2023 Limerick ILT NRC Post-Examination Challenges

Limerick training staff conducted a post-exam review and analysis per NUREG-1021, section ES-4.3. Our review determined there are three questions, 2 RO and 1 SRO, that contained flaws that impacted the fair and equitable outcome of the exam. We are therefore submitting these questions for your review per the guidance in NUREG-1021, section ES-4.4.

The table below summarizes the questions, basis for change, and affected applicants.

Question	Basis	Number of Affected Applicants
17	Unclear question stem	1 of 2 RO 4 of 8 SRO
46	Unclear question stem	0 of 2 RO 4 of 8 SRO
92	Newly discovered technical information	2 of 8 SRO

In accordance with ES-4.3, Section C.4, the following pages provide the analyses, justification for change, and our recommended disposition for each of these questions.

We present each of these questions in the following format:

The original question as approved by the NRC and administered to the applicants.

The justification for change, including an Analysis, Conclusions, and the Recommendation.

A copy of the reference documentation that supports the recommended change.

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Question 17

Unit 1 plant conditions:

- SE-1 (Remote Shutdown) has been entered and the MCR has been evacuated due to toxic gas
- Prior to evacuating the MCR, the Reactor was scrammed and All MSIVs were closed
- No other control room actions were completed

The Remote Shutdown Panel was staffed and SE-1 activities performed

- All RSP Transfer Switches are in EMERG
- Operators are controlling level with RCIC at 35 inches
- Controlling pressure with SRVs

A primary coolant leak in the drywell causes DW pressure to rise to 1.70 psig up slow.

With no additional operator action, what is the status of RCIC and HPCI 5 minutes later?

	RCIC	HPCI
A.	Running	Running
B.	Running	Tripped
C.	Tripped	Running
D.	Tripped	Tripped

Answer: B

ANSWER (B)	**Running, Tripped is Correct**, With operation at the RSP, all RCIC trips are bypassed except overspeed and manual. Therefore, it will run regardless of Rx water level. HPCI starts on the High DW pressure and injects at 5600 GPM. From 35 inches, water level in the vessel will reach +54 inches in approximately 1 minute. At that time, the high level trip will occur and HPCI stops injecting until level drops to -38 inches.
DISTRACTOR (A)	**Running, Running is Wrong** plausible to an applicant who recalls that operation at the RSP disables most safety interlocks. This is true for RCIC but HPCI is not controlled from the RSP. Therefore, it would Trip normally on +54 inch Rx level.
DISTRACTOR (C)	**Tripped, Running is Wrong** but plausible to the candidate who recalls that operation at the RSP disables most safety interlocks but incorrectly believes that RCIC would trip on high level as the RCIC overspeed trip is still enabled. HPCI running is plausible because there is an emergency shutdown switch on the RSP for HPCI when it has a fire induced fault. With no fault condition, RCIC would continue to inject and HPCI would trip at +54 inches.
DISTRACTOR (D)	**Tripped, Tripped is Wrong**, .Plausible to the candidate who recalls that operation at the RSP disables most safety interlocks but incorrectly believes that RCIC would trip on high level as the overspeed trip is still active. This is incorrect as the high level shutdown is bypassed.

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References Provided	None
K/A Justification	This K/A is met at the applicant must evaluate the system response to reactor water level changes when control is established at the RSP, considering the differences in system response between operation form the MCR and RSP.
SRO-Only Justification	N/A
Additional Information	None

General Data	
Level	RO
Tier	1
Group	1
KA # and Rating	295016 AA2.02 4.5
KA Statement	Ability to determine or interpret the following as they apply to (APE 16) CONTROL ROOM ABANDONMENT: Reactor Water Level
Cognitive level	High
Safety Function	2
10 CFR 55	41.10
Technical Reference with Revision No:	SE-1 Rev. 076
Question History: (i.e. LGS NRC-05)	New
Question Type: (New, Bank, Modified)	New
Revision History:	
Training Objective	LGSOPS0088.02

			%	17
RO	RO Section			
Allan Almeida	88		88	
Diego Martinez	86.67		86.67	A
Average			87.33	
SRO	RO Section	SRO Section	Overall	
Vignesh Babu	81.33	80	81	A
Dan Hudson	90.67	88	90	
Dan Maxey	84	80	83	A
Jim Roberts	88	80	86	
Bryan Schmidt	78.67	72	77	A
Brad Smith	88	88	88	A
Jeff Van Pelt	84	80	83	
David Yerkes	92	84	90	
Average	85.83	81.5	84.75	
# of Misses				5
			Question Score	50

RO AVERAGE OVERALL 86.1

# of ROs 2
# of SROs 8

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Applicant Comments:

1) Multiple applicants selected answer "A" (5 of 10) Running/Running. Most voiced some version of "With a primary coolant leak in the drywell, I assumed that once HPCI tripped on high level, RCIC injection (600 gpm) would not be sufficient to maintain level. Therefore, level would drop to the Reactor LO LO setpoint (-38") and HPCI would restart and re-inject. (i.e. Running)"

2) We could not determine if HPCI would be tripped or running because the leak rate was not quantified so we assumed running.

Discussion:

The stem of the question is unclear in that the leak in the drywell is not quantifiable and therefore leads to confusion on the status of the HPCI system. The first part of the question is asking the state of the RCIC system and is correct as stated in the answer explanation and is not in dispute. The basis for this answer is that when HPCI injects at 5600 gpm due to drywell pressure above 1.68 psig, it will fill the Rx Vessel to +54 inches which would cause the HPCI pump to trip. RCIC would not trip when operating from the RSP as the high level shutdown is disabled.

The second part of the answer is asking the state of the HPCI system. What the question stem does not adequately address is the impact of the drywell leak on Reactor Level. As previously stated, the initial HPCI injection would result in reactor level reaching +54 inches, tripping HPCI. But if the leak was beyond the capability of RCIC, Reactor level would drop below the HPCI reset setpoint causing HPCI to restart making answer A correct (RCIC running, HPCI running). Based on the severity and propagation of the leak both A and B could be correct. Attached is simulator data that supports this explanation.

Facility Recommendation:

In accordance with ES-4.4, Section C3c question 17 is "a question with an unclear stem that confused the applicants or did not provide all the necessary information" as stated above. Based on the discussion the station recommends accepting both A and B as correct.

References:

PDF

question 17 plots.pdf

Operations Approval:

12/21/23

Signature **Date**

Operations Training Approval:

12/21/23.

Signature **Date**

2023 Limerick ILT NRC Post-Examination Challenges

Question 46

Regarding the Standby Gas Treatment System, which of the following describes

1) The basis for the SGTS filter train and

2) The design feature to maintain filter efficiency

	Basis for SGTS Filter Train	Component to Maximize Filter Efficiency
A.	Limit iodine and particulate concentration in gases, prior to discharge	Electric Heaters
B.	Limit iodine and particulate concentration in gases, prior to discharge	Purge Air
C.	Limit particulate concentration ONLY in gases, prior to discharge	Electric Heaters
D.	Limit particulate concentration ONLY in gases, prior to discharge	Purge Air

Answer: A

ANSWER (A)	**Limit iodine and particulate concentration in gases, prior to discharge, Electric Heaters is correct:** The purpose of the SBGT filters per the Design basis document L-S-32 is "The SGTS/RERS filters iodine and particulate concentrations in gases potentially present within the Secondary Containment prior to discharge to the environment via the North Stack." and for efficiency "Upon initiation of the SGTS, either manually or automatically, the **SGTS heaters** are energized to maintain relative humidity of the airstream entering the SGTS filter trains below 70%. This ensures design charcoal filter efficiency for the removal of halogen and particulate concentrations in gases potentially present.
DISTRACTOR (B)	**Limit iodine and particulate concentration in gases, prior to discharge, Purge Air is wrong:** The first part of the answer option is correct. The second part is a plausible answer to the question of filter efficiency because "Purge air to the SGTS filter train is maintained to prevent condensation of water vapor on the charcoal filters". Incorrect because the specific design function of the electric heaters is to maintain filter efficiency.
DISTRACTOR (C)	**Limit particulate concentration ONLY in gases, prior to discharge, Electric Heaters is wrong:** Plausible answer to the first part of the answer option as the function of the HEPA filter in the filter train is to limit particulate concentration in the exhaust, however, the charcoal portion of the filter is designed for iodine adsorption. The second part is correct
DISTRACTOR (D)	**Limit particulate concentration ONLY in gases, prior to discharge, Purge Air is wrong:** Plausible answer to the first part of the answer option as the function of the HEPA filter in the filter train is to limit particulate concentration in the exhaust, however, the charcoal portion of the filter is designed for iodine adsorption. The second part is a plausible answer to the question of filter efficiency because "Purge air to the SGTS filter train is maintained to prevent condensation of water vapor on the charcoal filters". Incorrect because the specific design function of the electric heaters is to maintain filter efficiency

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References Provided	None
K/A Justification	None
SRO-Only Justification	N/A
Additional Information	None

General Data	
Level	RO
Tier	2
Group	1
KA # and Rating	261000 K4.05 3.3
KA Statement	Knowledge of (SF9 SGTS) STANDBY GAS TREATMENT SYSTEM design features and/or interlocks that provide for the following: Fission product gas removal
Cognitive level	Low
Safety Function	9
10 CFR 55	41.7
Technical Reference with Revision No:	DBD L-S-32 Rev.009
Question History: (i.e. LGS NRC-05)	New
Question Type: (New, Bank, Modified)	New
Revision History:	
Training Objective	LGSOPS0076B.09

			%	46
RO	RO Section			
Allan Almeida	88		88	
Diego Martinez	86.67		86.67	
Average			**87.33**	
SRO	RO Section	SRO Section	Overall	
Vignesh Babu	81.33	80	81	
Dan Hudson	90.67	88	90	B
Dan Maxey	84	80	83	
Jim Roberts	88	80	86	
Bryan Schmidt	78.67	72	77	B
Brad Smith	88	88	88	B
Jeff Van Pelt	84	80	83	B
David Yerkes	92	84	90	
Average	**85.83**	**81.5**	**84.75**	
# of Misses				4
			Question Score	60

RO AVERAGE OVERALL **86.1**

# of ROs 2
# of SROs 8

2023 Limerick ILT NRC Post-Examination Challenges

Applicant Comments:

1) "Purge Air is implemented to minimize condensation on the filter element when the SGTS is in standby mode. The question did not tell us the operational mode of the fan system."

2) "Heaters are only on when the system is in service, purge air is on when the fan is secured. I assumed purge air since the system is off most of the time."

Discussion:

The stem of the question is unclear as to the state of the SGTS for which the design feature would be used. The first part of the question is asking for the basis for the SGTS filter train and is correctly listed in the answer and identified in the answer explanation and is not in dispute. The second part of the question is asking for the design feature that maintains or maximizes filter efficiency. The options listed in the answer choices are Electric Heaters and Purge Air. Per Design Basis Document, L-S-32, Standby Gas Treatment System And Reactor Enclosure Recirculation System Rev 9 section 3.3 Design Features:

> 3.3.1.3.5 "Upon initiation of the SGTS, either manually or automatically, the SGTS heaters are energized to maintain relative humidity of the airstream entering the SGTS filter trains below 70%. This ensures design charcoal filter efficiency for the removal of halogen and particulate concentrations in gases potentially present."
>
> 3.3.1.3.3 "Purge air to the SGTS filter train is maintained to prevent condensation of water vapor on the charcoal filters."

Additionally, Section 2.2 System Interfaces includes:

> 2.2.2.2.3 Instrument Air and Nitrogen Systems {6.1.13.11}
>
> "The Instrument Air and Nitrogen Systems shall support operation of the SGTS/RERS by providing clean, dry air at 110 psi, nominal, to the SGTS/RERS pneumatically operated valves to provide the force for operating these valves during normal plant operations and accident conditions. The Instrument Air and Nitrogen Systems shall support operation of the SGTS/RERS by providing the SGTS/RERS charcoal filters with 1 cfm of clean, dry air during normal plant operations and accident conditions."

The reason to lower the relative humidity, maintain clean dry air, and prevent the condensation of water on the charcoal filter are all to ensure the efficiency of the filters are maintained so they are capable of performing their design functions. The question does not specifically ask when the design feature would be used, system operation or standby mode, and therefore both options for the second part would be correct in maintaining filter efficiency.

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Facility Recommendation:
In accordance with ES-4.4, Section C3c question 17 is "a question with an unclear stem that confused the applicants or did not provide all the necessary information" as stated above. Based on the discussion the station recommends accepting both A and B as correct.

References:

L-S-32, Sheet 00000,
Rev 009, STANDBY G/

Operations Approval:

12/21/23

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Operations Training Approval:

12/21/23.

Signature **Date**

2023 Limerick ILT NRC Post-Examination Challenges

Question 92

**********SRO ONLY**********

WHICH ONE of the following is required during Transient Response per OP-LG-103-102-1002, Strategies for successful Transient Mitigation?

A. An RO obtaining CRS permission prior to securing HPCI following automatic initiation

B. Shift Technical Advisor ensure identification of critical parameters

C. Shift Manager approval when action taken is necessary to prevent personal injury

D. An RO obtaining CRS permission to manually initiate RRCS during an ATWS

Answer: A

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ANSWER (A)	**An RO obtaining CRS permission prior to securing HPCI following automatic initiation is correct.** An RO obtaining CRS permission prior to securing HPCI is required because this represents defeating or overriding an automatic initiation of an ECCS component. OP-LG-103-102-1002 step 4.1.2.2.C states "Obtain Control Room Supervisor permission prior to defeating or overriding an automatic initiation of an ECCS component." Section 4.1.3.5 does note: "CRS permission is required prior to defeating/overriding an automatic initiation of ECCS or RCIC, with the following exceptions: □ The action is directed by an Emergency Operating Procedure (example: securing or defeating HPCI, RHR and Core Spray per T-270) □ The CRS has directed using ECCS or RCIC to control RPV level (this gives the RO the authority to take the required actions to keep level in the prescribed band) □ HPCI/RCIC minimization following an automatic initiation, with HPCI/RCIC not required for RPV level control (this will minimize the negative impact HPCI or RCIC will have on RPV level and pressure control, and the impact on reactor power if the reactor is not shutdown)" However, none of these exceptions are true in the given stem. Note that in this case, the RO may minimize HPCI without CRS permission; however, to secure HPCI, the operator will have to insert an isolation per S55.2.A due to an initiation signal being present on high drywell pressure.
DISTRACTOR (B)	**Shift technical advisor ensure identification of critical parameters is wrong.** Transient procedure OP-AA-103-102 step 4.2.2.4 , Determination and assignment of critical parameters, is a Control Room Supervisor responsibility. This is plausible as the STA provides input for determination of critical parameters, and provides the CRs and crew with estimated time to actions values on critical parameters per step 4.2.2.3
DISTRACTOR (C)	**Shift Manager approval when action taken is necessary to prevent personal injury is wrong.** Per OP-LG-103-102-1002 step 4.1.2.3.c Shift Manager approval is NOT required when action taken is necessary to prevent personal injury or to save a life. Plausible as OP-LG-103-102-1002 describes other actions not prescribed by procedures that do required Shift Manger approval, such as taking action outside of existing procedural guidance \ when action is necessary to protect equipment or stabilize the plant
DISTRACTOR (D)	**An RO obtaining CRS permission manually initiate RRCS during and ATWS is wrong.** OP-AA-103-102 step 4.4.4.7 discusses the RO action for an unsuccessful SCRAM, including initiating RRCs followed by report to the CRS per the hard card This is plausible because CRS permission is required prior to defeating or overriding an automatic initiation of an emergency systems .

References Provided	None
K/A Justification	This question asks the SRO Candidate to manage the crew by correctly identifying the changes in oversight of the operating crew during entry into EOPs
SRO-Only Justification	This tests at the SRO level because it requires knowledge of administrative procedures that specify implementation and coordination of plant normal and emergency procedures.
Additional Information	N/A

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General Data	
Level	SRO
Tier	3
Group	N/A
KA # and Rating	G2.1.6 / 4.8
KA Statement	(G2.1.6) CONDUCT OF OPERATIONS Ability to manage the control room crew during plant transients (SRO Only) (CFR: 43.5 / 45.12 / 45.13)
Cognitive level	High
Safety Function	N/A
10 CFR 55	CFR: 43.5 / 45.12 / 45.13
Technical Reference with Revision No:	OP-LG-103-102-1002 Rev 37
Question History: (i.e. LGS NRC-05)	New
Question Type: (New, Bank, Modified)	New
Revision History:	New
Training Objective	LLOTS0050.2

RO	RO Section		%	92
Allan Almeida	88		88	
Diego Martinez	86.67		86.67	
Average			87.33	
SRO	**RO Section**	**SRO Section**	**Overall**	
Vignesh Babu	81.33	80	81	B
Dan Hudson	90.67	88	90	
Dan Maxey	84	80	83	
Jim Roberts	88	80	86	
Bryan Schmidt	78.67	72	77	B
Brad Smith	88	88	88	
Jeff Van Pelt	84	80	83	
David Yerkes	92	84	90	
Average	**85.83**	**81.5**	**84.75**	
# of Misses				2
			Question Score	75

RO AVERAGE OVERALL **86.1**

# of ROs 2

# of SROs 8

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Applicant Comments:

1) "In simulator scenarios we observed with LORT, the STA routinely assisted the CRS with Critical Parameter identification/tracking."

2) "When I read the procedure (OP-LG-103-102-1002), I remember reading about the STA tracking critical parameters and giving estimated times."

Discussion:

There is additional technical information identified in the reference procedure that supports a change to the answer key. A is correct as identified in the answer explanation and is not in dispute. Analysis indicates B is also correct. While assignment of critical parameters is the responsibility of the Unit Supervisor/CRS, answer B does not state the STA determines critical parameters to be assigned but that the STA "ensure identification of critical parameters". OP-LG-103-102-1002 has guidance that supports that answer choice.

OP-LG-103-102-1002, Strategies For Successful Transient Mitigation discusses the following:

Step 5.3 OP-LG-103-102-1002 Appendix 1, "STA-IA Guide Sheet" has been created as a guide to aid the STA/IA in maintaining focus on the key aspects of a transient. OP-LG-103-102-1002 Appendix 1 or any equivalent tool may be used by the STA/IA to ensure roles and responsibilities of this unique crew position are consistently met. The purpose of the guide sheet is to provide the STA/IA with a format to log the status of events, the status of equipment malfunctions, to trigger thoughts about key strategic operational strategies, and to **identify critical parameters** for trending.

OP-AA-103-102, Watch-Standing Practices is referenced in the answer explanation for B and D. However, the reference to "OP-AA-103-102" in answer explanation B and D is a typo and should read "OP-LG-103-102-1002". Additionally, the applicants answer response is based on the procedure in the question interrogative. Furthermore, OP-AA-103-102 includes guidance that does not conflict with OP-LG-103-102-1002:

Step 4.3.3. Transient Critical Parameters

1. When mitigating a transient, **it is necessary for the Main Control Room Team to IDENTIFY the critical parameters** necessary for control. Once these are identified, the Main Control Room Team should establish a band/milestone within which the critical parameter should be controlled. The Unit Supervisor owns the responsibility to ensure this occurs.

While the Unit CRS owns the responsibility, the entire Main Control Room Team (Including the STA) is responsible for identifying the critical parameters necessary for control. This is emphasized by the procedure referenced in the stem of the question (OP-LG-103-102-1002 Step 5.3). The responsibilities of the STA outlined in OP-LG-103-102-1002 are based on the INPO 90-003 and ACAD 14-002, Guidelines for the Training and Qualification of Shift Technical Advisors. Ensuring the identification of critical parameters is a fundamental requirement of the STA role and one of the bases for its creation.

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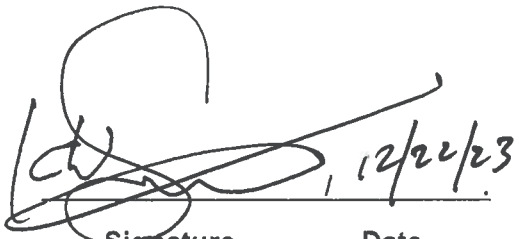
Facility Recommendation:
In accordance with ES-4.4, Section C3c, there is "newly discovered technical information that supports a change in the answer key" as stated above. Based on the discussion the station recommends accepting both A and B as correct.

References:

OP-LG-103-102-100 2. Rev 038. STRATEGI	OP-AA-103-102, Rev 021. WATCH-STANDI

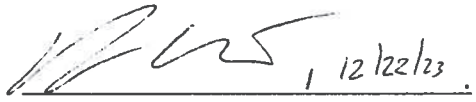
Operations Approval:



12/22/23

Signature **Date**

Operations Training Approval:



12/22/23

Signature **Date**

List of References

L-S-32, Sheet 0000, Rev 9, Standby Gas Treatment System
OP-AA-103-102, Rev 21, Watch Standing Practices
OP-LG-103-102-1002, Appendix 1, Rev 1, STA-IA Guide Sheet
OP-LG-103-102-1002, Rev 38, Strategies for Successful Transient Mitigation
Simulator Plots in support of question 17