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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: 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

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Constellation Energy Generation, LLC (CEG), proposes changes to the Technical Specifications (TS), Appendix A of Renewed Facility Operating License Nos. NPF-39 and NPF-85 for Limerick Generating Station (Limerick), Units 1 and 2, respectively.

The proposed changes involve the Control Room Emergency Fresh Air Supply System and the Control Room Air Conditioning (AC) System.

The proposed modifications to Technical Specifications are consistent with Technical Specification Task Force (TSTF) TS Traveler TSTF-477, Revision 3, "Add Action for Two Inoperable Control Room AC Subsystems," and NUREG-1433, Revision 5, "Standard Technical Specifications – General Electric BWR/4 Plants."

CEG has concluded that the proposed changes present no significant hazards consideration under the standards set forth in 10 CFR 50.92, "Issuance of amendment."

The proposed changes have been reviewed by the Limerick Plant Operations Review Committee in accordance with the requirements of the CEG Quality Assurance Program.

This amendment request contains no regulatory commitments.

Attachment 1 provides the evaluation of the proposed changes. Attachment 2 provides a copy of the marked-up TS pages that reflect the proposed changes.

CEG requests approval of the proposed amendments by November 17, 2023. Upon NRC approval, the amendments shall be implemented within 60 days of issuance. Modifications to the respective TS Bases for the proposed TS changes will occur upon approval of this license amendment request (LAR).

ATTACHMENT 1

License Amendment Request

Limerick Generating Station, Units 1 and 2

Docket Nos. 50-352 and 50-353

EVALUATION OF PROPOSED CHANGES

Subject: 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

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1.0 SUMMARY DESCRIPTION

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Constellation Energy Generation, LLC (CEG), proposes changes to the Technical Specifications (TS), Appendix A of Renewed Facility Operating License Nos. NPF 39 and NPF 85 for Limerick Generating Station (Limerick), Units 1 and 2, respectively.

The proposed changes modify the existing title of TS 3/4.7.2 from "Control Room Emergency Fresh Air Supply System – Common System" to "Control Room Systems – Common System." The proposed changes modify the current singular Limiting Condition for Operation (LCO) from 3.7.2 to 3.7.2.1 but retains its title as "Control Room Emergency Fresh Air Supply System" (CREFAS). Under the proposed TS 3.7.2.1.a.3 (a.6 for Unit 2), an action statement is added to the applicability section for OPERATIONAL CONDITION 1, 2, or 3 indicating that with both CREFAS subsystems inoperable for reasons other than an inoperable CRE boundary (a.2 for Unit 1 and a.5 for Unit 2), be in at least HOT SHUTDOWN in the next 12 hours and in COLD SHUTDOWN within the following 24 hours. Furthermore, the proposed changes add a second LCO under this TS 3/4.7.2, 3.7.2.2 "Control Room Air Conditioning (AC) System," with an control room air temperature of 90°F Wet Bulb Globe Temperature (WBGT), and associated Surveillance Requirement (SR) 4.7.2.2. Additionally, a footnote is being added allowing the use of supplemental cooling, if required, on a loss of both Control Enclosure Chilled Water (CECW) subsystems.

The modifications to Technical Specifications are consistent with Technical Specification Task Force (TSTF) TS Traveler TSTF-477, Revision 3, "Add Action for Two Inoperable Control Room AC Subsystems," and NUREG-1433, Revision 5, "Standard Technical Specifications – General Electric BWR/4 Plants."

2.0 DETAILED DESCRIPTION

The changes requested by this amendment application are described below:

1. The title of TS Section 3/4.7.2, "Control Room Emergency Fresh Air Supply System – Common System", on TS page 3/4 7-6 for Limerick, Unit 1, and page 3/4 7-6 for Limerick, Unit 2, will be changed to the following:

3/4.7.2 "Control Room Systems – Common System"

2. TS LCO 3.7.2, Control Room Emergency Fresh Air Supply System – Common System, on TS page 3/4 7-6 for Limerick, Unit 1, and page 3/4 7-6 for Limerick, Unit 2 will be changed to the following:

3.7.2.1 Two ~~independent~~ control room emergency fresh air supply system subsystems shall be OPERABLE.

3. TS LCO 3.7.2 action 'a' on TS page 3/4 7-6 for Limerick, Unit 1, and page 3/4 7-6a for Limerick, Unit 2 will add a third action statement for Unit 1, and a sixth action statement for Unit 2, as follows:

[Unit 1]

3. With both control room emergency fresh air supply subsystems inoperable for reasons other than Condition a.2, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

[Unit 2]

6. With both control room emergency fresh air supply subsystems inoperable for reasons other than Condition a.5, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
4. SR 4.7.2.1.a on TS page 3/4 7-7 for Limerick, Unit 1, and page 3/4 7-6a for Limerick, Unit 2, will be deleted as show below:

1. ~~DELETED In accordance with the Surveillance Frequency Control Program by verifying the control room air temperature to be less than or equal to 85°F effective temperature.~~

5. Due to the renumbering of the LCOs as described above, the two SRs associated with the TS LCO 3.7.2.1 are renumbered for Limerick Units 1 and 2 as follows:

SR 4.7.2.1 is revised to SR 4.7.2.1.1

SR 4.7.2.2 is revised to SR 4.7.2.1.2

6. A new TS LCO is added to TS 3/4.7.2, TS LCO 3.7.2.2 “Control Room Air Conditioning (AC) System.” This new LCO requires two control room AC subsystems to be OPERABLE in Operational Conditions 1, 2, 3 and when recently irradiated fuel is being handled in the secondary containment. Due to the size of this change by adding a new TS LCO, the full version is shown in Attachment 2 of this LAR.
7. TS LCO 3.7.2.2 Action a.2.a will use the temperature limit of 90°F Wet Bulb Globe Temperature which is a deviation from TSTF-477. TSTF-477 uses 90°F Dry Bulb Globe Temperature. Justification for this deviation is described in Section 3.5 of this Attachment.
8. A footnote is added to new TS LCO 3.7.2.2 Action a.2 that allows, when the action statement is entered, supplemental cooling provisions to be implemented. These supplemental cooling provisions are described in Section 3.5 of this Attachment. The footnote states:

Supplemental cooling provisions, if required, will be implemented under this condition.

The marked-up TS pages that reflect the proposed changes are provided in Attachment 2. Upon approval, the TS Bases will be revised in accordance with the TS Bases Control Program to reflect the proposed changes to the TS, including station procedures.

3.0 TECHNICAL EVALUATION

3.1 Background:

Limerick Units 1 and 2 currently operate with TS 3.7.2 “Control Room Emergency Air Filtration System – Common System” requiring two independent CREFAS subsystems to be operable while in all operational conditions, as well as when recently irradiated fuel is being handled in the secondary containment. This system is designed to keep the Main Control Room (MCR) habitable during design basis accidents, primarily to filter out radioisotopes and allow operators to remain in the MCR to mitigate the transient.

The Limerick MCR heating, ventilation, and air conditioning (HVAC) system design basis is to provide a suitable temperature environment that ensures both occupant habitability and equipment functionality during normal and accident conditions. This includes maintaining temperature limits for a 30-day continuous occupancy following isolation of the control room envelope under postulated accident conditions.

To accomplish this design basis, Limerick has two 100% capacity, independent and redundant, emergency diesel-backed MCR HVAC systems that are provided for control room temperature control to ensure that at least one system is available if a single failure disables the other. The two Control Enclosure Chilled Water systems are described in the Limerick UFSAR but, currently, do not have an associated TS LCO that governs their operability requirements. CECW is classified as safety related and seismically qualified with the exception of the humidification equipment, roll-filters, electric duct heaters and toilet room exhaust fan. Simplified schematics of the CREFAS and CECW systems are shown on Figures 1 through 4 provided at the end of this attachment. They illustrate the MCR HVAC system flow paths in the normal, purge mode, and CREFAS pressurized radiation isolation mode of operation, and the CECW system.

The redundant CREFAS system HVAC trains function to limit control room envelope occupant exposure and the redundant control enclosure chilled water subsystems that maintain control room temperature can operate independently from each other. Thus, the requested amendment enables entry into the limiting conditions for operation (LCO) for Control Room AC (e.g., due to a chiller or chilled water pump trip) and avoids entry into the CREFAS LCO. Conversely, one control room supply fan and one control room return air fan and their associated ductwork, dampers and controls that are part of CREFAS are required for air circulation to support the Control Room AC, chilled water subsystem’s function. Inoperability of one of these air circulation components, would require entry into the CREFAS LCO but avoids entry into the Control Room AC LCO.

The proposed changes to TS 3.7.2, adds TS LCO 3.7.2.2 “Control Room Air Conditioning (AC) System” as a new TS LCO with an associated TS SR 4.7.2.2. TS LCO 3.7.2.2 is titled as described to be consistent with verbiage in NUREG-1433; however, at Limerick, no system is currently titled this way. Therefore, for purposes of system consistency, Limerick proposes that Control Room Air Conditioning AC system be synonymous with the above described CECW system. The design functions and basis for operation are the same.

Additionally, to satisfy Limerick’s current TS SR 4.7.2.1.a, control room air temperature must be maintained less than or equal to an 85°F effective temperature. The proposed change deletes TS SR 4.7.2.1.a, and relocates the verification of MCR cooling in new TS LCO 3.7.2.2 action a.2,

This Action requires operators to verify control room temperature is less than 90°F Wet Bulb Globe Temperature (WBGT) every 4 hours and restore one AC chiller subsystem within 72 hours or be in at least HOT SHUTDOWN in 12 hours. Therefore, the CREFAS LCO only serves as the filtration function of MCR HVAC for radiological habitability. CREFAS and the MCR HVAC fans can operate without the AC cooling chillers operable. Thus, with the proposed changes, if both AC chillers become inoperable Limerick would only be in the TS Action 3.7.2.2.a.2.

In addition to the TS changes described above, a footnote is being added to the new TS LCO 3.7.2.2 action a.2 that allows for supplemental cooling provisions to be implemented under the action statement. The two supplemental cooling provisions, described below, support additional methods of cooling the MCR using a MCR purge mode of operation, as well as implementing a plant modification by installing manually operated process tap connections to crosstie the non-safety related Drywell Chilled Water (DWCW) system directly to the MCR safety related control enclosure chilled water-cooling coils. These supplemental provisions provide operators with more strategies to maintain habitability in the MCR under appropriate conditions and procedural direction.

3.2 Applicability of TSTF-477, and Published Safety Evaluation

CEG has reviewed TSTF-477, Rev. 3 (Reference 2), and the NRC model safety evaluation (SE) (Reference 3) as part of the consolidated line-item improvement process (CLIP). CEG has concluded that the information in TSTF-477, as well as the SE prepared by the NRC staff are applicable to Limerick Generating Station and justify this amendment for incorporation of the changes to the proposed new Limerick TS 3.7.2.2.

3.3 Optional Changes and Variations to Conform with NUREG-1433

CEG is proposing additional changes to ensure consistency with NUREG-1433, Rev 5, "Standard Technical Specifications (STS), General Electric Plant, BWR/4." Current TS 3/4.7.2 is renumbered as TS LCO 3/4.7.2.1 and revised; and new TS LCO 3/4.7.2.2 is added to establish separate LCO requirements for the Control Room Air Conditioning (AC) system. This new specification will provide the necessary requirements, consistent with NUREG-1433, to address the condition when Control Room AC subsystems are inoperable. The additional changes are discussed below.

1. Addition of New TS and Editorial Changes

The current Limerick TS 3.7.2, "Control Room Emergency Fresh Air Supply System – Common System" will be split into two separate TS LCOs and renamed. TS 3.7.2 will be titled "Control Room Systems – Common System" and encompass two LCOs. The current CREFAS LCO will become TS 3.7.2.1 and a new TS LCO will be added, TS 3.7.2.2 "Control Room Air Conditioning (AC) System". Currently, Limerick does not have an LCO for MCR cooling subsystems. This new LCO establishes OPERABILITY conditions for the AC subsystems in OPERATIONAL CONDITIONS 1, 2, 3 and when RECENTLY IRRADIATED FUEL is being handled in the secondary containment. The TS Index is revised to reflect these changes.

Along with the new TS LCO, a new SR is proposed. SR 4.7.2.2 requires that each control room AC subsystem be demonstrated OPERABLE in accordance with the

Surveillance Frequency Control Program by verifying each subsystem has the capability to remove the assumed heat load. This SR verifies that the heat removal capability of the system is sufficient to remove the control room heat load assumed in the design analysis.

Two current SRs, 4.7.2.1 and 4.7.2.2, are renumbered as 4.7.2.1.1 and 4.7.2.1.2, respectively, to fall under the CREFAS TS LCO 3.7.2.1 but are otherwise not changed.

2. Changes to TS 3.7.2.1 “Control Room Emergency Fresh Air Supply System – Common System”

An action statement is added to each Unit’s newly numbered LCO 3.7.2.1. The action numbering is different for both Units, but the statement reads the same:

With both control room emergency fresh air supply subsystems inoperable for reasons other than Condition a.2, [a.5 for Unit 2] be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

It provides a shutdown statement to ensure that at least one CREFAS subsystem is OPERABLE; otherwise, Limerick will enter a dual unit shutdown statement, as described above. Adding this action statement ensures that MCR radiological habitability conditions will always meet its design criteria of keeping radiological effluent material below design limits in the event of a design basis accident. The word “independent” in LCO 3.7.2.1 is removed to be consistent with NUREG 1433, Rev. 5.

3. Deletion of SR 4.7.2.1.a

The proposed amendment deletes SR 4.7.2.1.a. SR 4.7.2.1.a determines equipment operability for the CREFAS system by surveillance of the control room temperature (i.e., the function of the Control Room AC system). While this SR provides an indication of control room cooling, it does not assure that the necessary quality of the systems and components for control room cooling is maintained. New TS LCO 3.7.2.2 contains an action statement with two AC subsystems inoperable to verify control room air temperature is less than 90°F WBGT at least once per 4 hours and return one subsystem to OPERABLE within 72 hours, otherwise be in at least HOT SHUTDOWN within 12 hours and COLD SHUTDOWN within the following 24 hours. It is a more appropriate way to verify the cooling function and the quality of the control room cooling systems and components. Deletion of current SR 4.7.2.1.a is consistent with NUREG-1433, Rev. 5., and consistent with TSTF-477, Rev 3. Proposed SR 4.7.2.2, discussed above, confirms adequate control room cooling at an appropriate frequency.

4. Footnote Added to Proposed TS 3.7.2.2

A footnote, marked as ‘#’, is added to TS LCO 3.7.2.2 action a.2. This is an additional footnote not within the comparable NUREG 1433, Rev. 5 TS 3.7.5. The additional footnote provides supplemental cooling provisions when the action

statement is entered. The supplemental cooling provisions allow for temporary cooling sources when in the action statement, under certain circumstances and as directed by procedure. Additional detail of the supplemental cooling provisions is described in Section 3.5 of this attachment.

3.4 Justification for deviating from TSTF 477 Rev. 3 and using 90°F WBGT

To satisfy Limerick's current TS SR 4.7.2.1 a., control room air temperature must be maintained less than or equal to an 85°F effective temperature. The installed MCR dry bulb air temperature indicator, used to routinely verify the TS surveillance requirement, has an indicated range of 50°F to 150°F.

An effective temperature of 85°F ranges from 85°F dry bulb air temperature at 100% relative humidity to 113°F dry bulb air temperature at 7% relative humidity. The 85°F effective temperature limit basis is documented in Section 4.2.4, Recommendation 4, of the Control Room Habitability Working Group memo from H.R. Denton to W.J. Dircks (Reference 25). This limit addresses both occupant habitability and equipment functionality. Section 4.2.4 states: "If the human operator is considered to be an integral subsystem required for safe plant operation, then the limiting conditions for operation in the control room should be based on the more limiting performer whether it be equipment or human." For Limerick, operator habitability is limiting. Prior to this working group, the MCR TS temperature limit was solely based upon equipment qualification temperature.

Under normal operating conditions, one MCR HVAC system and its associated control enclosure chiller and cooling subsystem are in service with 2100 CFM of outside air being admitted into the MCR to provide an hourly air change per the American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) standards (See Figure 1 of this Attachment). The remaining air is recirculated in the areas served by the MCR HVAC system. The MCR is continuously occupied and fully air conditioned for personnel comfort and equipment cooling. MCR temperature is automatically maintained in a temperature range of 68°F-70°F, by sensing MCR return air duct temperature.

Additionally, as described in the UFSAR, the MCR HVAC system also has a purge mode of operation. Its function is to purge the areas served by the control room HVAC system of smoke from a fire by using a 100% fresh air supply and exhausting 100% of the air (See Figure 2 of this Attachment).

The MCR purge mode of operation can also be used in Limerick Off Normal (ON) procedure ON-115, "Loss of Control Enclosure Cooling," to provide supplemental cooling if the MCR temperature reaches 78°F dry bulb temperature during an abnormal condition when a complete loss of MCR cooling occurs.

As identified by plant-specific and nuclear industry operating experience, chiller performance issues are the predominant cause for loss of MCR cooling that challenge the MCR TS effective temperature limit. The purpose of this evaluation is to examine the most likely specific loss of cooling vulnerabilities based upon industry operating experience. These vulnerabilities are:

- When the operating control enclosure chiller trips while the redundant control enclosure chiller is inoperable for planned maintenance, or
- When shutting down the operating chiller and the standby chiller fails to start. The off-going chiller is available in this circumstance.

All other scenarios that are not enveloped by a single equipment failure, that require multiple coincident failures to cause a loss of all normal cooling with a loss of ventilation air flow, were not evaluated. If a concurrent loss of fans and both control enclosure chillers or subsystems actually occurred, with the plant operating at full power conditions, control room temperature cannot be controlled and can eventually increase above the proposed footnote 90°F WBGT limit. The subsequent actions would be no different than, or essentially the same as, the current surveillance requirement if cooling cannot be restored. Under the current TS SR and proposed TS 3.7.2.1 action 3 [action 6 for Unit 2], a loss of all forced circulation and, TS 3.7.2.2 action a.2 a loss of all cooling would require a dual unit plant shutdown. (See Figure 4 of this Attachment).

Analysis Summary/Assumptions/Benchmarking:

The room heat-up evaluation under a loss of cooling scenario utilized Bechtel Power Company's CFLUD computer program (1990 vintage) that is an analysis code of record for Limerick. It is used in the Limerick design and licensing basis for Station Blackout (SBO), and fire safe shutdown room heat-up analysis, as well as steam leak detection setpoint determination. This computer program has been NRC-reviewed and approved for use at Limerick for room heat-up type temperature calculations (Reference 24).

The evaluation used conservative inputs and assumptions to determine the final bounding temperature results. They are:

- Using constant maximum design outside air temperature conditions without crediting the normal daily temperature variations.
- Using design heat loads generated by equipment and human occupants and not actual heat loads.
- All heat sinks (structural steel, cabinets, etc.) were not included in the analysis. The room perimeter concrete walls, floors, and ceilings only are modelled as heat sinks.
- Constant thermal material properties and surrounding areas temperatures.
- 100% of the design heat loads were included at time = 0.

CFLUD directly computes dry bulb temperature and relative humidity. Wet bulb temperature from these outputs is computed using "Wet Bulb Temperature from Relative Humidity and Air Temperature", Roland Stull, American Meteorological Society, November 2011, with a spreadsheet for each CFLUD output time step.

The WBGT is then computed from dry bulb temperature and wet bulb temperature using the ASHRAE Fundamentals Handbook, page 8.14, 1993 Edition, using the following equation with a spreadsheet for each CFLUD output time step:

$$T_{WBGT} = 0.7 \times T_W + 0.3 \times T_a$$

Where:

T_{WBGT} = Wet Bulb Globe Temperature °F

T_W = Wet Bulb Temperature °F

T_a = Dry Bulb Temperature °F

The evaluation temperature results were used to evaluate operator habitability and safety related equipment functionality.

The computed temperature values are very conservative and will overpredict actual heat-up temperature results. This is evidenced by actual observed MCR heat-up temperature response when both control enclosure chillers have been lost for less than a one (1) hour duration. For Limerick, the MCR dry bulb temperature is automatically maintained in a range of 68-70°F and the entry condition to use the MCR HVAC purge mode of operation for supplemental control room cooling is 78°F dry bulb temperature per Off Normal procedure ON-115. As identified by review of Operator Logs from 2005 to present, the 78°F dry bulb limit has not been challenged. The actual response based on operator interviews is that the control room temperature rapidly increases a few degrees (to 73-74°F) then rises very slowly afterwards.

Acceptance Criteria:

A loss of all control room cooling was anticipated by General Electric (GE) during the initial control room design at Limerick.

This is documented in a 1986 correspondence between Philadelphia Electric Company (PECO) and GE in response to NRC IE Notice 85-89, "Potential Loss of Solid-State Instrumentation Following Failure of Control Room Cooling." As documented in the correspondence, GE qualified control room instruments and devices to a maximum room temperature of 120°F without having to open panel doors. Qualification tests were performed to verify operability over the temperature range of 40°F-120°F. The GE to PECO correspondence is documented in calculation M-78-44, "Control Room & Auxiliary Equipment Room Heatup (Units 1 & 2)," under a loss of offsite power scenario.

This longstanding temperature limit was used in the evaluation for the proposed footnote change, like other existing Station Blackout (SBO) and fire safe shutdown room heat-up analyses of record, for assessing safety related equipment functionality. This criterion also maintains control room equipment within the original GE maximum specified operating temperature limits.

Limerick Engineering also reviewed applicable control room safety related and non-safety related plant modifications to confirm the 120°F maximum temperature limit that might not be addressed by the GE correspondence. Based on the review, the modified equipment is suitable

for the environment encountered during normal conditions and loss of all control room cooling conditions.

For operator habitability with control room temperature greater than 85°F effective temperature, for up to 72 hours in accordance with the proposed TS 3.7.2.2 action a.2 footnote, a 90°F WBGT limit was used to assess control room habitability based upon the recommendations of NUREG-0700, Revision 2, "Human-System Interface Design Review Guidelines," Table 12-7. In accordance with the NUREG table, at a 90°F WBGT or less under control room working conditions (low-activity levels, normal work clothing), there is no stay time limit. The current TS surveillance requirement effective temperature of 85°F as called out in the 1984 Control Room Habitability Working Group memo and MIL-STD-1472E, "Department of Defense Design Criteria Standard: Human Engineering," was not used because:

- The WBGT based limit is the current "state of the art" MCR habitability limit for occupant stay time,
- CEG and industry heat stress procedures use the WBGT index, and simple handheld instruments are readily available onsite to directly measure WBGT temperature, and
- Depending on seasonal outside air conditions, a MCR effective temperature limit of 85°F might not be maintained if a loss of MCR cooling occurred.

Therefore, the 90°F WBGT index limit maintains an unlimited stay time in the MCR and provides reasonable assurance that operator performance will not be affected by the MCR environment while in the footnote. This limit satisfies the intent of GDC 4 and GDC 19 as described in Limerick UFSAR Section 3.1 and was also used at Vogtle Electric Generating Plant, Units 3 and 4, as the permanent MCR TS temperature limit following a DBA. (Reference ADAMS ML18011A894).

Results/Evaluation:

In the normal MCR HVAC alignment providing 2100 CFM of outside air cooling, without normal cooling, at a constant 95°F dry bulb and 78°F wet bulb maximum design basis outside air conditions, the final computed MCR dry bulb temperature will be 111.1°F, with a WBGT temperature of 91.3°F and a relative humidity of 28%. The computed, not actual, maximum MCR dry bulb temperature rise from 70°F to 111.1°F occurs approximately one hour after loss of all control enclosure chiller cooling.

The challenge under these design basis maximum weather conditions is control room habitability caused by increased temperatures. Because control room temperatures remain less than 120°F, the systems impacted by control room temperatures remain within their allowable limits and there is no adverse effect on equipment functionality.

Under these bounding maximum weather type conditions, the MCR HVAC purge mode of operation will be used as the primary means of temporary supplemental control room cooling. This mode provides 25,200 cfm of fresh outside air for MCR cooling, and a once per five-minute MCR volume air change, while exhausting the same amount of air flow from the MCR. Opening MCR doors, or using fans, is not an effective supplemental cooling source during warm weather

conditions since the turbine enclosure temperature with the plant operating at full power conditions is approximately 104°F. In the MCR HVAC purge system alignment, the final computed MCR dry bulb temperature will be 100.6°F, with a WBGT temperature of 86.6°F and a relative humidity of 40%. The purge mode can be used intermittently or continuously.

Without normal MCR cooling, the calculated maximum steady state MCR temperature with normal & purge outside air flow rates at various constant outside air temperature conditions is tabulated below:

Control Room Temperatures With Normal & Purge Flow Outside Air Flow Rates:									
Outside Air Temperature	20	30	40	50	60	80	90	92	95
Control Room Temperature (F)									
Dry Bulb Normal 2100 CFM OA	88.6	91.4	94.8	97.2	99.4		109.4	110	111.1
WBGT Normal HVAC	67.5	69.5	72.1	73.7	76.4		89.2	90	91.3
Dry Bulb Purge 25200 CFM OA						89.4	96.7		100.6
WBGT Purge						75.6	82.9		86.6

As shown above, unless outside dry bulb air temperature is less than or equal to 92°F, the normal MCR HVAC outside air flow is not sufficient, by itself, to maintain control room WBGT temperature at or below 90°F. Therefore, while in the proposed TS 3.7.2.2, to address the worst case computed, not actual, outcome as determined by conservative analysis results, the MCR HVAC system will have to be placed into the purge mode of operation, or another means of temporary supplemental cooling will be required to maintain WBGT temperature at or below 90°F.

Furthermore, under realistic conditions that consider normal summer daily temperature variations of approximately 16°F and crediting all heat sinks, the WBGT could be maintained at or below 90°F without using the MCR HVAC purge mode of operation, while in the proposed TS 3.7.2.2. However, as also shown in the table above, initiating purging per ON-115 provides a beneficial MCR temperature reduction for occupants and equipment when MCR temperature exceeds the outside air temperature during warm weather conditions.

Given Limerick’s meteorological outside air design conditions, that corresponds to approximately 50% relative humidity and the air is heated from MCR electrical equipment heat loads and operating fans (reduces humidity), relative humidity is not a technical concern while in the proposed TS 3.7.2.2. There are no condensing mechanisms that could adversely affect equipment. The moisture will remain in the air and not adversely impact equipment functionality because control room equipment will be either at ambient temperature or higher than ambient temperature conditions, if energized.

Based upon these conservative analysis results, it is concluded that MCR operator habitability and equipment functionality can be maintained within allowable limits with the MCR HVAC system in either its normal alignment or purge alignment, depending on outside air temperature conditions, during the proposed TS 3.7.2.2 duration until a control enclosure chiller or subsystem is returned to service within 72 hours, instead of entering TS 3.0.3.

Because a loss of both control enclosure chillers or subsystems 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 the conclusion that temperatures will remain below 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 while in the proposed footnote. The Control Enclosure is a mild environment plant area that is outside the secondary containment boundary. Secondary containment entry is not required to enter or exit the Control Enclosure.

Procedure ON-115 Temperature Monitoring Requirements:

As identified by the conservative analysis results, the limiting MCR temperature parameter that challenges occupant habitability is WBGT. Equipment functionality is not challenged due to original plant design considerations. This is the technical basis for the proposed footnote and the current MCR TS effective temperature limit. Because the MCR is continuously occupied, any notable temperature changes would be immediately recognized by the operators.

As part of this license amendment request, a revision to procedure ON-115 will contain a periodic routine temperature monitoring requirement of once per four hours for both MCR WBGT and dry bulb temperature if a loss of normal MCR cooling occurs. Once the MCR dry bulb temperature threshold of 78°F is achieved, temperature is monitored much more frequently until normal cooling is restored. Calibrated WBGT monitors are readily available near the MCR and do not require any specific qualifications for use. Using the monitor, an exact control room WBGT can be easily determined and periodically monitored during a normal 12-hour operator shift.

A monitoring frequency of at least once per four hours is justified since abnormal temperature conditions can be directly sensed by the operator, with adequate time to implement remediating cooling actions for a MCR loss of cooling event and obtain a WBGT monitor to acquire the actual MCR WBGT. If actual measured MCR WBGT exceeds 90°F, then actions are taken to shut down both units.

In summary, Limerick will enter symptom-based off normal procedure ON-115 prior to any significant increase in MCR temperature or symptoms of MCR HVAC equipment malfunctions and implement the necessary monitoring and remediating actions to maintain MCR temperature within allowable limits for occupants and equipment. If this cannot be achieved, then actions are taken to shut down both units.

3.5 Supplemental Cooling Provisions

This proposed footnote, applicable to loss of normal MCR cooling, is based, in part, on the low probability of the occurrence of events which would potentially challenge MCR habitability and safety related equipment functionality temperature limits. Two supplemental cooling provisions can be utilized during a loss of MCR cooling to support lowering temperatures in the MCR: MCR HVAC Purge Mode and Temporary Mechanical Jumper of Drywell Chilled Water (DWCW) to CECW coils. These two provisions, under certain conditions and directed by established procedures, can be effective in reducing MCR temperature while in the TS LCO 3.7.2.2 a.2 action statement. Considerations for utilizing the two supplemental cooling provisions during off-normal plant conditions are described below.

3.5.1 Purge Mode Vulnerabilities/Challenges:

For Purge Mode utilization, the specific vulnerabilities or challenges are either: 1) a postulated Design Basis Accident (DBA) that automatically isolates the MCR upon sensing high radiation in the outside air intakes, or 2) release of toxic gas from an offsite location.

1) Design Basis Accident with Postulated Fuel Damage:

The purge mode of operation is overridden and cannot be used for cooling when the control room is automatically isolated on high radiation when the CREFAS is required in the event of a DBA (See Figure 3 of this Attachment).

If an automatic isolation condition were to occur in the event of a DBA concurrently while both control enclosure chillers or subsystems are out of service using the purge mode of operation for cooling, outside air cooling is reduced to a flow rate (525 cfm or less) only needed to maintain the MCR pressurized. The CREFAS pressurization mode of operation DBA safety function is to filter contaminated inlet air for pressurization and filter a portion of recirculated MCR air to limit occupant's radiological dose to less than or equal to 5 rem TEDE for the accident duration (See Figure 3 of this Attachment).

Under these circumstances, MCR temperatures may eventually reach levels causing equipment malfunctions while also adversely affecting operator habitability. If a Control Enclosure chiller or subsystem is not restored, or another means of temporary cooling is not implemented, this scenario may result in a loss of function. All these events occurring concurrently within the proposed TS limit is improbable.

If required post DBA, other continuous or non-continuous temporary non-preferred supplemental cooling methods (e.g., opening turbine enclosure, MCR and control panel doors, ice vests, portable fans, air conditioning units, etc.) are available for temperature control. The three competing issues, i.e., MCR operator heat stress, MCR equipment function, and radiological dose, will be prioritized and managed to maintain them below permissible limits until a Control Enclosure chiller or subsystem is returned to service. For example, a MCR door can be affixed partially open to admit the design maximum analyzed amount of filtered outside air to provide additional supplemental cooling while maintaining the MCR pressurized to satisfy all criteria. The MCR, its two access doors in the Turbine Enclosure, and associated envelope are all located outside the secondary containment boundary. The main turbine will be out of service post-DBA and the turbine enclosure areas surrounding the control room will cool down to ambient type conditions to further facilitate MCR cooling. While not anticipated to be required, 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 onsite for a motive power supply in support of other less preferred temporary supplemental cooling methods.

In the event of a DBA, returning a control enclosure chiller or subsystem to service (repairs, reassembly, troubleshooting, and bypassing failed logic per approved procedures) is not adversely impacted by environment conditions or radiological dose because they are located in the Control Enclosure. The Control Enclosure is a mild environment plant area that is outside

the secondary containment boundary. Secondary containment entry is not required to enter or exit the Control Enclosure.

The TS LCO 3.7.2.2 action a.2 duration and supporting rationale is the same as the Improved Standard Technical Specification NUREG 1433, Volume 2, Revision 5, Bases Section 3.7.5 (Reference 4) that addresses loss of all MCR AC cooling. It provides a 72-hour LCO for this condition as long as MCR temperature is being maintained within allowable limits and based upon the low probability of an event occurring requiring MCR isolation during the 72-hour period, and the availability of safety related, and non-safety related alternate cooling methods. If a Control Enclosure chiller or subsystem cannot be restored within 72 hours or the MCR 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 3 within 12 hours.

On these bases, use of the MCR purge mode is considered acceptable as a supplemental cooling source during the duration of TS LCO 3.7.2.2 action a.2 until a Control Enclosure chiller or subsystem is returned to service within 72 hours.

2) Toxic Gas:

For a postulated toxic gas event, the deterministic concern raised in the 1980s while in the MCR purge mode of operation, is that the large increase in air flow velocity could prevent the toxic gas sensors, or occupants, from either sensing or being alerted to the toxic gas hazard. This constitutes a loss of toxic gas detection function during a postulated toxic gas event. No credit for purge air flow diluting the MCR atmosphere for hazard mitigation or operators sensing the condition to don a self-contained breathing apparatus (SCBA) was considered.

However, like the DBA, the same rationale can be applied to a postulated toxic gas event on the basis of event low probability while in the purge mode of operation during TS LCO 3.7.2.2 action a.2.

Limerick performs periodic control room habitability toxic gas surveys. A detailed evaluation of the survey results per applicable UFSAR Regulatory Guides was performed by calculations LM-0740 (Reference 8) and LM-0744 (Reference 9). This calculation justified elimination of the automatic control room chlorine isolation function.

For Limerick, the probability of a toxic gas initiating event is below 1E-6 per year per unique chemical as documented in calculation LM-0740, Table 6-2, which on its own, meets the low probability threshold without considering the other failures needed to utilize the purge mode for supplemental cooling while in TS LCO 3.7.2.2 action a.2.

Section 2.2.3 of the 1981 NRC Standard Review Plan states that a design basis event resulting from the presence of hazardous materials in the vicinity of the plant is acceptable if the occurrence rate of potential radiation exposures in excess of the 10 CFR 100 guidelines is equal to or less than approximately 1E-6 per year and reasonable qualitative arguments exist supporting the realistic probability of this rate of occurrence.

Qualitatively, the occurrence of a toxic chemical accident, that results in MCR operators becoming incapacitated by toxic chemicals, that would cause radiation exposures to exceed 10 CFR 100 limits, would occur with a lower probability than just the probability of a chemical release

creating toxic concentrations in the MCR while in TS LCO 3.7.2.2 action a.2. Thus, using this qualitative rationale, as long as the probability remains below 1E-6 per year, accidents due to releases of hazardous chemicals are improbable.

Since these probabilities for a toxic gas release and transport exceeding a toxic limit in the MCR are lower than the 1E-6 criterion of the Standard Review Plan, a toxic gas release can be excluded from consideration for MCR habitability while in TS LCO 3.7.2.2 action a.2. On this basis, use of the MCR purge mode is considered acceptable as a primary supplemental cooling source during the footnote duration until a Control Enclosure chiller or subsystem is returned to service within 72 hours.

Preemptive donning of SCBAs is not required while in TS LCO 3.7.2.2 action a.2. since the toxic gas event probability meets the Standard Review Plan 2.2.3 exclusion criteria using a probabilistic argument, and donning a mask challenges operator heat stress and habitability. Notwithstanding this, if a valid toxic gas event is identified, procedure ON-115 will still require donning of SCBAs. Habitability and plant operation would then be reassessed based upon MCR conditions.

3.5.2 Contingency Drywell Chilled Water to Control Enclosure Chilled Water Mechanical Jumper Temporary Supplemental Cooling Option:

In support of this LAR, Limerick is installing manually operated process tap connections to crosstie the non-safety related DWCW system directly to the MCR safety related CECW cooling coils. These hard piped connections, combined with a temporary fire hose type mechanical jumper, are desired to be utilized as another form of short-term supplemental cooling while in TS LCO 3.7.2.2 action a.2. A total of two temporary jumpers (one chilled water supply and one chilled water return) will be used. For external leakage and backflow protection, the temporary jumpers will be equipped with backflow and excess flow protection devices. These features minimize the possibility of an internal flooding or loss of drywell cooling event if the jumper develops a significant leak. The temporary jumper would be used if it is identified that a Control Enclosure chiller or subsystem cannot be promptly restored due to the failure cause or other unanticipated complicating circumstances. Jumper installation and its other associated tasks to place it into operation is a manpower intensive task and will not be used unless absolutely needed.

The temporary crosstie supply and return jumper benefits, while in TS LCO 3.7.2.2 action a.2, is that it provides more supplemental cooling capability without relying on the MCR purge mode of operation. Another room heat-up evaluation was performed to determine the cooling requirements to maintain MCR dry bulb temperature below 95°F during peak weather conditions. The evaluation identified that a supply and return jumper providing 22.6 tons of temporary supplemental cooling satisfies this objective. Specifically, with the temporary jumpers installed, in the normal HVAC alignment providing 2100 CFM of outside air, without normal MCR cooling, the final computed MCR dry bulb temperature would be 94.4°F, with a WBGT temperature of 83.1°F and a relative humidity of 47%.

As discussed previously, the 72-hour condition applicable to loss of normal MCR cooling, is based, in part, on the low probability of the occurrence of concurrent postulated events while in TS LCO 3.7.2.2 action a.2. Therefore, the installation and use of these temporary jumpers with the non-safety related non-diesel backed drywell chilled water system as another temporary

supplemental cooling method assumes that no other concurrent postulated plant accidents, severe natural phenomenon, or other events occur when in this short duration action statement on the basis of low probability.

For the crosstie supply and return jumpers to be a successful temporary cooling source, a loss of offsite power (LOOP), seismic event, or a postulated High Energy Line Break (HELB) in the Turbine Enclosure are the specific deterministic events that require short term relief on a low probability basis while in TS LCO 3.7.2.2 action a.2. For jumper installation, a HELB door between the Turbine Enclosure and Control Enclosure must be partially cracked opened to run the temporary supply and return jumpers.

In the unlikely event that one of these scenarios occurs concurrently, while in TS LCO 3.7.2.2 action a.2, plant safe shutdown is not adversely impacted. Available mitigators are reestablishing MCR HVAC purge mode, using other means of supplemental cooling, crosstie jumper external leakage and backflow protection, and isolating the temporary crosstie jumpers with the qualified manual isolation valve piping connections. Industry experience has shown that high energy pipes experience leaks long before a pipe break condition develops. This phenomenon is known as leak before break. Because of leak before break considerations and the large amount of physical and spatial separation (walls/floors/elevation) between the door and the high energy piping locations, it is not expected that safety related equipment will be challenged with the HELB door cracked open to facilitate the temporary jumpers. Effective detection and isolation systems are also available for main steam piping to isolate the leak early at low flow conditions to minimize consequences.

Therefore, on a qualitative basis, having multiple concurrent failures while in TS LCO 3.7.2.2 action a.2, meets the low probability threshold and therefore temporary crosstie supply and return jumper installation is considered acceptable, as a viable non-preferred temporary supplemental cooling source.

Conclusion:

The proposed footnote for supplemental cooling provisions to recover from a loss of normal MCR cooling, when both Control Enclosure chillers or subsystems are unavailable, is considered acceptable because:

- If needed, safety related and non-safety related alternative cooling methods are available,
- Control room temperature and other impacted control enclosure safety related equipment areas can be monitored and maintained within allowable limits for occupants and/or equipment while in this short 72-hour time duration,
- The probability of a postulated DBA occurring concurrently while in this short time duration is highly improbable, and
- A plant shutdown induced transient that could result in needing the normal MCR and Control Enclosure cooling system is potentially avoided.

4.0 REGULATORY EVALUATION

4.1 Applicable Regulatory Requirements/Criteria

10 CFR 50, Appendix A, General Design Criterion 4 - Environmental and dynamic effects design bases. Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation, maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit. However, dynamic effects associated with postulated pipe ruptures in nuclear power units may be excluded from the design basis when analyses reviewed and approved by the Commission demonstrate that the probability of fluid system piping rupture is extremely low under conditions consistent with the design basis for the piping.

10 CFR 50, Appendix A, General Design Criterion 19 - Control room. A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents. Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident. Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures.

4.2 Precedents

NRC Safety Evaluation for Amendment No. 191 for Hope Creek Generating Station was issued on February 8, 2012 (ADAMS ML110590636). This amendment approved Hope Creek Generating Station's request for approval of TSTF-447, Revision 3, "Add Action for Two Inoperable Control Room AC Subsystems."

NRC Safety Evaluation for Amendment Nos. 108 and 107 for Vogtle Electric Generating Plant, Units 3 and 4, respectively, was issued on February 1, 2018 (ADAMS ML18011A894). Concerning MCR habitability, the Technical Specification Surveillance Requirement temperature acceptance criterion for the MCR following a DBA was changed from effective temperature of 85 °F as called out in MIL-STD-1472E, "Department of Defense Design Criteria Standard: Human Engineering," to the Wet Bulb Globe Temperature (WBGT) Index of 90°F based on the recommendations of NUREG-0700, "Human-System Interface Design Review Guidelines."

4.3 No Significant Hazards Consideration

In accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit," Constellation Energy Generation, LLC (CEG), proposes changes to the Technical Specifications (TS), Appendix A of Renewed Facility Operating License Nos. NPF 39 and NPF 85 for Limerick Generating Station (Limerick), Units 1 and 2, respectively.

The proposed changes modify the existing title of TS 3/4.7.2 from "Control Room Emergency Fresh Air Supply System – Common System" to "Control Room Systems – Common System." The proposed changes modify the current singular Limiting Condition for Operation (LCO) from 3.7.2 to 3.7.2.1 but retains its title as "Control Room Emergency Fresh Air Supply System" (CREFAS). Under the proposed TS 3.7.2.1.a.3 (a.6 for Unit 2), an action statement is added to the applicability section for OPERATIONAL CONDITION 1, 2, or 3 indicating that with both CREFAS subsystems inoperable for reasons other than an inoperable CRE boundary (a.2 for Unit 1 and a.5 for Unit 2), be in at least HOT SHUTDOWN in the next 12 hours and in COLD SHUTDOWN within the following 24 hours. Furthermore, the proposed changes add a second LCO under this TS 3/4.7.2, 3.7.2.2 "Control Room Air Conditioning (AC) System," with an associated Surveillance Requirement (SR) 4.7.2.2. Additionally, a footnote is being added allowing the use of supplemental cooling, if required, on a loss of both Control Enclosure Chilled Water (CECW) subsystems.

The modifications to Technical Specifications are consistent with Technical Specification Task Force (TSTF) TS Traveler TSTF-477, Revision 3, "Adding an Action Statement for Two Inoperable Control Room AC Subsystems," and NUREG-1433, Revision 5, "Standard Technical Specifications – General Electric BWR/4 Plants."

CEG has evaluated the proposed changes, using the criteria in 10 CFR 50.92, "Issuance of amendment," and has determined that the proposed changes do not involve a significant hazards consideration. The following information is provided to support a finding of no significant hazards consideration.

1. Do the proposed changes involve a significant increase in the probability or consequences of an accident previously evaluated?

Response: No

The proposed changes add TS LCO 3.7.2.2 that verifies the OPERABILITY of the MCR AC subsystems. If a loss of normal main control room (MCR) cooling occurs, a limited 72-hour time duration is required to restore one MCR cooling subsystem provided that MCR temperature is verified to be less than or equal to a 90°F WBGT every four hours. This ensures that temperature is being maintained low enough that occupants and equipment in the MCR are not adversely affected. Supplemental cooling provisions allow for additional cooling strategies during the limited 72-hour time duration to further support cooling the MCR, wherein the probably of an accident while in TS LCO 3.7.2.2 and needing the use of the supplement provisions is highly improbable.

The MCR heating, ventilation, and air conditioning (HVAC) system and its associated chilled water subsystem are not an initiator of any accident previously evaluated. Additionally, CRFEAS TS 3.7.2.1 is modified to incorporate a shutdown statement if both subsystems of CREFAS become inoperable to be in HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hour. This ensures the filtration functionality of MCR HVAC is maintained, if needed. As a result, the probability of an accident previously evaluated is not increased.

The consequences of any accident previously evaluated with these changes are no different than an accident during the existing time provided in LCO 3.0.3 to prepare for a dual unit plant shutdown. The availability of safety related, and non-safety related alternate supplemental cooling methods to maintain control room temperature within the allowable occupant habitability and equipment limits will still be available should a postulated design basis accident occur until one MCR cooling subsystem is returned to service. The probability of toxic gas accident is below the threshold in NRC Standard Review Plan 2.2.3 and is not a vulnerability for MCR habitability while using the MCR HVAC purge mode of operation as a primary alternate cooling method associated with the proposed change. As a result, the consequences of any accident previously evaluated are not significantly increased.

Additionally, administrative changes are made to be consistent with NUREG 1433, Rev 5.

Therefore, the proposed changes do not involve a significant increase in the probability or consequences of an accident previously evaluated.

2. Do the proposed changes create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No

There are no new or different accidents result from utilizing the proposed changes. The changes do not alter the design or function of the control room, its associated HVAC/chilled water system, or CREFAS, involve a physical alteration of the plant (i.e., no new or different type of permanent equipment will be installed), change the methods governing normal plant operation, impose any new or different requirements, or alter safety analysis assumptions. Ensuring the MCR air temperature is less than 90°F WBGT does not affect operator habitability or control room equipment analyses. The temporary non-safety related drywell chilled water to safety related control enclosure chilled water crosstie supply and return jumpers would only be potentially used when both safety related subsystems are out of service during concurrent activities to restore one subsystem. Supplemental cooling provisions for additional cooling strategies would be used as applicable, and the probably of an accident while in

TS LCO 3.7.2.2 and needing the use of the supplement provisions is highly improbable.

Should the 72-hour time duration expire without restoring normal cooling, or at any time, both CFREAS subsystems become inoperable, a dual unit plant shutdown will be performed as currently required by LCO 3.0.3.

Additionally, administrative changes are made to be consistent with NUREG 1433, Rev 5.

Therefore, the proposed changes do not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Do the proposed changes involve a significant reduction in a margin of safety?

Response: No

If a loss of normal MCR cooling occurs, the proposed changes provide a limited 72-hour time duration to restore one MCR cooling subsystem, provided that control room air temperature is verified to be less than or equal to a 90°F WBGT every four hours instead of requiring an immediate dual-unit plant shutdown. A plant shutdown is a transient which might be avoided by providing this limited time to make repairs. Furthermore, CRFEAS TS 3.7.2.1 is modified to incorporate a shutdown statement if both subsystems of CREFAS become inoperable to be in HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hour. This ensures the filtration functionality of MCR HVAC is maintained, if needed.

The proposed changes will not cause a significant reduction in the margin of safety considering the requirement to monitor control room less than 90°F WBGT ensures the environment for the control room equipment and occupants is maintained within allowable limits, the availability of safety related and non-safety related alternate supplemental cooling methods, the low probability of an event occurring that would require control room isolation, and the potential to avoid a plant transient in conjunction with maintaining the control room temperature offsets any risk associated with the limited 72-hour time duration.

Additionally, administrative changes are made to be consistent with NUREG 1433, Rev 5.

Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Based on the above evaluation, CEG concludes that the proposed amendments present no significant hazards consideration under the standards set forth in 10 CFR 50.92, paragraph (c), and accordingly, a finding of "no significant hazards consideration" is justified.

4.4 Conclusions

In conclusion, based on the considerations discussed above, (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or the health and safety of the public.

5.0 ENVIRONMENTAL CONSIDERATION

CEG has determined that the proposed changes would change a requirement with respect to installation or use of a facility component located within the restricted area, as defined in 10 CFR 20, or would change an inspection or surveillance requirement. However, the proposed changes do not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed changes meet the eligibility criterion for categorical exclusion set forth in 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed changes.

6.0 REFERENCES

1. NUREG-1433, Volume 1, Revision 5. GE BWR/4 Plants Improved Standard Technical Specifications.
2. TSTF-477, Revision 3, "Adding an Action Statement for Two Inoperable Control Room Air Conditioning Subsystems."
3. Federal Register Notice: "Notice of Availability Concerning Technical Specification Improvement to Add an Action Statement for Two Inoperable Control Room Air Conditioning Subsystems to the Technical Specifications Using the Consolidated Line Item Improvement Process," published on March 26, 2007 (72 FR 141432).
4. NUREG-1433, Volume 2, Revision 5. GE BWR/4 Plants Improved Standard Technical Specifications Bases
5. Calculation LM-0732, "Control Room and Aux. Equipment Room Temperature Analysis-Loss of Chilled Water."
6. Calculation LM-0733, "Temperature Response of The Control Structure Below Elevation 269'-0" and Above Elevation 289'-0" to a Loss of Control Structure Chilled Water."
7. Calculation M-78-44, "Control Room & Auxiliary Equipment Room Heatup (Units 1 & 2)" under a loss of offsite power scenario.

8. Calculation LM-0740, "Control Room Habitability for Hazardous Chemical Releases."
9. Calculation LM-0744, "Control Room Habitability Offsite Chemical Hazard Survey and Screening."
10. EC632718, "Owners Acceptance Review of LM-0732 and LM-0733."
11. EC631473, "Chlorine Detection System Abandonment."
12. EC631821, "Addition of Hot Tap Connections on CECW and DWCW Systems."
13. Limerick Off Normal Procedure ON-115, "Loss of Control Enclosure Cooling."
14. Limerick Safety Evaluation Report (NUREG-0991), Section 2.3.2, "Local Meteorology, "dated August 1983.
15. Wet Bulb Temperature from Relative Humidity and Air Temperature, Roland Stull, American Meteorological Society, November 2011 (Calculation LM-0732 reference).
16. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
17. Fundamentals Handbook, 1993 Edition (Calculation LM-0732 reference).
18. 85°F Effective Temperature Limit Basis (ADAMS ML041900518).
19. NUREG-0700, Revision 2, "Human-System Interface Design Review Guidelines" (90°F WBGT Temperature Limit Basis).
20. NRC Safety Evaluation, Vogtle Electric Generating Plant, Units 3 and 4, dated February 1, 2018 (ADAMS ML18011A894) (Control Room 90°F WBGT Technical Specification Temperature Surveillance Requirement). MIL-STD-1472E, "Department of Defense Design Criteria Standard: Human Engineering."
21. Letter, U.S. NRC to Exelon Nuclear, "Limerick Generating Station. Units 1 And 2 - Issuance of Amendment Re: High Pressure Coolant Injection Equipment Room Delta-Temperature High Isolation Trip Setpoint And Allowable Value Changes (TAC NOS.ME4171 AND ME4172), dated May 11. 2011 (ADAMS ML111101429).
22. Letter, U.S. NRC to Exelon Nuclear, "Limerick Generating Station, Units 1 And 2- Issuance of Amendments Re: Leak Detection System Setpoint and Allowable Value Changes (TAC NOS. MF3198 AND MF3199), dated December 29, 2014" (ADAMS ML14324A808)

23. Limerick Updated Final Safety Analysis Report, Sections 2.2, 3.1, 3.6, 6.4, 9.2.10, 9.4.1, and 15.6.
24. Limerick 1/2 - Issuance of Amendments 202/164 Re: High Pressure Coolant Injection Equipment Room Delta Temperature High Isolation Trip Setpoint and Allowable Value Changes (TAC Nos. ME4171 and ME4172) (ML111101429).
25. Memo from H.R. Denton, Director Nuclear Reactor Regulation to W.J. Dircks, Executive Director of Operations, on June 29, 1984 (ML041900518)

Limerick Generating Station, Units 1 and 2
Simplified Control Room Ventilation/Chilled Water System Drawings – Uncontrolled

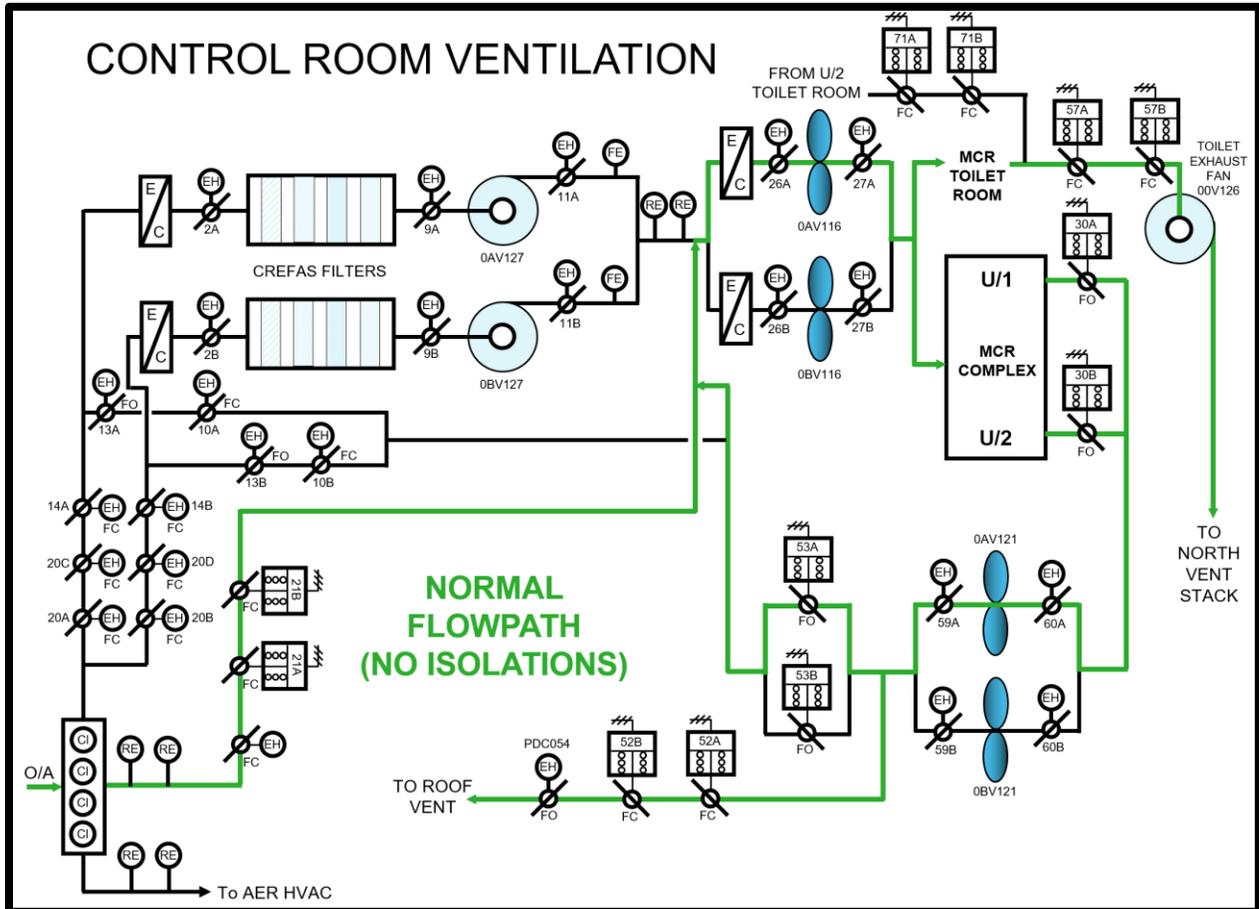


Figure 1

Limerick Generating Station, Units 1 and 2
 Simplified Control Room Ventilation/Chilled Water System Drawings – Uncontrolled

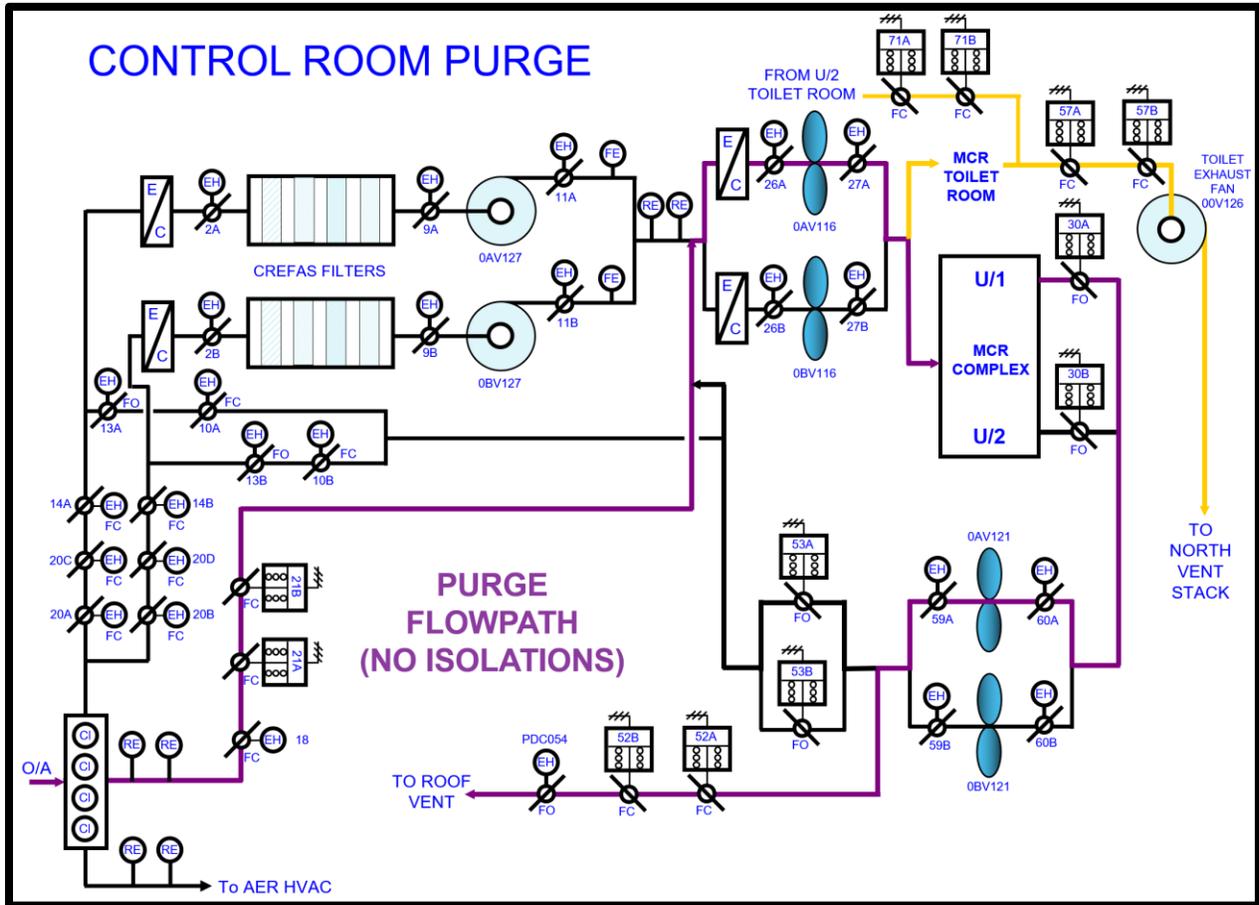


Figure 2

Limerick Generating Station, Units 1 and 2
Simplified Control Room Ventilation/Chilled Water System Drawings – Uncontrolled

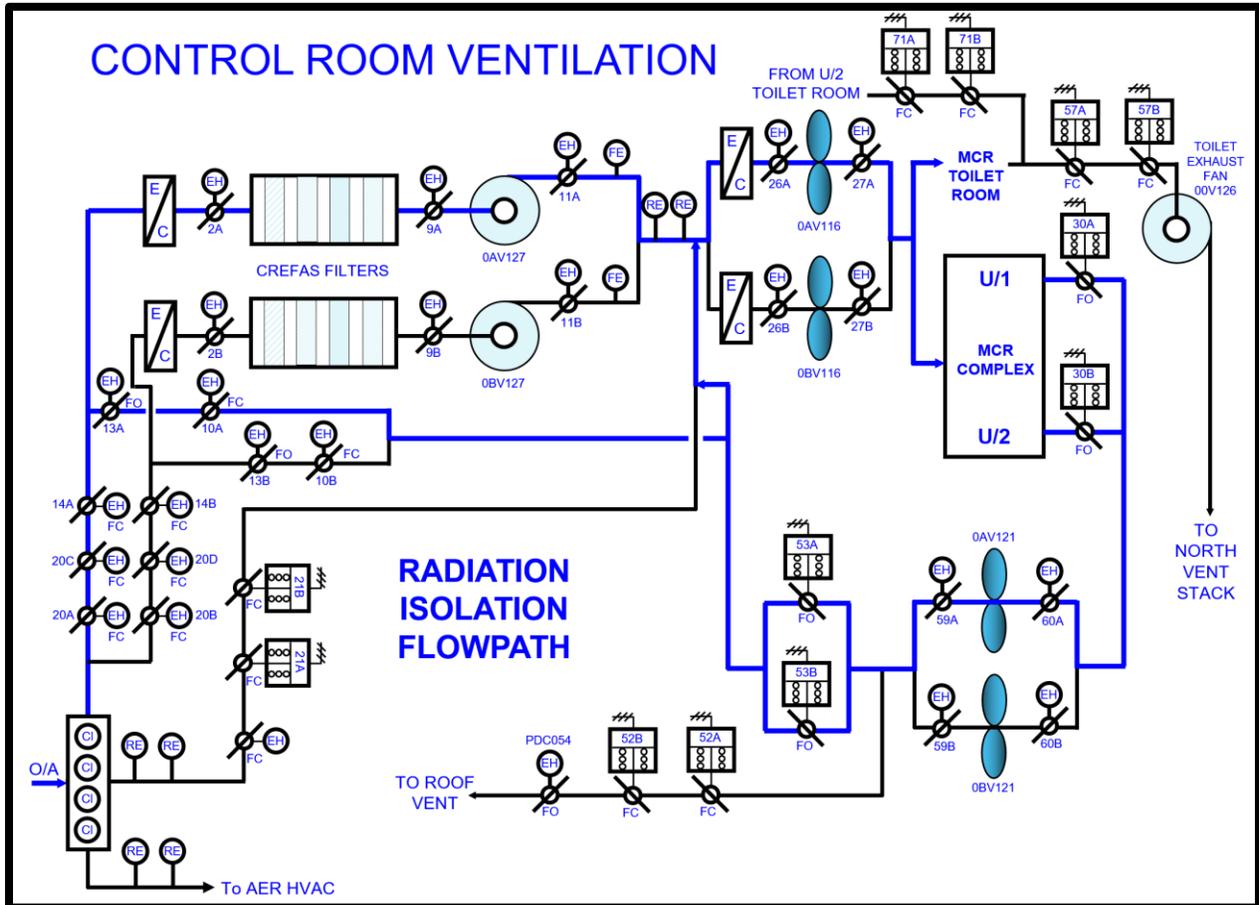
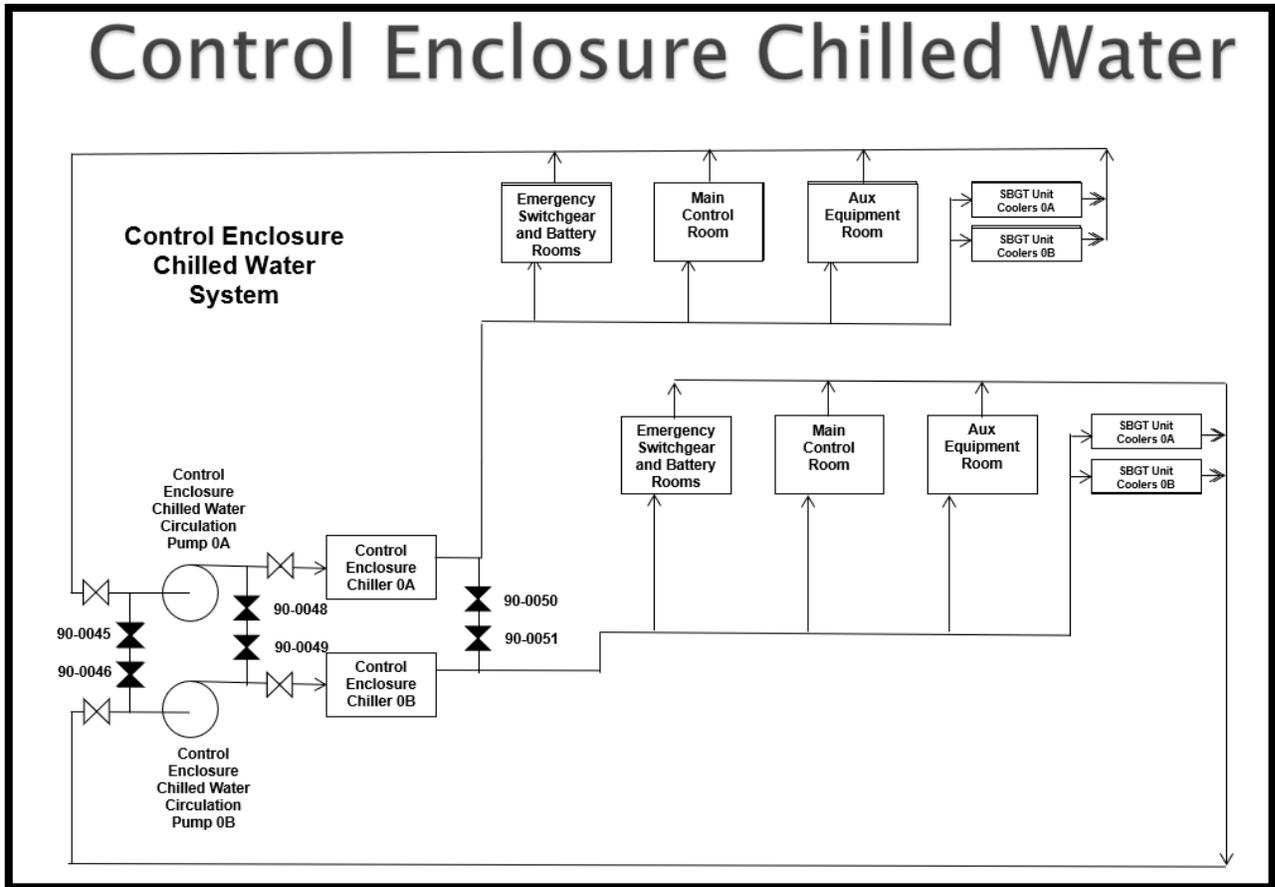


Figure 3

Limerick Generating Station, Units 1 and 2
Simplified Control Room Ventilation/Chilled Water System Drawings – Uncontrolled



* Excludes Individual Cooling Coil Temperature Control Valve and System Head Tank

Figure 4

ATTACHMENT 2

License Amendment Request

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

License Amendment Request - Proposed Adoption of Technical Specification 3.7.2.2 "Control Room Air Conditioning (AC) System" and Proposed Modification to Technical Specification 3.7.2 "Control Room Emergency Fresh Air Supply – Common System."

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LICENSEE--CONTROLLED
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3/4.7.2 CONTROL ROOM SYSTEMS

PLANT SYSTEMS

3/4.7.2 CONTROL ROOM EMERGENCY FRESH AIR SUPPLY SYSTEM-- COMMON SYSTEM

3/4.7.2.1 CONTROL ROOM EMERGENCY FRESH AIR SUPPLY SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.2 Two independent control room emergency fresh air supply system subsystems shall be OPERABLE.

NOTE: The main control room envelope (CRE) boundary may be opened intermittently under administrative control

APPLICABILITY: All OPERATIONAL CONDITIONS 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 emergency fresh air supply subsystem inoperable for reasons other than Condition a.2, restore the inoperable subsystem to OPERABLE status within 7 days or be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.
 - 2. With one or more control room emergency fresh air supply subsystems inoperable due to an inoperable CRE boundary,
 - a. Initiate action to implement mitigating actions immediately or be in HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the following 24 hours; and
 - b. Within 24 hours, verify mitigating actions ensure CRE occupant exposures to radiological and chemical hazards will not exceed limits and actions to mitigate exposure to smoke hazards are taken or be in HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the following 24 hours; and
 - c. Restore CRE boundary to operable status within 90 days or be in HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the following 24 hours.
- b. In OPERATIONAL CONDITION 4, 5, or when RECENTLY IRRADIATED FUEL is being handled in the secondary containment:
 - 1. With one control room emergency fresh air supply subsystems inoperable for reasons other than Condition b.3, restore the inoperable subsystem to OPERABLE status within 7 days or initiate and maintain operation of the OPERABLE subsystem in the radiation isolation mode of operation.
 - 2. With both control room emergency fresh air supply subsystems inoperable for reasons other than Condition b.3, immediately suspend handling of RECENTLY IRRADIATED FUEL in the secondary containment. The provisions of Specification 3.0.3 are not applicable.

3. With both control room emergency fresh air supply subsystems inoperable for reasons other than Condition a.2, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

PLANT SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

3. With one or more control room emergency fresh air subsystems inoperable due to an inoperable CRE boundary, immediately suspend handling of RECENTLY IRRADIATED FUEL in the secondary containment. The provisions of Specification 3.0.3 are not applicable.

SURVEILLANCE REQUIREMENTS

4.7.2.1¹ Each control room emergency fresh air supply subsystem shall be demonstrated OPERABLE:

- a. ~~In accordance with the Surveillance Frequency Control Program by verifying the control room air temperature to be less than or equal to 85°F effective temperature.~~
- b. In accordance with the Surveillance Frequency Control Program on a STAGGERED TEST BASIS by initiating, from the control room, flow through the HEPA filters and charcoal adsorbers and verifying that the subsystem operates with the heaters OPERABLE.
- c. In accordance with the Surveillance Frequency Control Program or (1) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (2) following painting, fire, or chemical release in any ventilation zone communicating with the subsystem by:
 1. Verifying that the subsystem satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 0.05% and uses the test procedure guidance in Regulatory Positions C.5.a, C.5.c, and C.5.d of Regulatory Guide 1.52, Revision 2, March 1978, and the system flow rate is 3000 cfm \pm 10%.
 2. Verifying within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, shows the methyl iodide penetration of less than 2.5% when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86°F) and a relative humidity of 70%.
 3. Verifying a subsystem flow rate of 3000 cfm \pm 10% during subsystem operation when tested in accordance with ANSI N510-1980.
- d. After every 720 hours of charcoal adsorber operation by verifying within 31 days after removal that a laboratory analysis of a representative carbon sample obtained in accordance with Regulatory Position C.6.b of Regulatory Guide 1.52, Revision 2, March 1978, shows the methyl iodide penetration of less than 2.5% when tested in accordance with ASTM D3803-1989 at a temperature of 30°C (86°F) and a relative humidity of 70%.

PLANT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

- e. In accordance with the Surveillance Frequency Control Program by:
 - 1. Verifying that the pressure drop across the combined prefilter, upstream and downstream HEPA filters, and charcoal adsorber banks is less than 6 inches water gauge while operating the subsystem at a flow rate of 3000 cfm \pm 10%; verifying that the prefilter pressure drop is less than 0.8 inch water gauge and that the pressure drop across each HEPA is less than 2 inches water gauge.
 - 2. Relocated to the TRM.
 - 3. Verifying that on each of the below radiation isolation mode actuation test signals, the subsystem automatically switches to the radiation isolation mode of operation:
 - a) Outside air intake high radiation, and
 - b) Manual initiation from control room.
- f. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter bank satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 0.05% in accordance with ANSI N510-1980 while operating the system at a flow rate of 3000 cfm \pm 10%.
- g. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorber bank satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 0.05% in accordance with ANSI N510-1980 for a halogenated hydrocarbon refrigerant test gas while operating the system at a flow rate of 3000 cfm \pm 10%.

4.7.2.2  1 The control room envelope boundary shall be demonstrated OPERABLE:

- a. At a frequency in accordance with the Control Room Envelope Habitability Program by performance of control room envelope unfiltered air inleakage testing in accordance with the Control Room Envelope Habitability Program.

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 place the OPERABLE control room AC subsystem in operation; or immediately suspend movement of recently irradiated fuel assemblies in the secondary containment and initiate action to suspend operations with a potential for draining the reactor vessel*.
 2. With two control room AC subsystems inoperable, immediately suspend movement of recently irradiated fuel assemblies in the secondary containment and initiate action to suspend operations with a potential for draining the reactor vessel*.

* The provisions of Specification 3.0.3 are not applicable.

Supplemental cooling provisions, if required, will be implemented under this condition

PLANT SYSTEMS

CONTROL ROOM AIR CONDITIONING (AC) SYSTEM

Entire Page is New

SUREVILLANCE REQUIREMENTS

4.7.2.2 Each control room AC subsystem shall be demonstrated OPERABLE in accordance with the Surveillance Frequency Control Program by verifying each subsystem has the capability to remove the assumed heat load.

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LIMITING CONDITIONS FOR OPERATION AND SURVEILLANCE REQUIREMENTS

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PLANT SYSTEMS

3/4.7.2 CONTROL ROOM SYSTEMS

3/4.7.2 CONTROL ROOM EMERGENCY FRESH AIR SUPPLY SYSTEM - COMMON SYSTEM

3/4.7.2.1 CONTROL ROOM EMERGENCY FRESH AIR SUPPLY SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.2 Two ~~independent~~ control room emergency fresh air supply system subsystems shall be OPERABLE.

NOTE: The main control room envelope (CRE) boundary may be opened intermittently under administrative control.

APPLICABILITY: All OPERATIONAL CONDITIONS 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 emergency fresh air supply 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 emergency fresh air supply subsystem inoperable for reasons other than Condition a.5, restore the inoperable subsystem to OPERABLE status within 7 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 control room emergency fresh air supply subsystem inoperable for reasons other than Condition a.5, and the other control room emergency fresh air supply subsystem with an inoperable Unit 1 diesel generator, restore the inoperable subsystem to OPERABLE status or restore the 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 emergency fresh air supply 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 one or more control room emergency fresh air supply subsystems inoperable due to an inoperable CRE boundary,
 - a. Initiate action to implement mitigating actions immediately or be in HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the following 24 hours; and
 - b. Within 24 hours, verify mitigating actions ensure CRE occupant exposures to radiological and chemical hazards will not exceed limits and actions to mitigate exposure to smoke hazards are taken or be in HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the following 24 hours; and

PLANT SYSTEMS

LIMITING CONDITION FOR OPERATION (Continued)

ACTION: (Continued)

c. Restore CRE boundary to operable status within 90 days or be in HOT SHUTDOWN within 12 hours and in COLD SHUTDOWN within the following 24 hours.

b. In OPERATIONAL CONDITION 4, 5 or when RECENTLY IRRADIATED FUEL is being handled in the secondary containment:

1. With one control room emergency fresh air supply subsystem inoperable for reasons other than Condition b.3, restore the inoperable subsystem to OPERABLE status within 7 days, or initiate and maintain operation of the OPERABLE subsystem in the radiation isolation mode of operation.

2. With both control room emergency fresh air supply subsystem inoperable for reasons other than Condition b.3, immediately suspend handling of RECENTLY IRRADIATED FUEL in the secondary containment. The provisions of Specification 3.0.3 are not applicable.

3. With one or more control room emergency fresh air subsystems inoperable due to an inoperable CRE boundary, immediately suspend handling of RECENTLY IRRADIATED FUEL in the secondary containment. The provisions of Specification 3.0.3 are not applicable.

6. With both control room emergency fresh air supply subsystems inoperable for reasons other than Condition a. 5, be in at least HOT SHUTDOWN within the next 12 hours and in COLD SHUTDOWN within the following 24 hours.

SURVEILLANCE REQUIREMENTS

4.7.2.1^{.1} Each control room emergency fresh air supply subsystem shall be demonstrated OPERABLE:

a. ~~In accordance with the Surveillance Frequency Control Program by verifying the control room air temperature to be less than or equal to 85°F effective temperature.~~

b. In accordance with the Surveillance Frequency Control Program on a STAGGERED TEST BASIS by initiating, from the control room, flow through the HEPA filters and charcoal adsorbers and verifying that the subsystem operates with the heaters OPERABLE.

c. In accordance with the Surveillance Frequency Control Program or (1) after any structural maintenance on the HEPA filter or charcoal adsorber housings, or (2) following painting, fire, or chemical release in any ventilation zone communicating with the subsystem by:

1. Verifying that the subsystem satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 0.05% and uses the test procedure guidance in Regulatory Positions C.5.a, C.5.c, and C.5.d of Regulatory Guide 1.52, Revision 2, March 1978, and the system flow rate is 3000 cfm ± 10%.

PLANT SYSTEMS

SURVEILLANCE REQUIREMENTS (Continued)

- f. After each complete or partial replacement of a HEPA filter bank by verifying that the HEPA filter bank satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 0.05% in accordance with ANSI N510-1980 while operating the system at a flow rate of 3000 cfm \pm 10%.
- g. After each complete or partial replacement of a charcoal adsorber bank by verifying that the charcoal adsorber bank satisfies the in-place penetration and bypass leakage testing acceptance criteria of less than 0.05% in accordance with ANSI N510-1980 for a halogenated hydrocarbon refrigerant test gas while operating the system at a flow rate of 3000 cfm \pm 10%.

4.7.2.2   The control room envelope boundary shall be demonstrated OPERABLE:

- a. At a frequency in accordance with the Control Room Envelope Habitability Program by performance of control room envelope unfiltered air inleakage testing in accordance with the Control Room Envelope Habitability Program.

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 place the OPERABLE control room AC subsystem in operation; or immediately suspend movement of recently irradiated fuel assemblies in the secondary containment and initiate action to suspend operations with a potential for draining the reactor vessel*.
 2. With two control room AC subsystems inoperable, immediately suspend movement of recently irradiated fuel assemblies in the secondary containment and initiate action to suspend operations with a potential for draining the reactor vessel*.

* The provisions of Specification 3.0.3 are not applicable.

Supplemental cooling provisions, if required, will be implemented under this condition.

PLANT SYSTEMS

CONTROL ROOM AIR CONDITIONING (AC) SYSTEM

Entire Page is New

SUREVILLANCE REQUIREMENTS

4.7.2.2 Each control room AC subsystem shall be demonstrated OPERABLE in accordance with the Surveillance Frequency Control Program by verifying each subsystem has the capability to remove the assumed heat load.

Insert 1

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