in stem for clarification and corrected question reference to OP 2209A, Steps 4.1.11 and 4.4.1a] - rlc

**NRC K/A System/E/A** System 029 Containment Purge System (CPS)

**Number** A2.01 **RO** 2.9 **SRO** 3.6 **CFR Link** (CFR: 41.5 / 43.5 / 45.3 / 45.13)

Ability to (a) predict the impacts of the following malfunctions or operations on the Containment Purge System; and (b) based on those predictions, use procedures to correct, control, or mitigate the consequences of those malfunctions or operations: Maintenance or other activity taking place inside containment