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10 CFR 50.90

October 31, 2023

U.S. Nuclear Regulatory Commission
Washington, DC 20555-0001
ATTN: Document Control Desk

Limerick Generating Station, Units 1 and 2
Renewed Facility Operating License Nos. NPF-39 and NPF-85
NRC Docket Nos. 50-352 and 50-353

Subject: Response to Request for Additional Information for Application to Adopt TSTF-477, Revision 3, "Add Action for Two Inoperable Control Room AC Subsystems" and Associated Technical Specification Changes

References:

1. Letter from David P. Helker, Constellation Energy Generation, LLC to the U.S. Nuclear Regulatory Commission, "License Amendment Request for Application to Adopt TSTF-477, Revision 3, 'Add Action for Two Inoperable Control Room AC Subsystems' and Associated Technical Specification Changes," dated November 17, 2022 (ADAMS Accession No. ML22321A105).
2. Letter from David P. Helker, Constellation Energy Generation, LLC to the U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information for License Amendment Request for Application to Adopt TSTF-477, Revision 3, 'Add Action for Two Inoperable Control Room AC Subsystems' and Associated Technical Specification Changes," dated August 30, 2023 (ADAMS Accession No. ML23242A217).
3. Email from Audrey Klett, U.S. Nuclear Regulatory Commission to Stephen Flickinger, Constellation Energy Generation, LLC, "NRC Request for Additional Information Re. TSTF-477 LAR" (EPID L-2022-LLA-0174), dated October 3, 2023 (ADAMS Accession No. ML23276B464).

By letter dated November 17, 2022, Constellation Energy Generation, LLC (CEG) submitted an application for amendment of the Renewed Facility Operating License Nos. NPF-39 and NPF-85 for Limerick Generating Station (Limerick), Units 1 and 2, respectively. The proposed amendments would modify the licensing basis by adopting Technical Specification Taskforce (TSTF) Traveler 477, Revision 3, 'Add Action for Two Inoperable Control Room AC Subsystems' and associated Technical Specification (TS) changes. By letter dated August 30, 2023, CEG submitted a response to the U.S. Nuclear Regulatory Commission's (NRC) Request for Additional Information (RAIs) #1-3 (Reference 2). By email dated October 3, 2023, the NRC notified CEG that additional information is needed to complete the review of the LAR (Reference 3). CEG's response to the NRC's RAIs #4-19 is provided in Attachment 1. Attachment 2 includes revised TS pages that were modified in response to

RAI #19. No other changes are being made to the proposed TS pages submitted in the Reference 1 LAR.

CEG has reviewed the information supporting the No Significant Hazards Consideration and the Environmental Consideration that was previously provided to the NRC in Reference 1. The information in this response does not impact the conclusion that the proposed license amendments do not involve a significant hazards consideration. The information also does not impact the conclusion that there is no need for an environmental assessment to be prepared in support of the proposed amendments.

There are no regulatory commitments contained in this response.

In accordance with 10 CFR 50.91, "Notice for public comment; State consultation," paragraph (b), CEG is notifying the Commonwealth of Pennsylvania of this response to request for additional information by transmitting a copy of this letter to the designated State Official.

If you have any questions regarding this submittal, then please contact Steve Flickinger at 267-533-5302.

I declare under penalty of perjury that the foregoing is true and correct. Executed on this 31st day of October 2023.

Respectfully,

David P. Helker
Sr. Manager - Licensing
Constellation Energy Generation, LLC

Attachment 1: Response to Request for Additional Information
Attachment 2: Mark-Ups of Limerick Technical Specifications revised based on RAI 19

cc: Regional Administrator - NRC Region I w/ attachments
NRC Senior Resident Inspector - Limerick Generating Station "
NRC Project Manager, NRR - Limerick Generating Station "
Director, Bureau of Radiation Protection - Pennsylvania Department of Environmental Protection "

ATTACHMENT 1

Response to Request for Additional Information
License Amendment Request

Limerick Generating Station, Units 1 and 2
NRC Docket Nos. 50-352 and 50-353

By letter dated November 17, 2022, Constellation Energy Generation, LLC (CEG) submitted an application for amendment of the Renewed Facility Operating License Nos. NPF-39 and NPF-85 for Limerick Generating Station (Limerick), Units 1 and 2, respectively. The proposed amendments would modify the licensing basis by adopting Technical Specification Taskforce (TSTF) Traveler 477, Revision 3, 'Add Action for Two Inoperable Control Room AC Subsystems' and associated Technical Specification (TS) changes. By letter dated August 30, 2023, CEG submitted a response to the U.S. Nuclear Regulatory Commission's (NRC) Requests for Additional Information #1-3 (Reference 2). By email dated October 3, 2023, the NRC notified CEG that additional information is needed to complete the review of the LAR (Reference 3).

Requests for Additional Information:

RAI-04 – Clarify which supplementary cooling provisions discussed in the LAR that the licensee is requesting NRC staff review and approval and that are beyond the scope of TSTF-477, Revision 3. Describe the function of the temporary chiller water hose/jumper modification and why NRC approval is needed. (Refer to Audit Question 1.)

Response:

As documented in the license amendment request (LAR), all described temporary supplemental cooling provisions are within the scope of the generic TSTF-477 traveler except the Drywell Chilled Water (DWCW) to Control Enclosure Chilled Water (CECW) temporary cross tie cooling water supply and return jumpers documented in LAR Section 3.5.2. These rugged mechanical fire hose type jumpers supply cooling water to the Main Control Room (MCR) HVAC air supply CECW cooling coils but require a passive High Energy Line Break (HELB) barrier door to be blocked partially open between the Turbine Enclosure and Control Enclosure while in the Limiting Condition for Operation (LCO) when both AC subsystems are lost.

NRC approval was requested for partially blocking open the HELB door while in the complete loss of cooling 72-hour LCO because the peak HELB temperature adjacent to the HELB door will exceed the as-analyzed 120°F equipment functionality temperature limit for certain types of equipment in control enclosure room 619 for a short duration. Room 619 is classified as a mild environment area and equipment in that room is not environmentally qualified. The peak temperature conditions incorporating power rerate and MUR is estimated to be ≤ 135°F. This may result in a loss of equipment function to certain types of equipment in room 619 if a hypothetical Unit 1 HELB occurred concurrently with the HELB door open while in the LCO.

RAI-05 – Confirm whether all doors between the safety-related control enclosure, control room envelope, and nonsafety-related turbine enclosure are qualified HELB barriers. (Refer to Audit Question 2.)

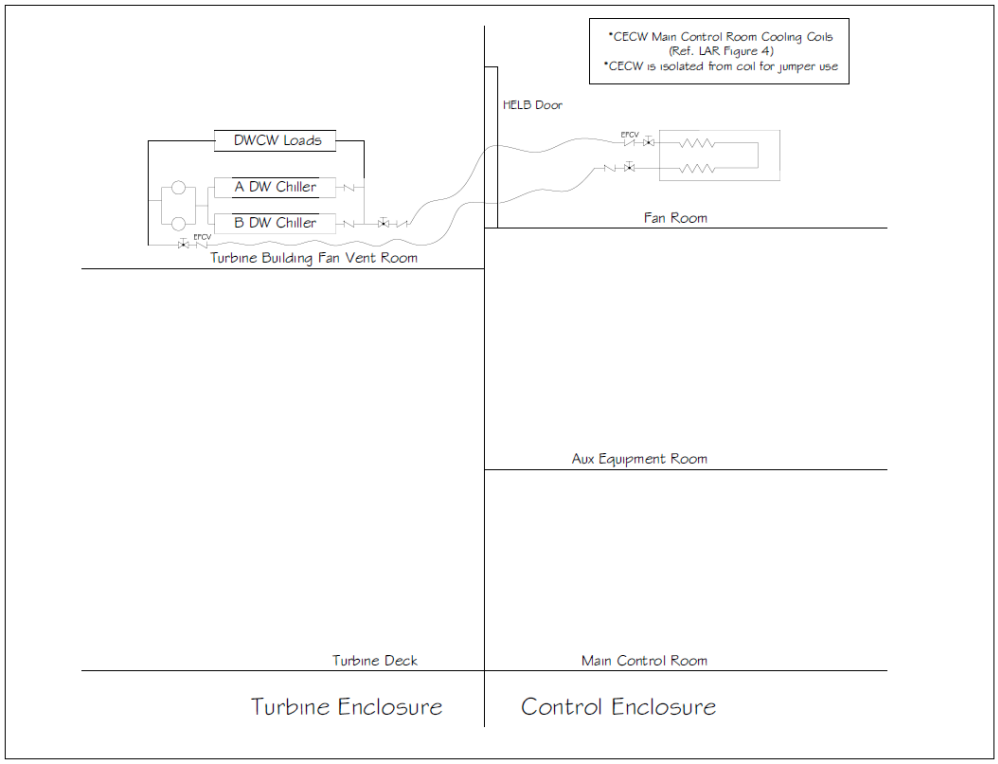
Response:

All doors between the safety related control enclosure, control room envelope and non-safety related turbine enclosure are qualified HELB barriers.

RAI-06: Regarding the configuration of the temporary chiller water hose (jumpers):

a. *Describe (e.g., via a simplified sketch or drawing) the temporary chiller water hose's (jumper's) proximity to the control room (including a description of where the jumper will be located and routed from the turbine enclosure to the control enclosure). (Refer to Audit Question 3.)*

Response: Simplified drawing (not a controlled drawing):



The DWCW cooling supply and return jumper connections are only installed on Unit 1. The Limerick primary means of temporary supplemental MCR cooling documented in the LAR utilizes cooling methods that do not breach the MCR envelope while in the LCO. Opening MCR doors that breach the MCR envelope during normal operating conditions is not an effective temporary cooling provision, because the steady state turbine deck temperature is 105ºF during warm weather conditions. This would accelerate MCR heat up and negate temporary cooling efforts.

For the Turbine Enclosure main steam line or feedwater line HELB vulnerable systems, routine operator rounds, and equipment monitoring will identify small leaks long before

they can propagate and develop into a leak that corresponds to a critical crack size (hundreds of gallons per minute) that can result in a full pipe rupture for the respective system piping.

Discussion:

As described in UFSAR Chapter 3.6, the Limerick HELB design basis is to postulate a hypothetical guillotine type line break, isolate it via an isolation valve or reactor scram, cope with its associated environmental conditions, and achieve plant safe shutdown. The hypothetical turbine enclosure HELB worst case vulnerabilities are a main steam system steam break of a 26" pipe and a feedwater system high energy liquid break of either a 20" or 34" pipe.

The actual, not postulated piping time-based failure mechanism begins as a small leak that, if left unattended for a very long-time duration, can propagate and develop into a leak that corresponds to a critical crack size that can result in a full pipe rupture for the respective system piping. For the subject turbine enclosure HELB vulnerabilities, UFSAR Section 5.2.5.6 documents "that leak rates of hundreds of gallons per minute will precede crack instability."

This information supports that either a leak detection temperature monitoring system or routine operator rounds can detect small leakage well before the margin to piping rupture is challenged.

For a Turbine Enclosure feedwater line leak, no automatic isolation system is provided. Plant personnel can detect small leakage flows by routine inspections and other available equipment monitoring data well before the margin to piping rupture leak flows of "hundreds of gallons per minute" is challenged.

b. *Are any doors to other rooms kept open to facilitate the routing of jumpers? (Refer to Audit Question 13.b.)*

Response:

No, there are no other doors kept open to facilitate the routing of the jumpers.

c. *Are the rooms along the path of the jumpers to the control room HVAC cooling coils served by any cooling systems? (Refer to Audit Question 13.c.)*

Response:

Room 620 adjacent to the breached HELB door is cooled by non-safety related Turbine Enclosure HVAC.

Room 619 is cooled by the safety related Auxiliary Equipment Room HVAC system. This system, like all of the other control enclosure HVAC systems, loses cooling water. This loss of CECW cooling water would require entry into the proposed MCR AC TS 72-hour LCO.

RAI-07: Provide a high-level description of factors that make a catastrophic pipe failure in the turbine building unlikely in the plant configuration requested in the LAR. (Refer to Audit Question 7.)

Response: To supplant the deterministic HELB door's passive barrier function with the temporary jumper running through the partially open HELB door during the LCO, an abrupt hypothetical guillotine line break is postulated in the UFSAR for a LOCA and HELB to determine the worst-case consequences and required mitigative actions. However, this is contrary to the actual realistic piping behavior that is evidenced by industry operating experience and addressed by piping design and installation standards. Based upon these factors, an in-service piping leak will first start as a small leak and then gradually progress into a larger leak over time. This realistic time-based failure mechanism provides ample opportunity to identify, trend, and mitigate/isolate the leak well before a hypothetical guillotine line break (Ref.-UFSAR Section 5.2).

Discussion:

The justification is:

> While the design basis for Limerick and other facilities includes the evaluation of loss of coolant accidents from postulated piping breaks in the UFSAR, significant effort goes into designing piping systems to assure that such a break will not occur. Piping systems are analyzed and designed using appropriate codes and standards with implicit large margins to limit applied stresses far below the material ultimate strength and materials are selected to provide adequate strength, ductility and toughness that minimizes fatigue. This is also supported by UFSAR Section 15.6.4 for a steam line break outside of containment and Section 15.6.6 for a feedwater pipe break outside of containment. The UFSAR states:
>
> > "A main steam line break is postulated without the cause being identified. These lines are designed to high quality engineering codes and standards, and seismic and environmental requirements. However, for the purpose of evaluating the consequences of a postulated large steam line rupture, the failure of a main steam line is assumed to occur." "A feedwater line break is assumed without the cause being identified. The subject piping is designed to high quality engineering codes and standards, and seismic and environmental requirements."
>
> If a small leak occurred due to a pipe flaw, it will be proactively detected and isolated long before the flaw could grow to an unstable size and lead to a design basis pipe break. For example, a high energy pressure boundary type main steam line leak would be detected and isolated (≤ 35 gpm) long before the critical crack size (hundreds of gallons per UFSAR figure 5.2-12) where the flaw becomes unstable and could propagate into a full pipe rupture.

RAI-08: (DELETED)

Response: Response to this RAI is not applicable.

RAI-09: Discuss how operators can detect (1) leakage in the turbine enclosure prior to a HELB, including the leak rates that may be detected, and (2) a HELB occurring. (Refer to Audit Questions 3 and 8.)

Response: Regarding audit question 3, the DWCW cooling supply and return jumper connections are only installed on Unit 1. The Limerick primary means of temporary supplemental MCR cooling documented in the LAR utilizes cooling methods that do not breach the MCR envelope while in the LCO. Opening MCR doors that breach the MCR envelope during normal operating conditions is not an effective temporary cooling provision, because the steady state turbine deck temperature is 105ºF during warm weather conditions. This would accelerate MCR heat up and negate temporary cooling efforts.

For the Turbine Enclosure main steam line or feedwater line HELB vulnerable systems, routine operator rounds, and equipment monitoring will identify small leaks long before they can propagate and develop into a leak that corresponds to a critical crack size (hundreds of gallons per minute) that can result in a full pipe rupture for the respective system piping.

Discussion:

As described in UFSAR Chapter 3.6, the Limerick HELB design basis is to postulate a hypothetical guillotine type line break, isolate it via an isolation valve or reactor scram, cope with its associated environmental conditions, and achieve plant safe shutdown. The hypothetical turbine enclosure HELB worst case vulnerabilities are a main steam system steam break of a 26” pipe and a feedwater system high energy liquid break of either a 20” or 34” pipe.

The actual, not postulated piping time-based failure mechanism begins as a small leak that if left unattended for a very long duration, can propagate and develop into a leak that corresponds to a critical crack size that can result in a full pipe rupture for the respective system piping. For the subject turbine enclosure HELB vulnerabilities, UFSAR Section 5.2.5.6 documents “that leak rates of hundreds of gallons per minute will precede crack instability.”

This information supports that either a leak detection temperature monitoring system or routine operator rounds can detect small leakage well before the margin to piping rupture is challenged.

For a Turbine Enclosure main steam line leak, a temperature monitoring steam leak detection system provides early detection, via a main control room alarm, of a main steam line leak. The Limerick main steam lines are 26” diameter pipes and, as depicted in UFSAR Figure 5.2-12, the critical crack size flow rate for a 24” Sch. 80 diameter pipe is approximately 300 gpm. A larger pipe size results in a larger allowable leakage value.

For a Turbine Enclosure feedwater line leak, no automatic isolation system is provided. Plant personnel can detect small leakage flows by routine inspections and other available equipment monitoring data well before the margin to piping rupture leak flows of “hundreds of gallons per minute” is challenged.

Regarding audit question 8, either a steam leak detection temperature monitoring system or routine operator rounds can detect small steam and liquid leakage well before the margin to piping rupture (“hundreds of gallons” as described in the UFSAR) is challenged.

A main steam line break is the bounding design basis HELB hazard. For a Turbine Enclosure feedwater line leak, no automatic isolation system is provided because the feedwater line break HELB causes a loss of feedwater flow that initiates a reactor SCRAM and terminates the HELB. Operations personnel can detect small feedwater leakage flows by routine inspections during rounds and other available equipment monitoring data well before a pipe break condition can develop.

Plant personnel can detect small leakage flows by routine inspections and other available equipment monitoring data, Ref. ADAMS ML22101A094. These detection methods are shown below from the Hatch TS amendment SE and is applicable to both steam and liquid leak detection.

> Indications of a small MSL leak in the turbine building include, but are not limited to:
> - An unexpected, sudden rise in area temperature,
> - An unexpected increase in radiation monitor readings,
> - An unexpected rise in turbine building sump levels,
> - An unexpected decrease in plant electrical output, and
> - Visual and sound indications.

Therefore, detection of small leaks and implementation of any remediating actions by plant personnel would occur well before the margin to piping rupture (“hundreds of gallons” as described in the UFSAR) is challenged.

RAI-10: Describe the conditions under which implementation of the proposed jumper supplementary cooling provision will be precluded if leakage is detected? (Refer to Audit Question 16.)

Response: The following conditions would preclude implementation of the proposed jumper supplementary cooling provision:

For the Main Steam (MS) HELB vulnerability, no watches are proposed. As a prerequisite, it is proposed that turbine enclosure MSL leakage via the NUMAC steam leak detection temperature indication will be checked prior to breaching the HELB door. If pressure boundary pipe leakage is suspected or identified, then jumper installation and breaching the HELB door will be aborted.

For the Feedwater (FW) HELB vulnerability, no watches are proposed. As a prerequisite, it is proposed to confirm no evidence of pressure boundary pipe leakage prior to breaching the HELB door. If pressure boundary pipe leakage is suspected or identified, then jumper installation and breaching the HELB door is aborted.

Also, the HELB door provides a TRM Fire Barrier function, and a fire watch will be implemented per the requirements of the TRM with the door breached to facilitate cooling jumper installation and use only while in the complete loss of cooling LCO.

RAI-11: Describe whether control room habitability is affected if there is a HELB or if the temporary chiller water hose (jumper) breaks while the HELB door is partially blocked open. Does the control room habitability envelope include control room cooling equipment, safety related filters, etc. located in the same room? Please confirm whether a HELB impact would propagate to this room and, if yes, what measures would be needed to address the temperature and habitability. (Refer to Audit Questions 5 and 15.a.)

Response: Regarding audit question 5, the Limerick primary means of temporary supplemental cooling do not breach the MCR envelope while in the LCO.

The loss of control enclosure and MCR HVAC post HELB is addressed in the following jumper malfunction assessment.

Temporary Jumper Malfunction Consequences:

As described in the LAR, the temporary rugged fire hose type mechanical jumpers have features installed to minimize the possibility of external leakage, and cope with a jumper rupture that could result in flooding. The HELB door also provides a fire protection barrier that requires a fire watch per the requirements of the TRM if the door does not remain in its normally closed and latched position. This area surveillance would provide early incipient type detection of jumper external leakage that will be addressed before developing into a hazard that could impact equipment functionality.

The Control Enclosure was designed to cope with internal flooding caused by a postulated medium energy line break (MELB) as described in UFSAR Sections 3.6.1.2.2.3 and 9.3.3.3. Required safety related equipment was either protected from the consequences of the MELB or designed to operate in that environment. Floor drains, physical spatial distance from postulated breaks, and elevating equipment out of the flooded areas are typical protection strategies. Flooding in the non-safety related Turbine Enclosure does not impact plant safe shutdown.

Any water spray type leakage, or complete failure of the temporary jumper(s) has the worst-case consequences of entering the same TS end state of a dual unit 12-hour plant shutdown if normal MCR cooling is not restored within 72-hours.

At Limerick, the Class-1E AC power supply system is divided into four independent power supply channels per unit. Each of these four channels supplies loads in its own load group and has a dedicated Emergency Diesel Generator (EDG) (EDG A, B, C, and D). 120 Vac class 1E control power to safety related HVAC systems and the EDG enclosure HVAC (non-TS support system) are SSCs that can be impacted and potentially rendered inoperative.

The specific worst-case impacts are as follows:

For Dual Unit Common Limerick Systems:

Either a single train or both trains of the two train Control Room Emergency Fresh Air Supply System (CREFAS), and the two train Standby Gas Treatment (SGT) could become inoperative. The TS end state is a dual unit 12-hour plant shutdown for a loss of function for either of these accident mitigation HVAC systems (TS 3.0.3).

For Limerick Unit 1:

Either a single train or both trains of the Reactor Enclosure Recirculation System (RERS) could become inoperative. The TS end state is a 12-hour plant shutdown for a loss of function for this two-train accident mitigation HVAC system.

Three of the four EDGs (D11, D13, D14) could be rendered inoperative due to loss of EDG HVAC enclosure cooling that are required to support EDG operability. The TS end state is a 2-hour action to restore EDG operability or enter a 12-hour plant shutdown statement.

For Limerick Unit 2:

The 2B train of the RERS could become inoperative. The TS action is a 7-day LCO for this two-train accident mitigation HVAC system.

Two of the four EDGs (D22, D24) could be rendered inoperative due to loss of EDG HVAC enclosure cooling that are required to support EDG operability. The TS action is a 72-hour LCO for these non-TS support systems.

The safety related TS governed accident mitigation HVAC systems are not required to achieve plant safe shutdown and the EDGs are not required to achieve plant safe shutdown because offsite power is available.

As described in the LAR, given the loss of control enclosure and MCR HVAC post HELB, other continuous or non-continuous temporary supplemental cooling methods are available and can be taken for temperature control (e.g., opening turbine enclosure, MCR and control panel doors, ice vests, portable fans, AC units, etc.). A portable diesel generator, cables, flexible ductwork, and portable fans used to cope with a fire-induced loss of MCR HVAC for plant fire safe shutdown, as well as a FLEX generator, are also available on site for a motive power supply in support of temporary supplemental cooling methods. Therefore, as required, these remediating actions would maintain equipment functionality and MCR habitability.

Also, a jumper rupture could cause loss of enough DWCW cooling water inventory to result in a loss of Limerick Unit 1 drywell cooling. If drywell temperatures are unable to be maintained within their prescribed TS limits, a single unit manual plant shutdown is the end state.

Regarding audit question 15.a, yes, the safety related seismically qualified heavy gauge steel gas tight design ductwork that is part of the main control room envelope is located in room 619 on control enclosure elevation 304. The ductwork and filter assemblies are gas tight and can withstand a pressure of 1.7 psi without structural failure and is of the same design that is located in the drywell (340°F design limit). Because of these original design considerations, the ductwork does not provide an ingress path for the muted HELB environmental condition and will not expose MCR equipment or personnel to the HELB environment with the HELB door breached. The floor slab is also watertight to address postulated MELB internal flooding, and all penetrations in the floor and wall are sealed. Therefore, there is no impact to MCR operator habitability or equipment functionality if a HELB occurred with the HELB door breached.

RAI-12: Confirm whether a dual unit shutdown starts as soon as the control room technical specification temperature limit is exceeded, given that this limit could be exceeded before the 72-hour LCO expiration. (Refer to Audit Questions 5 and 15.b.)

Response: In addition to the response to RAI #11 above and regarding audit question 15.b, the Limerick MCR HVAC system, and CECW system are common systems to both Limerick Units 1 and 2. If a control enclosure chiller cannot be restored within 72 hours or the control room temperature cannot be maintained less than or equal to the 90°F WBGT limit, then both units will be placed in at least Operational Condition (OPCON) 3 within 12 hours.

RAI-13: Confirm whether, if the drywell temperature exceeded the TS limit, Unit 1 would be shut down and Unit 2 would continue to operate until the expiration of the 72-hour LCO, provided the control room temperature is maintained within the TS acceptance level using chiller water from Unit 1 drywell chiller. (Refer to Audit Questions 5 and 15.c.)

Response: In addition to the response to RAI #11 above and regarding audit question 15.c, if a jumper malfunction occurred, then only Limerick Unit 1 would be shut down if drywell temperatures could not be maintained within their prescribed TS limits. Unit 2 would continue to operate provided control room temperature is maintained less than or equal to the 90°F WBGT limit while in the 72-hour loss of all cooling LCO. Another supplemental cooling option would be used while in the LCO under these circumstances.

RAI-14: Please confirm whether, in addition to Control Room HVAC, the control building chillers also support other HVAC equipment (e.g., Battery Rooms). When the chillers are not operating, how are the non-control room HVAC systems supported? (Refer to Audit Question 14.d.)

Response: The MCR/CREFAS HVAC systems are the only Control Enclosure HVAC system(s) that are governed by Technical Specifications.

As documented in the initial LAR submittal, because a loss of both control enclosure chillers also causes a loss of all cooling to safety related equipment in the control enclosure, these areas/rooms were also evaluated using the same methodology by Limerick calculations LM-0732 and LM-0733, respectively. The results of these analyses also support that temperatures will remain below safety related equipment functionality limits.

While not required from the conservative analysis results, supplemental temporary cooling such as fans, opening panel or room doors, portable AC units, etc., could also be implemented. The postulated HELB will cause loss of HVAC fans and the areas in the control enclosure may require implementation of existing supplemental cooling provisions.

RAI-15: Describe the actions operators would take if leakage was detected in the turbine enclosure prior to a HELB. (Refer to Audit Question 9.)

Response: The condition would be placed into the corrective action program. Any leakage would be periodically monitored, managed, and as warranted temporarily or permanently repaired by plant personnel, well before the margin to piping rupture is challenged.

If a steam leak was identified on this piping, the operability evaluation procedure would be entered, and the appropriate actions will be implemented to either mitigate or monitor and manage this condition long before it could develop into a rupture.

RAI-16: Discuss how operators would shut down the plant if a HELB occurs during the proposed jumper supplementary cooling provision (refer to Audit Questions 4, 6, 12, 16, and 19), including:

a. *A discussion of the equipment that would be relied upon to shut down the plant and if this equipment would be affected by the HELB. (Refer to Audit Questions 6 and 19.3.a.)*

Response: Regarding audit question 6, the DWCW cooling supply and return jumper connections are only installed on Unit 1, so the postulated HELB scenario vulnerability within the LCO can only occur in Unit 1.

For a Unit 1 Turbine Enclosure postulated main steam line HELB, the MSIVs close on high flow or low RPV level. After closure, a reactor SCRAM on low level or MSIV closure signal occurs. This event then becomes an isolation type transient where HPCI/RCIC controls RPV water level. To achieve plant safe shutdown after the reactor scram, a controlled manual cooldown occurs with SRVs until RHR can be placed in the shutdown cooling mode (SDC) of operation to establish plant cold safe shutdown. Offsite power is available to support plant safe shutdown.

For a Unit 1 Turbine Enclosure postulated feedwater line break HELB, the loss of feedwater flow will cause reactor water level to drop, initiating a reactor SCRAM. Water level will continue to drop because of reactor decay heat and HPCI/RCIC will control RPV water level. The remaining sequence of events to achieve safe shutdown are similar to the main steam piping break. Offsite power is available to support plant safe shutdown.

The impacted safety-related TS governed accident mitigation HVAC systems are not required to achieve plant safe shutdown and the EDGs are not required to achieve plant safe shutdown because offsite power is available. The loss of control enclosure and MCR HVAC post HELB, with remediating actions, as required, would maintain equipment functionality and MCR habitability.

Regarding audit question 19.a.3, plant safe shutdown is implemented from the main control room. The remaining functional portions of the MCR/CECW HVAC systems, that lost cooling water and required MCR AC TS LCO entry, could be rendered inoperative if the Unit 1 HELB occurred with the Control Enclosure fan room HELB door breached. This would require establishing other forms of preexisting supplemental cooling using operator manual actions (OMAs) in the control enclosure to maintain the MCR and the control enclosure within allowable temperature limits to achieve plant safe shutdown. Existing plant procedure SE-1-3 “PROTECTED VENTILATION SOURCE” used to cope with the consequences of a deterministic fire in room 619 (Fire Area 27) contains the temporary ventilation provisions that can be implemented, if required, to achieve plant

safe shutdown. These cooling provisions (non-preferred) are also described in the submitted LAR.

b. A discussion of the procedures that operators would use to shut down the plant (refer to Audit Questions 9, and 19.3.b), including any:

Response: In addition to the response to RAI #15 above and regarding audit question 19.3.b, Operations personnel will use event driven trip procedure T-101 "RPV control", procedure ON-115 "LOSS OF CONTROL ENCLOSURE COOLING", and procedure SE-1-3 "PROTECTED VENTILATION SOURCE", if required, to achieve plant safe shutdown.

i. verifications that these procedures are adequate to shut down the plant during the postulated conditions (refer to Audit Question 19.3.c)

Response: Yes, Limerick Engineering and Operations has verified that the procedures are adequate to shut down the plant if alternative equipment is required.

ii. procedure changes required for operators to be able to shut down the plant during the postulated conditions (refer to Audit Questions 16 and 19.3.d)

Response: Regarding audit question 16, yes. As part of implementing the cooling jumpers, procedure ON-115 will be revised to:

- Add the once per 4-hour 90F WBGT surveillance,
- Remove TS 3.0.3 language when purge mode is placed in service and MCR temperature exceeds 78F,
- Add other supplemental cooling provisions such as placing a portable AC Unit in the supply plenum,
- Add the crosstie cooling jumper which is a procedurally controlled temporary configuration change (PCTCC),
- Confirm a main steam or feedwater high energy pipe leak is not present prior to breaching the HELB door,
- Update functionality temperature limits that were superseded by the analysis in LM-0732 and LM-0733.

The HELB door also provides a TRM Fire Barrier function and requires a fire watch per the requirements of the TRM with the door breached to facilitate cooling jumper installation and use only while in the complete loss of cooling LCO.

For the MS HELB vulnerability, no watches are proposed. As a prerequisite, it is proposed that turbine enclosure MSL leakage via the NUMAC steam leak detection temperature indication will be checked prior to breaching the HELB

door. If pressure boundary pipe leakage is suspected or identified, then jumper installation and breaching the HELB door will be aborted.

For the FW HELB vulnerability, no watches are proposed. As a prerequisite, it is proposed to confirm no evidence of pressure boundary pipe leakage prior to breaching the HELB door. If pressure boundary pipe leakage is suspected or identified, then jumper installation and breaching the HELB door is aborted.

Regarding audit question 19.3.d, the LAR requires revision to procedure ON-115 "LOSS OF CONTROL ENCLOSURE COOLING". It is planned to include the procedure guidance on coping with a HELB and achieving plant safe shutdown if a postulated HELB occurred with the subject HELB door breached for the cooling jumper use.

iii. *additional training required for operators to be able to shut down the plant during the postulated conditions (refer to Audit Question 19.3.e)*

Response: No, additional training would not be required over and above standard processes for operational procedure revisions.

c. *A discussion of whether operators can close the HELB door between the turbine enclosure and control enclosure building if a HELB occurs during the proposed jumper supplementary cooling provision and if this action can be credited as a possible mitigative action. (Refer to Audit Question 4.)*

Response: Since the temporary crosstie cooling jumpers are routed through the partially open HELB door and impede prompt door closure, the HELB door cannot be manually closed and credited as a possible postulated HELB mitigative action.

d. *In its response to Audit Question 6, the licensee indicated that a potential HELB event with the HELB door propped open is bounded by the fire analysis for fire area 27, which assumes the complete loss of equipment in this fire area. Please confirm whether the fire safe shutdown in this area relies on an alternative shutdown (e.g., confirm whether a safe shutdown can be performed from the control room) or any equipment in the turbine enclosure that could be affected by a HELB. (Refer to Audit Question 12.)*

Response: MCR evacuation is not required to implement a dual unit plant safe shutdown per the fire safe shutdown strategy for fire area 27. Fire safe shutdown Method R would be specified in the FPER if a plant shutdown is required from the remote shutdown panel. It is acknowledged that preexisting OMAs outside of the MCR for vital ventilation are implemented during plant safe shutdown for this fire strategy.

RAI-17: Regarding the components in Room 619, what are the limiting components at the elevated temperature environment, and are any of them safety related and required for safe shutdown? (Refer to Audit Question 13.a.)

Response: The control enclosure is a safety-related, seismically qualified structure. It contains safety related SSCs that support the Control Room, Auxiliary Equipment Room, Safeguard Battery Rooms, and Safeguard Emergency Switchgear Rooms.

Electrical and electronic components are the limiting components in Room 619. The majority of SSCs in this room are safety-related and are required for plant safe shutdown and/or DBA mitigation.

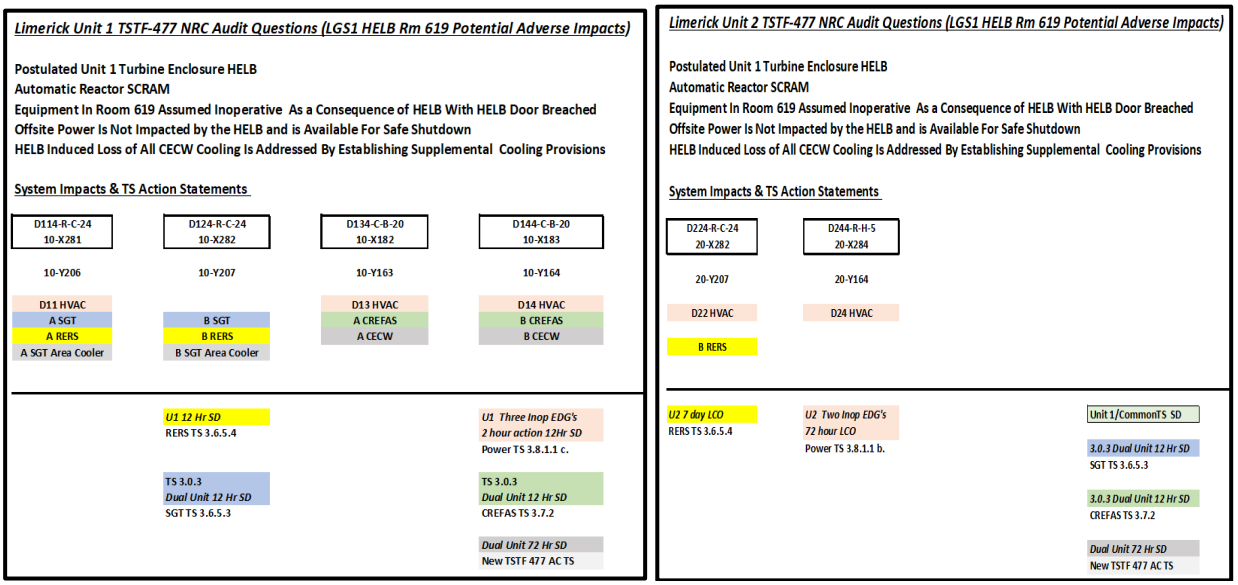
NRC approval was requested to breach the HELB door while in the complete loss of MCR cooling 72-hour LCO if a postulated HELB occurred, because:

- Credited DBA mitigation equipment could be rendered inoperable and both units would enter TS 3.0.3 and be placed in at least Operational Condition (OPCON) 3 within 12 hours.

- The remaining functional portions of the MCR/CECW HVAC systems, that lost cooling water and required MCR AC TS LCO entry, could be rendered inoperative. This would require establishing other forms of preexisting supplemental cooling using operator manual actions to maintain the MCR and the control enclosure within allowable temperature limits to achieve plant safe shutdown.

The postulated HELB environment, although muted due to spatial distance from the break, will be a hot air and steam mixture thru turbine enclosure available floor slab penetration leakage paths and the HVAC ductwork that are not addressed by available room heat-up type equipment functionality evaluations. Therefore, a conservative supporting basis is not available for these environmental conditions and the exposed equipment in room 619 is conservatively considered inoperative with the HELB door partially blocked open while in the complete loss of cooling LCO.

A list of HELB-impacted SSCs, and their associated TS LCO are provided in the following tables:



Post HELB Plant Safe Shutdown Coping Strategy:

The Limerick licensing basis for fire safe shutdown copes with a complete loss of all control enclosure cooling and has established long term supplemental cooling manual actions to maintain temperatures within allowable equipment functionality limits. This bounds and copes with the same loss of HVAC functions as the postulated HELB with the HELB door partially blocked open for use of the crosstie cooling jumpers. The below excerpt from fire safe shutdown procedure FSSG-3027 provides a list of manual actions.

2.0 VENTILATION

CAUTION

Given a loss of HVAC, limiting room temperatures can be reached within the indicated time periods. Indicated actions should be initiated upon loss of ventilation to the affected area.

AREA	TEMP.	TIME	ACTION
Inverter Rooms	130°F	4 hours	Per SE-1-3
Aux. Equipment/RSP Room	120°F	7 hours	Per SE-1-3
Control Room	120°F	9 hours	Per SE-1-3
4 KV Switchgear Rooms	122°F	4 hours	Per SE-1-3

RAI-18: Regarding application of current TS:

a. *Is the TS equipment in Control Enclosure Room 619 considered inoperable/inoperative under the current TS if the HELB door under consideration is inoperable/inoperative? (Refer to Audit Question 18.1.)*

Response: Yes, per the existing Limerick barrier breach program, if the subject HELB door is temporarily blocked open and its function is defeated, the equipment in room 619 is declared TS inoperative, because of the adverse environmental effects that may

compromise equipment functionality if a deterministic Turbine Enclosure HELB occurred. From a TS operability perspective, the HELB door is considered a non-TS support system that is required to support equipment operability in room 619 during a design bases internal hazard type event as described in UFSAR Chapter 3.

b. *Which technical specification LCO action statements is the licensee required to enter if the HELB door under consideration is inoperable/inoperative? (Refer to Audit Question 18.3.a.)*

Response: The Limerick barrier breach program basically inhibits blocking open the subject HELB door in OPCONS 1, 2, and 3. The plant would enter several 12-hour TS 3.0.3 dual unit shutdown statements.

In regard to utilizing TS 3.0.9, this TS can only be used if one train of a single multi-train TS system becomes inoperative when a credited HELB barrier is defeated. Opening the subject HELB door impacts several multi-train TS systems and creates a loss of function situation which is not permitted under TS 3.0.9. CREFAS, SGT, and EDGs (3 are required for accident mitigation) all constitute loss of function situations.

c. *Would Technical Specification 3.0.3 be entered if the HELB door is breached or only if a HELB occurred while the HELB door is breached? (Refer to Audit Question 19.1.)*

Response: Predicated on NRC approval to breach the HELB door while only in the 72-hour complete loss of cooling dual unit LCO, applicable Technical Specification actions associated with the breached HELB door would only be entered if a Turbine Enclosure HELB occurred.

RAI-19: During the audit, the licensee indicated (ref. audit question 18.3.b) that the submitted LAR requests NRC approval to not enter the Technical Specification action statements associated with temporarily defeating the subject HELB door's function. The TS footnote, as currently proposed does not include an exception to entering the technical specification action statements associated with temporarily defeating the subject HELB door's function. The proposed TS footnote, which states, "Supplemental cooling provisions, if required, may be implemented under this condition," would still require entry into these conditions because an explicit exception is not included.

Limerick LCO 3.0.1 states:

> *Compliance with the Limiting Conditions for Operation contained in the succeeding Specifications is required during the OPERATIONAL CONDITIONS or other conditions specified therein, except as provided in Specification 3.0.8. Upon failure to meet the*

Limiting Conditions for Operation, the associated ACTION requirements shall be met, except as provided in Specifications 3.0.5, 3.0.6, and 3.0.9.

As indicated in the audit response, LCO 3.0.9 cannot be applied to the CREFAS, SGT, and EDGs. Therefore, the conditions associated with these LCOs would be entered in accordance with LCO 3.0.1.

The NRC requests the licensee to either explain how the conditions associated with the LCOs discussed above would not be required to be entered with the currently proposed TS, or address (e.g., via revised TS markups) the apparent inconsistencies with the action statement completion time associated with the proposed footnote and the completion times associated with the TS action statements entered when the HELB door's function is temporarily defeated.

Response:

The proposed TS footnote is modified to include an additional sentence referencing the specific DWCW to CECW supplemental cooling provisions and eliminate the entry requirement in TS conditions associated with the HELB door being defeated while in the LCO. The following is the revised footnote wording, and Units 1 and 2 TS 3.7.2.2 is included in Attachment 2.

> # Supplemental cooling provisions, if required, may be implemented under this condition. When Hazard Barriers are unable to perform their support function(s) to allow implementation of DWCW to CECW supplemental cooling, any supported system Limiting Conditions for Operation are not required to be declared not met solely for this reason.

Furthermore, the provided TS Bases in RAI #3 (Reference 2), "3/4 7.2.2 Control Room Air Conditioning (AC) System – Common System," is revised to specify the TS LCOs and subsystems to which the revised TS footnote is referring. Below is the revised TS Bases for both Unit 1 and Unit 2, for information only.

> 3/4 7.2.2 CONTROL ROOM AIR CONDITIONING (AC) SYSTEM – COMMON SYSTEMS
>
> Each MCR AC subsystem is considered operable when the individual components necessary to maintain the control room temperature are functional. Each subsystem includes a supply fan, a return air fan, associated ductwork, dampers, centrifugal water chiller, a chilled water circulating pump, MCR cooling coil, controls, power, piping, and valves. One control room supply fan and one control room return air fan and their associated ductwork, dampers and controls are also required for air circulation to support the CREFAS subsystem function by providing a flow path to and from the control room whenever CREFAS is operating.
>
> If both chillers or AC subsystems become inoperative and main control room temperature remains less than or equal to 90° WBGT, 72-hours is permitted to restore one chiller/subsystem provided control room temperature is monitored once per 4 hours to ensure that temperature is being maintained low enough that occupants and equipment in the control room are not adversely affected. This repair time duration is reasonable considering that the control room temperature is being maintained within allowable limits and the low probability of an event occurring requiring control room isolation.

The main control room purge mode of operation, and any other viable supplemental cooling options (portable cooling, fans, opening doors, etc.) can be utilized if both chillers or subsystems are inoperative. A concurrent design basis event is not postulated while in the complete loss of cooling LCO to support supplemental cooling, as required, in order to maintain main control room temperature less than or equal to 90° WBGT. This is based upon the low probability of a concurrent event occurring while in the 72-hour LCO that requires MCR isolation.

Temporary DWCW to CECW crosstie jumpers can also be utilized as a viable supplemental cooling option, but it requires a HELB door between the Turbine Enclosure and Control Enclosure to be breached (blocked open) while only in the 72-hour complete loss of cooling LCO. It is permitted to breach the subject HELB door for supplemental cooling jumper use although it impacts several multi-train TS systems and creates a loss of function situation which is not permitted under TS 3.0.9 if a HELB occurred. CREFAS, SGT, and EDGs (required for DBA accident mitigation) all constitute loss of function situations.

The safety related SSCs protected by the breached HELB door to solely facilitate utilizing the CECW to DWCW crosstie cooling jumpers are not required to be declared inoperable while in the complete loss of CECW cooling 72-hour LCO.

The justification for this request was (1) the low probability of HELB occurring while in the LCO and (2) the ability to realistic detect a turbine enclosure high energy line leak far prior to a break occurring. The caveat for breaching the HELB door for this supplemental cooling provision is to confirm that a main steam line or feedwater high energy line leak is nonexistent. With this basis, safety related equipment in Control Enclosure room 619 would not be exposed to any post HELB environmental conditions that could compromise equipment functionality while only in the 72-hour complete loss of cooling dual unit LCO. Notwithstanding the above justification, if a postulated HELB occurred with the HELB door breached, while in the LCO, the ability to mitigate the consequences of a HELB are still maintained and plant safe shutdown can be achieved by using a preexisting fire safe shutdown strategy.

A list of impacted Tech. Spec. SSCs protected by the breached HELB door are provided below:

- Unit 1 and 2 SGT TS 3.6.5.3, 3.0.3 dual unit shutdown
- Unit 1 and 2 CREFAS TS 3.7.2, 3.0.3 dual unit shutdown
- Unit 1 RERS TS 3.6.5.4, 12-hour shutdown
- Unit 1 EDG Power TS 3.8.1.1 (3 inoperable EDGs), 2-hour action
- Unit 2 2B RERS, TS 3.6.5.4 7day LCO
- Unit 2 EDG Power TS 3.8.1.1 (2 inoperable EDGs), 72-hour LCO

The MCR AC periodic surveillance requirement verifies that the system is capable of removing the control room design basis heat loads.

When handling RECENTLY IRRADIATED FUEL, a fuel handling accident is postulated and therefore it is appropriate to suspend movement of RECENTLY IRRADIATED FUEL.

References:

1. Letter from David P. Helker, Constellation Energy Generation, LLC to the U.S. Nuclear Regulatory Commission, “License Amendment Request for Application to Adopt TSTF-477, Revision 3, ‘Add Action for Two Inoperable Control Room AC Subsystems’ and Associated Technical Specification Changes,” dated November 17, 2022 (ADAMS Accession No. ML22321A105).
2. Letter from David P. Helker, Constellation Energy Generation, LLC to the U.S. Nuclear Regulatory Commission, “Response to Request for Additional Information for License Amendment Request for Application to Adopt TSTF-477, Revision 3, ‘Add Action for Two Inoperable Control Room AC Subsystems’ and Associated Technical Specification Changes,” dated August 30, 2023 (ADAMS Accession No. ML23242A217).
3. Email from Audrey Klett, U.S. Nuclear Regulatory Commission to Stephen Flickinger, Constellation Energy Generation, LLC, “NRC Request for Additional Information Re. TSTF-477 LAR” (EPID L-2022-LLA-0174), dated October 3, 2023 (ADAMS Accession No. ML23276B464).

Attachment 2

Response to Request for Additional Information
License Amendment Request

Limerick Generating Station, Units 1 and 2
Docket Nos. 50-352 and 50-353

Mark-Ups of Limerick Technical Specifications revised based on Attachment 1, RAI 19

Unit 1 TS Pages

3/4 7-8a (New)

Unit 2 TS Pages

3/4 7-8a (New)

PLANT SYSTEMS

3/4.7.2.2 CONTROL ROOM AIR CONDITIONING (AC) SYSTEM

Entire Page is New

LIMITING CONDITION FOR OPERATION

3.7.2.2 Two control room AC subsystems shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, 3, and when RECENTLY IRRADIATED FUEL is being handled in the secondary containment.

ACTION:

a. In OPERATIONAL CONDITION 1, 2 or 3:

1. With one control room AC subsystem inoperable, restore the inoperable subsystem to OPERABLE status within 30 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

2. With two control room AC subsystems inoperable: #

a. Verify control room air temperature is less than 90°F Wet Bulb Globe Temperature at least once per 4 hours; and

b. Restore one control room AC subsystem to OPERABLE status within 72 hours.

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

b. When RECENTLY IRRADIATED FUEL is being handled in the secondary containment:

1. With one control room AC subsystem inoperable, restore the inoperable subsystem to OPERABLE status within 30 days; or immediately place the OPERABLE control room AC subsystem in operation; or immediately suspend movement of RECENTLY IRRADIATED FUEL assemblies in the secondary containment*.

2. With two control room AC subsystems inoperable, immediately suspend movement of recently irradiated fuel assemblies in the secondary containment*.

---

* The provisions of Specification 3.0.3 are not applicable.

Supplemental cooling provisions, if required, may be implemented under this condition. When Hazard Barriers are unable to perform their support function(s) to allow implementation of DWCW to CECW supplemental cooling, any supported system Limiting Conditions for Operation are not required to be declared not met solely for this reason.

3/4.7.2.2 CONTROL ROOM AIR CONDITIONING (AC) SYSTEM

Entire Page is New

LIMITING CONDITION FOR OPERATION

3.7.2.2 Two control room AC subsystems shall be OPERABLE.

APPLICABILITY: OPERATIONAL CONDITIONS 1, 2, 3, and when RECENTLY IRRADIATED FUEL is being handled in the secondary containment.

ACTION:

a. In OPERATIONAL CONDITION 1, 2 or 3:

1. With the Unit 1 diesel generator for one control room AC subsystem inoperable for more than 30 days, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

2. With one control room AC subsystem inoperable, restore the inoperable subsystem to OPERABLE status within 30 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

3. With one MCR AC subsystem inoperable and the other control room AC subsystem with an inoperable Unit 1 diesel generator, restore the inoperable subsystem to OPERABLE status or restore the inoperable Unit 1 diesel generator to OPERABLE status within 72 hours, or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

4. With the Unit 1 diesel generators for both control room AC subsystems inoperable for more than 72 hours, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

5. With two control room AC subsystems inoperable: #

a. Verify control room air temperature is less than 90°F Wet Bulb Globe Temperature at least once per 4 hours; and

b. Restore one control room AC subsystem to OPERABLE status within 72 hours.

Otherwise, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

b. When RECENTLY IRRADIATED FUEL is being handled in the secondary containment:

1. With one control room AC subsystem inoperable, restore the inoperable subsystem to OPERABLE status within 30 days; or immediately place the OPERABLE control room AC subsystem in operation; or immediately suspend movement of RECENTLY IRRADIATED FUEL assemblies in the secondary containment*.

2. With two control room AC subsystems inoperable, immediately suspend movement of recently irradiated fuel assemblies in the secondary containment.

---

* The provisions of Specification 3.0.3 are not applicable.

\# Supplemental cooling provisions, if required, may be implemented under this condition. When Hazard Barriers are unable to perform their support function(s) to allow implementation of DWCW to CECW supplemental cooling, any supported system Limiting Conditions for Operation are not required to be declared not met solely for this reason.