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PSEG Nuclear LLC

SEP 11 2015

10 CFR 50.90

LR-N15-0084
LAR S14-04

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

Salem Nuclear Generating Station Units 1 and 2
Renewed Facility Operating License Nos. DPR-70 and DPR-75
NRC Docket Nos. 50-272 and 50-311

Subject: License Amendment Request Modifying Chilled Water System Requirements

In accordance with 10 CFR 50.90, PSEG Nuclear LLC (PSEG) hereby requests an amendment to Renewed Facility Operating License Nos. DPR-70 and DPR-75 for Salem Nuclear Generating Station Units 1 and 2. In accordance with 10 CFR 50.91(b)(1), a copy of this request for amendment has been sent to the State of New Jersey.

The proposed change is to Technical Specification (TS) 3/4.7.10, "Chilled Water System – Auxiliary Building Subsystem." The change would allow: (1) a reduction in the number of required components (two vs. three required chillers); and (2) use of the cross-tie capability between Unit 1 and Unit 2 (one unit's chilled water system operating and providing chilled water to the cooling coils of both units). PSEG intends to utilize these revised operating configurations to implement chiller replacements and for performing maintenance on common line components. A supporting change is also proposed to the Control Room Emergency Air Conditioning System TS 3.7.6.1 (Unit 1) and TS 3.7.6 (Unit 2) ACTION a.

A public pre-submittal meeting was held with the NRC Staff to discuss this amendment request on June 24, 2015; feedback received during the meeting has been incorporated into this submittal.

Attachment 1 to this letter provides an evaluation supporting the proposed changes. The marked-up TS pages with the proposed changes are provided in Attachment 2 to this letter. Attachment 3 provides, for information only, proposed changes to the TS Bases.

There are no regulatory commitments contained in this letter.

PSEG requests NRC approval of the proposed License Amendment by September 30, 2016, to be implemented within 60 days of issuance.

These proposed changes have been reviewed by the Plant Operating Review Committee.

If you have any questions or require additional information, please contact Brian Thomas at (856) 339-2022.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on SEP 11 2015
(Date)

Respectfully,

John F. Perry
Site Vice President
Salem Generating Station

Attachments: 3

1. License Amendment Request Modifying Chilled Water System Requirements
2. TS Markup
3. TS Bases Markup

cc: Mr. D. Dorman, Administrator, Region I, NRC
Ms. C. Parker, Project Manager, NRC
NRC Senior Resident Inspector, Salem
Mr. P. Mulligan, Chief, NJBNE
Mr. L. Marabella, Corporate Commitment Tracking Coordinator
Mr. T. Cachaza, Salem Commitment Tracking Coordinator

SALEM GENERATING STATION
RENEWED FACILITY OPERATING LICENSE NOS. DPR-70 AND DPR-75
DOCKET NOS. 50-272 AND 50-311

License Amendment Request Modifying Chilled Water System Requirements

1.0 DESCRIPTION

This license amendment request proposes (1) a reduction in the number of required components (two vs. three required chillers) and (2) use of the cross-tie capability between Unit 1 and Unit 2 (one unit’s chilled water system operating and providing chilled water to the cooling coils of both units). PSEG intends to utilize these revised operating configurations to implement chiller replacements and for performing maintenance on common line components. Technical Specification (TS) 3/4.7.10, “Chilled Water System – Auxiliary Building Subsystem” Limiting Condition for Operation (LCO), Action Statements and Surveillance Requirements (SR) would be revised to reflect the conditions necessary for the proposed changes. The proposed changes would effectively create a three tier LCO configuration; each configuration with their own applicability requirements as described in Section 2.0 below. A supporting change is also proposed to the Control Room Emergency Air Conditioning System (CREACS) TS 3.7.6.1 (Unit 1) and TS 3.7.6 (Unit 2) ACTION a.

2.0 PROPOSED CHANGE

The proposed TS changes are described below and are indicated on the marked up TS pages provided in Attachment 2 of this submittal. Proposed changes to the TS Bases are provided in Attachment 3 for information only; changes to the affected TS Bases pages will be incorporated in accordance with TS 6.17 (Unit 1) and TS 6.16 (Unit 2), "Technical Specifications (TS) Bases Control Program."

1. <u>TS 3.7.10 LCO is revised as follows (Unit 2 changes reflected by *[ ]*)</u>:

   3.7.10 The chilled water system loop which services the safety-related loads in the Auxiliary Building shall be OPERABLE with ***one of the following configurations***:

	a	*b*	*c*
CONFIGURATION	***1. Three OPERABLE chillers and,*** ***2. Two OPERABLE chilled water pumps***	***1. Two OPERABLE chillers and,*** ***2. Two OPERABLE chilled water pumps***	***1. Three OPERABLE chillers and,*** ***2. Two OPERABLE chilled water pumps*** ***from either Unit 1 or Unit 2 (Units Cross-tied)(2)***
APPLICABLITY	***1. ALL MODES and during movement of irradiated fuel assemblies***	***1. November 1 through April 30 in ALL MODES and during movement of irradiated fuel assemblies*** ***2. The Unit 1[2] Emergency Control Air Compressor (ECAC) is isolated from the chilled water system*** ***3. Chilled water flow to the third chiller that is not in service is isolated(1)*** ***4. Control Room Emergency Air Conditioning System (CREACS) single filtration train alignment (TS 3.7.6.1 [3.7.6] ACTION a.) restrictions:*** ***a. Alignment only permitted to Unit 2[1]*** ***b. Unit 2[1] must be in the LCO 3.7.10a configuration*** ***c. Non-essential heat loads are isolated from the chilled water system on BOTH Units***	***1. November 1 through April 30 in ALL MODES and during movement of irradiated fuel assemblies*** ***2. The Unit 1 and Unit 2 ECACs are isolated from the chilled water system*** ***3. Non-Essential heat loads are isolated from the chilled water system on BOTH Units*** ***4. BOTH CREACS trains are operable per TS 3.7.6.1 [3.7.6] (single filtration train alignment is not permitted)*** ***5. Unit chilled water cross-tie valves are OPEN*** ***6. Administrative controls are in place for the Unit providing the required components to notify the other Unit if a chiller or pump becomes inoperable***

~~a. Three OPERABLE chillers~~

~~b. Two OPERABLE chilled water pumps~~

~~Applicability: ALL MODES and during movement of irradiated fuel assemblies~~

2. <u>TS 3.7.10 ACTION statement for MODES 1, 2, 3, and 4 is revised as follows</u>:

ACTION[3]: MODES 1, 2, 3, and 4

a. With one ***of the required*** chillers inoperable:

    1. Remove[4] the appropriate non-essential heat loads from the chilled water system within 4 hours and;

    2. Restore the chiller to OPERABLE status within 14 days or;

    3. Be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With two ***of the required*** chillers inoperable[5][6]:

    1. Remove the appropriate non-essential heat loads from the chilled water system within 4 hours and;

    2. Align the control room emergency air conditioning system (CREACs) for single filtration operation using the Salem Unit 2 *[1]* train within 4 hours and;

    3. Restore at least one chiller to OPERABLE status within 72 hours or;

    4. Be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With one chilled water pump inoperable, restore the chilled water pump to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

3. <u>TS 3.7.10 ACTION statement for MODES 5 and 6 is revised as follows</u>:

ACTION[3]: MODES 5 and 6 or during movement of irradiated fuel assemblies. *

a. With one ***of the required*** chillers inoperable:

    1. Remove[4] the appropriate non-essential heat loads from the chilled water system within 4 hours and;

    2. Restore the chiller to OPERABLE status within 14 days or;

    3. Suspend CORE ALTERATIONS and movement of irradiated fuel assemblies.

b. With two ***of the required*** chillers inoperable[5][6]:

    1. Remove the appropriate non-essential heat loads from the chilled water system within 4 hours and;

2. Align the control room emergency air conditioning system (CREACs) for single filtration operation using the Salem Unit 2 *[1]* train within 4 hours and;

3. Restore at least one chiller to OPERABLE status within 72 hours or;

4. Suspend CORE ALTERATIONS and movement of irradiated fuel assemblies.

c. With one chilled water pump inoperable, restore the chilled water pump to OPERABLE status within 7 days or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies.

4. <u>TS SR 4.7.10 is revised to add new surveillance requirements d. and e.:</u>

4.7.10 The chilled water loop which services the safety-related loads in the Auxiliary Building shall be demonstrated OPERABLE:

a. In accordance with the Surveillance Frequency Control Program by verifying that each manual valve in the chilled water system flow path servicing safety related components that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. In accordance with the Surveillance Frequency Control Program, by verifying that each automatic valve actuates to its correct position on a Safeguards Initiation signal.

c. In accordance with the Surveillance Frequency Control Program by verifying that each chiller starts and runs.

d. When in the LCO 3.7.10b configuration verify once per 24 hours:

(i) The Unit 1 [2] ECAC is isolated from the chilled water system,
(ii) Chilled water flow is isolated to the third chiller that is not in service and,
(iii) If CREACS is in single filtration alignment verify non-essential heat loads are isolated from the chilled water system on BOTH Units.

e. When in the LCO 3.7.10c configuration verify once per 24 hours:

(i) The Unit 1 and Unit 2 ECACs are isolated from the chilled water system,
(ii) Non-essential heat loads are isolated from the chilled water system and,
(iii) Cross-tie valves are verified OPEN.

5. TS 3.7.10 NOTES are revised to add new notes 1 through 6:

NOTES

(1) ***When transitioning from the LCO 3.7.10b to LCO 3.7.10a configurations, the chiller may be un-isolated (restored to service) under administrative controls***

(2) ***The LCO 3.7.10c (Cross-Tied) configuration is common to both Units; either Unit 1 chilled water components are required operable, OR Unit 2. A combination of both Units chilled water components is not permitted. When transitioning from the LCO 3.7.10c configuration to either the LCO 3.7.10a or LCO 3.7.10b configurations, chilled water components may be restored to service under administrative controls***

(3) ***When in the LCO 3.7.10c configuration ACTIONs are applicable for both Units***

(4) ***When in the LCO 3.7.10c configuration this ACTION has already been implemented***

(5) ***When in the LCO 3.7.10b configuration, implement Action b.2 AND Action b.4 OR transition to the LCO 3.7.10c configuration***

(6) ***When in the LCO 3.7.10c configuration, proceed directly to Action b.4***

* During Modes 5 and 6 and during movement of irradiated fuel assemblies, chilled water components are not considered to be inoperable solely on the basis that the backup emergency power source, diesel generator, is inoperable. **This is not applicable to the LCO 3.7.10c configuration.**

6. TS 3.7.6.1 (Unit 1) and TS 3.7.6 (Unit 2) ACTION a. is revised to add new note **:

ACTION: MODES 1, 2, 3, and 4

a. With one filtration train inoperable, align CREACS for single filtration train operation** within 4 hours, and restore the inoperable filtration train to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

MODES 5 and 6 or during movement of irradiated fuel assemblies

a. With one filtration train inoperable, align CREACS for single filtration train operation** within 4 hours, or suspend movement of irradiated fuel assemblies.

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* The CREACS is a shared system with Salem Unit 2 *[1]*

******** ***Alignment only permitted if the Unit with the operable CREACS train is also in Chilled Water System LCO 3.7.10a configuration. Alignment is not permitted if in the LCO 3.7.10c configuration.***

3.0 BACKGROUND

The Salem Auxiliary Building (AB) Chilled Water (CH) System is classified as safety related and supplies cooling to the Control, Electrical Equipment and Relay Rooms, and other safety and non-safety related equipment loads. Six separate chiller skids, three per unit, reject heat to the Service Water (SW) System. The Salem Chillers currently utilize HCFC-22 (R-22) as their refrigerant. R-22 for use in refrigeration purposes will be phased out. Through Title VI of the Clean Air Act, which is implemented by the EPA, the U.S. will ban the production and sale of R-22 because of its ozone depletion potential. Recycled R-22 will be limited in supply and costly. Currently, operators of the existing R-22 refrigeration chillers are required to monitor and recover any R-22 that leaks. As a result, the existing chillers will either require modification or replacement to meet the system demands with an acceptable refrigerant with no ozone depletion potential. Consequently PSEG plans to replace the existing chillers.

A number of design solutions for the chiller replacements were evaluated. PSEG determined that the best solution is to completely replace the existing chillers with new chiller units in the same location. The required capacity in the replacement chiller specification includes additional margin in heat load and in SW design temperature. Due to space restrictions of the chiller location an additional chiller(s) cannot be accommodated. PSEG proposes to modify the requirements for chilled water system OPERABILITY during periods of the year when fewer chillers are required for the AB CH system safety function. The cross-tie will also permit maintenance on common line AB CH components (common line components are components on lines that require the removal of a single Unit's chillers/pumps in order to perform maintenance). To reduce demand on the AB CH system when in the reduced equipment and cross-tied configurations, upgrades and maintenance will be performed during cooler portions of the year consistent with the operating restrictions proposed for the TS.

The piping cross-tie between the Unit 1 and Unit 2 AB CH system currently exists and was part of the original plant design. The AB CH system was added to the TS in 1997 by Amendments 199 and 182[1] to comply with the requirements of 10 CFR 50.36(c)(2) related to the combining of the individual Salem Control Rooms into a Common Control Room complex. Amendments 199 and 182 did not address cross-tie operation; this subsequently resulted in maintenance and operational challenges. Portions of AB CH piping cannot be taken out of service for maintenance without complete shutdown of the AB CH System; the system is required to be operable in all Modes and during the movement of irradiated fuel assemblies. The only time a single Unit's chilled water TS is not applicable is when the unit is defueled and not moving irradiated fuel. Even when defueled, the Unit's chilled water system must remain available to support the operability of the common control room ventilation system for the opposite unit. Each Salem Unit provides a single train of the two train CREACS system for the common control room. The proposed changes of this amendment request continue to support the existing accident analyses.

[1] ADAMS ML011720149

4.0 TECHNICAL ANALYSIS

4.1 AB CH System Configuration

The AB CH system for each Unit contains the following major components (a simplified diagram of the Unit 2 CH system is shown in Figure 4-1).

- Pumps - The AB CH system contains two redundant pumps.

- Chillers - Each AB CH system contains three chillers. The system can be operated with less than three operable chillers by securing some AB CH system heat loads or shifting them to other systems (permitted per existing TS). Cooling to the chiller condensers is provided by the Service Water (SW) system, which is supplied by the Delaware River.

The CH system services the following heat loads:

- Control Area Air Conditioning System (CAACS) Cooling Coils - CAACS is a sub-system of the Control Area Ventilation (CAV) System and provides cooling for the entire CAV System during normal operation. During accident conditions the CAACS provides cooling for those portions of the CAV outside of the Control Room Envelope (CRE), which includes the Electrical Equipment Rooms (EERs) and Control Area Relay Rooms (CARRs).

- Control Room Emergency Air Conditioning System (CREACS) Cooling Coils - CREACS is a sub-system of CAV and provides cooling for the CRE during accident conditions. (shown as EACC in diagram)

- Emergency Control Air Compressors (ECACs) - The ECACs provide compressed air for safety-related components.

- Penetration Area Cooling Units (PACUs) - The PACU system provides cooling for containment penetration area rooms.

- Lab and Room Coolers (Unit 2 Only) - Various laboratory and room coolers provide cooling to their respective areas.

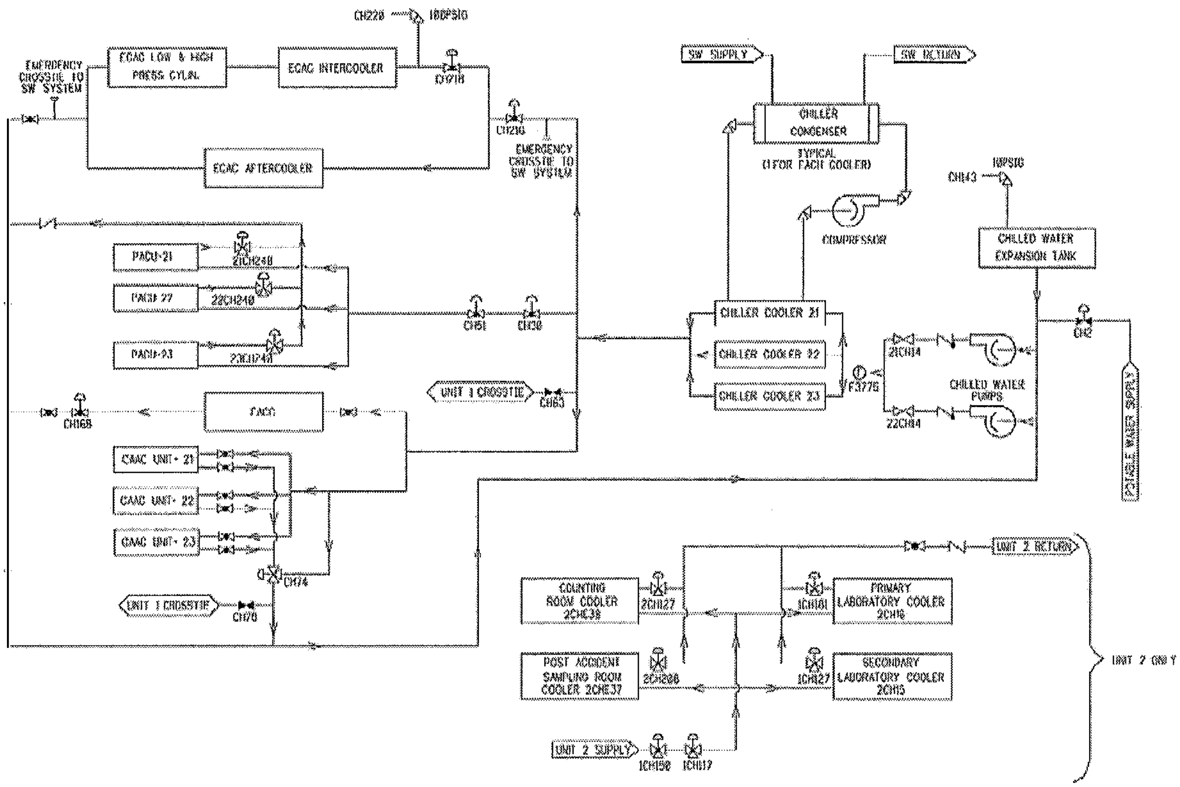

Figure 4-1 Simplified AB CH System Diagram
(Typical for both units except where indicated; Unit 2 component designations used)

As shown in the diagram, the cross-tie valves (1CH63 and 1CH78) are manual valves and will remain manual valves with the proposed TS changes. Prior to use of the cross-tie, the valves and cross-tie line-up will be tested to confirm required performance. The failure mode and effects analysis (FMEA) has determined the cross-tie configuration does not introduce any new failure modes.

The AB CH system heat load configuration for normal operations and accident conditions are shown below in Table 4-1.

Table 4-1 AB CH System Heat Load Standard Configuration

Heat Loads	**Configuration**	
	Normal Operations	**Accident Conditions (Safety Injection Signal)**
Unit 1 and Unit 2 CAACS	Operating	Operating
Unit 1 and Unit 2 CREACS	Not Operating (Note 1)	Operating
Unit 1 and Unit 2 ECACs	Not Operating	Operating
Unit 1 and Unit 2 PACUs	Operating	Isolated (non-essential)
Lab and Room Coolers (Unit 2 Only)	Operating	Isolated (non-essential)

Note 1 - The CREACS are secured during normal operation but are not isolated from the AB CH system.

The CAACS and CREACS cooling coils are essential (safety related) as they supply the CAV system (CRE, EERs and CARRs). During normal operation, both Units 1 and 2 CAACS remove heat from the common CRE and the non-CRE rooms. During accident conditions at either unit, the CREACS supplies the CRE and CAACS is isolated from the CRE. The CREACS starts from either a safety injection (SI) signal or the R1B radiation monitors in the normal CAACS intake for those accidents that do not generate an SI signal. The CREACS removes heat from the common CRE and the CAACS continues to remove heat from the non-CRE rooms. This sequence (normal and accident) will remain the same when the AB CH systems are in the proposed Two Chiller LCO 3.7.10b configuration and the Cross-Tied LCO 3.7.10c configuration.

The CREACS is a shared system between the units with two trains. Each unit provides a single train of the two train system. During normal operations the CREACS trains are in standby (not operating). The CREACS can be aligned to Single Filtration Train Mode where only a single CREACS train and cooling coil are in service for both Units and the CREACS train from the other unit is removed from service for maintenance.

The ECACs are normally aligned to the AB CH, but may be cooled by the SW System if required. Isolating the ECACs from AB CH will reduce the total heat load on the AB CH system and improve the flow distribution in the Two Chiller or Cross-Tied LCO configurations. Therefore, isolating the ECACs from the AB CH system is a prerequisite for both the Two Chiller and Cross-Tied LCO configurations.

During an accident at either unit, the non-essential heat loads (PACUs and Lab and Room Coolers (Unit 2 only)) are isolated. The non-essential loads have double isolation valves that are either automatically isolated on the accident Unit experiencing a safety injection or are manually isolated per procedure following an accident. During normal operations in the AB CH cross-tied alignment, the total system heat load for both units would exceed the capacity of one unit's chillers if the non-essential heat loads are included. For this reason, all non-essential heat loads will be preemptively isolated from both units AB CH systems when the AB CH systems are in the Cross-Tied LCO configuration. Pre-emptive isolation is not required for the Two Chiller LCO configuration unless entering CREACS Single Filtration Train Mode[2].

Single filtration alignment is only permitted if the Unit with the operable CREACS train is also in Chilled Water System LCO 3.7.10a. Single filtration alignment is not permitted if in LCO 3.7.10c.

Replacement Chillers:

One of the requirements for the new chillers is that their heat removal performance will be equal to or greater than the current chillers. As such, the conclusions of the evaluation below will apply to the replacement chillers.

[2] As allowed per TS 3.7.6.1 ACTION a.

4.2 Two Chiller LCO 3.7.10b Evaluation

4.2.1 Discussion

To demonstrate that the AB CH system can perform its design basis requirements during Two Chiller configuration, the following evaluations were performed:

1. Evaluation of the AB CH System
2. Evaluation of the Chiller performance
3. Evaluation of the CAV System performance
4. Evaluation of Environmental Limitations (i.e., outside air conditions and river water temperatures)

The evaluations assumed that one of the two required chillers is out of service to account for a possible failure of a chiller.

The calculations determined that in the Two Chiller configuration, in addition to the seasonal restriction ensuring cooler river water and air temperatures, some of the heat loads are required to be isolated from the AB CH system to maintain the total heat load below the capacity of the remaining operating chillers. Additional restrictions are required if the CREACS single filtration alignment is to be used as permitted by TS 3.7.6.1 (Unit 1) and TS 3.7.6 (Unit 2) ACTION a. No changes are required to the UFSAR Chapter 15 accident analyses to support the proposed changes. The impacts of Two Chiller operation on AB CH system components are described below, followed by a summary table identifying required operating configuration and limitations.

4.2.2 Chilled Water System Evaluation

PSEG Calculation No. S-C-CH-MDC-2319 (Reference 2) modeled the Salem Units 1 and 2 AB CH systems in the Two Chiller configuration. The results for Two Chiller operation at normal operating conditions and accident conditions are provided in Tables 4-2 and 4-3 below. The flow rate to each chiller increases during Two Chiller operation because flow is isolated to the third chiller.

Table 4-2 Chilled Water System Flow Rates at Normal Operating Conditions LCO 3.7.10b

Chilled Water Flow Rate (gpm)	Unit 1	Unit 2	Notes
Total System	349.4	350.7	
Minimum per Chiller	174.3	174.9	100 gpm assumed for Chiller Evaluation
CAACS	174.1	122.2	

Table 4-3 Chilled Water System Flow Rates at Accident Conditions LCO 3.7.10b

Chilled Water Flow Rate (gpm)	Unit 1 Accident Conditions	Unit 2 Accident Conditions	Notes
Total System Unit 1	293.8	349.4	
Minimum per Chiller Unit 1	146.6	174.3	100 gpm assumed for Chiller Evaluation
Unit 1 CAACS	191.4	174.1	The lower value of 174 gpm assumed in the Control Area System Evaluation
Unit 1 CREACS	102.4	93.1	The lower value of 93 gpm assumed in the Control Area System Evaluation
Total System Unit 2	350.7	252.4	
Minimum per Chiller Unit 2	174.9	125.9	100 gpm assumed for Chiller Evaluation
Unit 2 CAACS	122.2	143.2	The lower value of 122 gpm assumed in the Control Area System Evaluation
Unit 2 CREACS	93.2	109.2	The lower value of 93 gpm assumed in the Control Area System Evaluation

4.2.3 Chiller Evaluation

The discussion in this section is applicable to both LCO 3.7.10b and LCO 3.7.10c (evaluated in Section 4.3).

Cooling to the Chiller Condensers is provided by the SW system, which is supplied by the Delaware River. A control valve at the outlet of each chiller condenser (SW102) throttles SW flow to maintain a constant condenser pressure. A recirculation line runs from the condenser outlet back to the inlet. This line contains a recirculation pump that runs during colder SW temperature conditions to prevent potential overcooling of the condensers and possible trip on freeze protection. To reduce demand on the AB CH system when in Two Chiller or Cross-Tied configuration, chiller replacement and other system maintenance will be performed during winter months, and thus the recirculation pumps will be running.

PSEG Calculation No. S-C-CH-MDC-2282 (Reference 3) determines the heat removal capacity of the chiller unit considering the full capacity of the chiller (i.e., design condition) and the service water recirculation line for the chiller condenser in operation. The calculation uses SW system flow rates that bound the flow rates identified in Calculation No. S-C-SW-MDC-1967 (Reference 1) and uses AB CH system flow rates that bound the flow rates identified in Tables 4-2 and 4-3 (Two Chiller LCO) above and Tables 4-9 and 4-10 (Cross-Tied LCO) discussed later. Table 4-4 provides the chiller design capacity for a specific chiller AB CH outlet temperature. Table 4-4 also provides the maximum SW temperature where these chiller capacities are valid.

Table 4-4 Chiller Heat Load versus Chilled Water Outlet Temperature

Chilled Water Outlet Temperature (°F)	Evaporator Heat Load (BTU/hr)	Maximum Service Water Temperature (°F)
42.4 (Note 1)	732,900	82.7
43.0	742,700	82.4
44.0	759,300	82.0
46.0	792,100	81.1
48.0	826,700	80.2
50.0	861,200	79.3
52.0	896,500	78.4
54.0	932,700	77.5

Note 1 - The chiller design supply temperature is 44°F but Reference 3 determined that the chiller can operate down to 42.4°F while operating within the chiller control setpoints.

Operations at temperatures below the SW temperature provided in Table 4-4 will not appreciably increase the capacity of the chillers because the chiller condenser service water outlet valve SW102 controls SW flow to maintain chiller condenser pressure at 225 psia to prevent freezing in the AB CH system. The results summarized in Table 4-4 are based on a SW flow with the SW102 valve fully open. As the temperature of the SW at the chiller condenser decreases, the condenser pressure drops. As a result, the SW102 valve restricts SW flow to the chiller condenser to maintain the condenser pressure and prevent freezing in the AB CH system. This control function makes the design heat load of the chiller relatively independent of SW temperature below the values presented in Table 4-4.

Evaluation of Required SW Temperatures

The maximum allowable SW temperature from Table 4-4 is 77.5°F. The maximum allowable SW temperature during Two Chiller operation is 78.3°F (see Table 4-6 below). The maximum allowable SW temperature during Cross-Tied operation is 79.9°F (see Table 4-11 below).

SW is supplied by the Delaware River. The historical Delaware River temperatures were obtained from various sources from 1948 to 2015 (Reference 6). The maximum monthly temperatures from all of these sources[3] are provided in Table 4-4.1.

[3] The various sources contain periods where daily temperatures are not provided (i.e., instrumentation was out of service). However; the overall collection of data is sufficient and is representative of the historical maximums.

Table 4-4.1 Monthly Delaware River Water Temperatures

	Maximum Monthly Temperature (°F)
January	49.4
February	49.0
March	57.0
April	66.7
May	81.9
June	85.4
July	90.5
August	88.7
September	85.5
October	78.1
November	66.2
December	60.1

The bounding allowed service water temperature is 78.3°F (see Table 4-6). The historical data for the Delaware River at Salem has more than a 10 degree margin to this limit during the months from November to April. Limiting operation of the AB CH system in Cross-tied or Two Chiller configuration to the months of November to April ensures that the service water temperature (supplied by the Delaware River) is below the highest allowed temperature.

The use of the calendar window (November to April) is the preferred parameter for the plant Operations staff; this simplifies confirmation of conformance with the required LCO temperature restrictions (for water, and for air temperature as discussed below). This calendar approach has been previously approved by the NRC for use in Salem TS; TS 3.9.3, Refueling Operation, Decay Time[4]. TS 3.9.3 Applicability provides a similar calendar window:

Specification 3.9.3.a - From October 15th through May 15th, during movement of irradiated fuel in the reactor pressure vessel.

Specification 3.9.3.b - From May 16th through October 14th, during movement of irradiated fuel in the reactor pressure vessel.

Operation within the proposed calendar window (November 1 through April 30) for the new chiller LCO configurations does not introduce any other environmental issues unique to the timeframe.

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4 Originally introduced by Amendments 251 and 232 in October 2002 (ADAMS ML022770181); subsequently updated by Amendments 289 and 273: “Salem Nuclear Generating Station, Unit Nos. 1 and 2, Issuance of Amendments Re: Refueling Operations - Decay Time (TAC Nos. MD8259 and MD5260), September 24, 2008 (ADAMS ML082340922).”

4.2.4 Control Area Ventilation System Evaluation

4.2.4.1 Discussion

The discussion in this section is applicable to both LCO 3.7.10b and LCO 3.7.10c (evaluated in Section 4.3).

PSEG Calculation No. S-C-CAV-MDC-2320 (Reference 4) models the Salem Units 1 and 2 Control Area Ventilation (CAV) systems using GOTHIC accounting for: (1) the AB CH flows to the CAACS and CREACS from Table 4-2, 4-3, 4-9 and 4-10; and (2) the outside air conditions that are applicable when the AB CH system maintenance will be performed (November through April). This calculation determines the air temperatures in the Control Area (CRE and non-CRE rooms) and the total heat load on each of the CAACS and CREACS.

4.2.4.2 Outside Air Conditions

The discussion in this section is applicable to both LCO 3.7.10b and LCO 3.7.10c (evaluated in Section 4.3).

Calculation S-C-CAV-MDC-2320 was performed using outside air temperatures and solar irradiance for the month of April that bound, with margin, the conditions for November 1 through April 30 based on ASHRAE data. The outside conditions used in the calculation are provided in Table 4-5.

Table 4-5 Outside Air Conditions

Daily Average Temperature	75.0°F
Maximum peak Temperature	84.6°F
Solar Irradiance	Based on conditions for the month of April

The temperature and solar irradiance values used in the CAV evaluation are from ASHRAE (ASHRAE Fundamentals Handbook, 2009). The values used in the model correspond to the 0.4% design dry-bulb temperature and the clear sky solar irradiance for Wilmington, DE, the closest location with available ASHRAE data. The ASHRAE values are based on historical data over the identified period of record (POR). The ASHRAE data used in the evaluation are based on a POR between 1982 and 2006[5]. The 0.4% design temperature is the temperature that is exceeded on average 0.4% of the time which corresponds to 3 hours per month.

The solar irradiance refers to the applicable parameters required to calculate the solar-related radiative heat loads based on the distance between the Earth and the Sun, the angle of the sun, and other factors. The solar irradiance values are for the twenty-first day of the month[6].

[5] The 2013 Edition of ASHRAE Fundamentals was reviewed (POR to 2009) and the mean 0.4% design temperature for the month of April has increased by 0.2 °F and the max 0.4% design temperature has increased by 0.1 °F. The heat load due to external conditions is only a small portion of the total heat load on the CAV system. Increasing the outside air temperature in the GOTHIC model by 0.2 °F would result in temperatures increasing by less than 0.1 °F. Based on the current temperature margins, this small increase in temperatures would not impact the conclusions of this evaluation.

[6] Solar irradiance values are provided for the twenty-first of each month because the solar solstices occur on June 21 and December 21 (ASHRAE Fundamentals Handbook, 2009) which correspond to the maximum and minimum solar irradiance for the year.

The Wilmington, DE 0.4% design temperatures for all months of the year are provided in Table 4-5.1 below.

Table 4-5.1 Monthly Outside Air Temperatures for Wilmington, DE

Month	0.4% Monthly Design Temperature	Daily Average Temperature (Note 1)
January	62.4	55.2
February	66.0	58.2
March	76.9	68.2
April	84.6	75.0
May	89.5	80.0
June	93.0	84.0
July	96.2	87.6
August	94.2	85.7
September	90.7	81.7
October	81.6	72.2
November	72.6	64.0
December	67.0	59.5

Note 1: The daily average temperature equals the 0.4% monthly temperature minus half of the mean daily temperature range

The outside air temperature fluctuates diurnally and also fluctuates from day to day due to local weather variations. The GOTHIC model uses a diurnal temperature input based on the 0.4% design peak and mean temperatures for the month of April. It is acknowledged that the outside air temperature may exceed this temperature during the month of April for short periods of time. However, due to the thermal mass of the control building and the small percentage of outside air that is drawn into the CAV system, any short period of time when actual outside air temperatures exceed the model temperatures will not invalidate the conclusions of the evaluation. During the cooler winter months, it is less likely that the April 0.4% design temperatures will be exceeded for short periods of time.

The solar irradiance[7] for April twenty-first is appropriate for the months of November through April. It is noted that at some times during this period the actual solar irradiance may be higher than the April 21st values (e.g., for the final days in April). This slight change in solar irradiance will have a negligible impact on the overall AB CH system performance since the internal heat loads are much higher than the heat addition due to the full solar irradiance. Using the outside

7 Calculating the solar irradiance for a specific time of year requires complex equations and multiple inputs to account for both solar and extraterrestrial radiation and specific values are not provided in this report. See ASHRAE Fundamentals Handbook, 2009, for the input values for each month and applicable equations.

air conditions for the month of April is conservative and appropriate for conditions from October[8] through April.

4.2.4.3 Maximum Allowed SW Temperatures

Reference 4 calculates the total heat load on the AB CH system and the resulting chiller outlet temperature during normal and accident conditions while in Two Chiller operation. The chiller outlet temperatures are used to determine the maximum SW temperature using Table 4-4. The chiller AB CH outlet temperatures and maximum SW temperatures for Two Chiller operation are provided below.

Table 4-6 Chiller Outlet Temperatures and Maximum SW Temperatures for Two Chiller Operation

Condition	Chiller AB CH Outlet Temperature (ºF)	Maximum SW Temperature (ºF)
Normal Operation	50.2	79.2
Accident Conditions	52.2	78.3
Maintenance Mode (standby)	42.9	82.5
Maintenance Mode (accident)	42.4	82.7

4.2.4.4 Resulting Room Temperatures

The maximum temperatures of the Control Area rooms served by the CAV system during normal operation and accident conditions are provided in Table 4.7. The CAV system is capable of maintaining the temperatures of the Control Area Rooms below the acceptance criteria temperatures during Two Chiller operation for both normal operation and accident conditions. Acceptable operation of the CAV system during Two Chiller operation is possible due to isolating some AB CH system loads (ECACs) and securing AB CH flow to the out of service chiller (which are identified as part of the required applicability entry conditions for LCO 3.7.10b.).

8 Based on the SW temperature restrictions discussed in this report, the period of November through April is used for the proposed license amendment change.

Table 4-7 Maximum Control Area Temperatures LCO 3.7.10b

Condition		Maximum Temperature (ºF)	Acceptance Criteria (ºF)
Normal Operations	CRE and Non-CRE (CAACS)	75.8 (U1 CARR & Ops. Ready Room)	76
Accident Conditions	Non-CRE (CAACS)	75.4 (U2 EER)	76
	CRE (CREACS)	79.7 (Control Room)	85
		80.4 (U1 Data Logging (DL) Room)	90

Table 4-7.1 shows the maximum temperatures of the Control Area rooms served by the CAV during Unit 1 single filtration alignment (maintenance mode) while in normal (standby) operation and following an accident during Two Chiller operation.

Table 4-7.1 Maximum Control Area Temperatures During Unit 1 Maintenance Mode LCO 3.7.10b

Condition		Maximum Temperature (ºF)	Acceptance Criteria (ºF)
Normal Operations (standby)	CRE and Non-CRE (CAACS)	74.2 (U1 CARR)	76
		79.8 (Ops. Ready Room)	85
		82.2 (U2 DL Room)	90
Accident Conditions	Non-CRE (CAACS)	70.7 (U2 EER)	76
	CRE (CREACS)	83.3 (Control Room)	85
		85.9 (U2 DL Room)	90

Table 4-7.2 shows the maximum temperatures of the Control Area rooms served by the CAV during Unit 2 maintenance mode while in standby and following an accident during Two Chiller operation.

Table 4-7.2 Maximum Control Area Temperatures During Unit 2 Maintenance Mode LCO 3.7.10b

Condition		Maximum Temperature (ºF)	Acceptance Criteria (ºF)
Normal Operations (standby)	CRE and Non-CRE (CAACS)	74.9 (U2 EER)	76
		81.5 (Control Room)	85
		83.3 (U2 DL Room)	90
Accident Conditions	Non-CRE (CAACS)	72.7 (U2 EER)	76
	CRE (CREACS)	82.1 (Control Room)	85
		83.1 (U2 DL Room)	90

4.2.4.5 Single Filtration Train Alignment During Two Chiller LCO 3.7.10b

Operation in single filtration train operation[9], (also referred to as Maintenance Mode) alignment is allowed during Two Chiller operation with restrictions. During maintenance mode, one unit is designated to supply the CREACS train and the other CREACS train is taken out of service. To show adequate heat removal capability, the Unit supplying the available CREACS train must have all three of its chillers available (i.e., be in LCO 3.7.10a) if the opposite Unit is operating in Two Chiller LCO 3.7.10b operation. Additionally, all non-essential heat loads must be isolated in both units as a prerequisite to entering maintenance mode if either unit is in Two Chiller operation. This analysis takes into account the loss of a chiller in both units during maintenance mode as a single failure criterion (i.e. two chillers supplying the available CREACS train and one chiller operating in the opposite unit).

4.2.5 Summary and Required Two Chiller LCO 3.7.10b Configuration/Limitations

The evaluations of previous Sections support operation of Salem Units 1 and 2 CH systems in the Two Chiller configuration. The Two Chiller configuration analyses demonstrate the system will continue to provide required cooling capability to the control room and safety related areas during normal operation and in the event of an accident. To accommodate Two Chiller configuration, limitations must be established and maintained as shown in Table 4-8.

9 As allowed per TS 3.7.6.1 (Unit 1) and TS 3.7.6 (Unit 2) ACTION a.

Table 4-8 Limitations and Required Configuration for AB CH System During Two Chiller Operation

Equipment or Condition	Operating Condition			
	Normal Operations	**Accident Conditions at either Unit**	**Maintenance Mode (Normal)**	**Maintenance Mode (Accident)**
AB CH Pumps	1 pump per unit operating (normal condition)			
Existing AB CH Chillers Operable	2 Chillers per unit (one chiller failure per unit postulated, see Note 1)		2 Chillers in unit undergoing CREACS maintenance; 3 Chillers in unit supplying available CREACS (one chiller failure per unit postulated, see Note 2)	
AB CH Flow to Chillers (Note 5)	AB CH flow secured to out of service chiller in either unit		Flow supplied to all chillers in unit supplying CREACS Flow secured to out of service chiller in opposite unit	
Unit 1 and Unit 2 CAACS	Operating			
Unit 1 and Unit 2 CREACS	Not Operating	Operating	Not Operating	Single train operating
Unit 1 and Unit 2 ECACs	Isolated from Chilled Water (Note 6)			
Unit 1 and Unit 2 PACUs (Note 4)	Operating	Automatically Isolated in Unit experiencing accident	Isolated (Note 3)	Isolated (Note 3)
Laboratory and Room Coolers (Unit 2 Only) (Note 4)	Operating	Automatically Isolated (Unit 2 Accident only)	Isolated (Note 3)	Isolated (Note 3)
Operation of the SW Chiller Condenser Recirculation Pump	Allowed			
Maximum SW Temperature	79.2°F	78.3°F (limiting value)	82.5°F	82.7°F
Maximum Mean Outside Air Temperature	75°F			
Maximum Peak Outside Air Temperature	84°F			
Period of Acceptable Two Chiller Operation	November through April			

Table 4-8 Notes:

1. The supporting calculations demonstrate that only one chiller is required to be operating in each unit for normal operation and accident conditions. This supports operating with two chillers available and the potential loss of a chiller during an accident as the single failure or the unexpected loss of a chiller during normal operation resulting in entering a TS ACTION Statement until the chiller is restored.

2. Maintenance mode requires that the unit supplying the available CREACS have all three chillers in service (LCO 3.7.10a) if the other unit is in Two Chiller operation (LCO 3.7.10b). This supports operating with three chillers available (two in the unit undergoing CREACS maintenance) and the potential loss of a chiller during an accident as the single failure or the unexpected loss of a chiller during normal operation resulting in entering a TS LCO Action statement until the chiller is restored.

3. Isolation of non-essential heat loads is a prerequisite to entering maintenance mode.

4. When a unit is in Two Chiller operation, if that unit unexpectedly loses an additional chiller, all non-essential heat loads (e.g., PACUs and room coolers) for that unit must be isolated.

5. Two Chiller Operation requires AB CH flow to be secured to the out of service chiller in that unit, even if the maintenance to be performed does not require AB CH flow to be secured. If flow is secured to one chiller and another chiller subsequently fails, it is not necessary to secure flow to the second chiller as long as flow remains secured to the first out of service chiller. Either or both units may be in Two Chiller operation at one time (except during maintenance mode – see Note 2).

6. The ECAC must be isolated from the AB CH system.

4.3 Cross-Tied LCO 3.7.10c Evaluation

4.3.1 Discussion

The AB CH systems for Salem Unit 1 and Unit 2 are physically designed to allow the systems to be cross-tied; allowing for the pumps and chillers of one unit to cool the heat loads of both units. To demonstrate that the AB CH system can perform its design basis requirements during Cross-Tied operations, the following evaluations were performed:

1. Evaluation of the AB CH System
2. Evaluation of the Chiller performance
3. Evaluation of the CAV System performance
4. Evaluation of Environmental Limitations (i.e., outside air conditions and river water temperatures)

The evaluations assumed that one of the three chillers is out of service for the supplying unit to account for a possible failure of a chiller.

The calculations determined that in the Cross-Tied configuration, in addition to the seasonal restriction ensuring cooler river water and air temperatures, some of the heat loads are required to be isolated from the AB CH system to maintain the total heat load below the capacity of the operating chillers. Additionally, the CREACS cannot be aligned to single filtration train (maintenance) mode (TS 3.7.6.1 (Unit 1), TS 3.7.6 (Unit 2) Action a.) when the AB CH systems are cross-tied. No changes are required to the UFSAR Chapter 15 accident analyses to support the proposed changes. The impacts of cross-tied operation on each AB CH system components is described below, followed by a summary table identifying required operating configuration and limitations.

4.3.2 Chilled Water System Evaluation

PSEG Calculation No. S-C-CH-MDC-2319 (Reference 2) modeled the Salem Units 1 and 2 AB CH systems in the cross-tied configuration. The results for the cross-tied AB CH systems at normal operating conditions and accident conditions are provided in Table 4-9 and Table 4-10. All non-essential heat loads (i.e., PACUs and all lab and room coolers) were excluded in the evaluation (i.e.; isolated from the AB CH system).

Table 4-9 Cross-tie Chilled Water System Flow Rates at Normal Operating Conditions LCO 3.7.10c

Chilled Water Flow Rate (gpm)	Unit 1 CH Pump and Chillers Cooling Both Units	Unit 2 CH Pump and Chillers Cooling Both Units	Notes
Total System	409.0	399.6	
Minimum per Chiller	134.6	131.5	100 gpm assumed for Chiller Evaluation
Unit 1 CAACS	152.8	135.9	The lower value of 135.9 gpm assumed for both Units in the Control Area System Evaluation
Unit 2 CAACS	99.1	108.4	The lower value of 99.1 gpm assumed for both Units in the Control Area System Evaluation

Table 4-10 Cross-tie Chilled Water System Flow Rates at Accident Conditions LCO 3.7.10c

Chilled Water Flow Rate (gpm)	Unit 1 AB CH Pump and Chillers Cooling Both Units	Unit 2 AB CH Pump and Chillers Cooling Both Units	Notes
Total System	409.0	399.6	
Minimum per Chiller	134.6	131.5	100 gpm assumed for Chiller Evaluation
Unit 1 CAACS	152.8	135.9	The lower value of 135.9 gpm assumed for both Units in the Control Area System Evaluation
Unit 2 CAACS	99.1	108.4	The lower value of 99.1 gpm assumed for both Units in the Control Area System Evaluation
Unit 1 CREACS	81.7	72.7	The lower value of 72.7 gpm assumed for both Units in the Control Area System Evaluation
Unit 2 CREACS	75.5	82.6	The lower value of 75.5 gpm assumed for both Units in the Control Area System Evaluation

4.3.3 Chiller Evaluation

Refer to Section 4.2.3 (same for both LCO 3.7.10b and LCO 3.7.10c).

4.3.4 Control Area Ventilation System Evaluation

4.3.4.1 Discussion

Refer to Section 4.2.4.1 (same for both LCO 3.7.10b and LCO 3.7.10c).

4.3.4.2 Outside Air Conditions LCO 3.7.10c

Refer to Section 4.2.3.2 (same for both LCO 3.7.10b and LCO 3.7.10c)

4.3.4.3 Maximum Allowed SW Temperatures

Reference 4 calculates the total heat load on the AB CH system and the resulting chiller outlet temperature during normal and accident conditions while in Cross-Tied operation. The chiller outlet temperatures are used to determine the maximum SW temperature using Table 4-4. The chiller AB CH outlet temperatures and maximum SW temperatures for cross-tied operation are provided in Table 4-11.

Table 4-11 Chiller Outlet Temperatures and Maximum SW Temperatures for LCO 3.7.10c

Condition	Chiller AB CH Outlet Temperature (ºF)	Maximum SW Temperature (ºF)
Normal Operation	44.6	81.7
Accident Conditions	48.6	79.9

4.3.4.4 Resulting Room Temperatures

The maximum temperatures of the Control Area rooms served by the CAV system during normal operation and accident conditions are provided in Table 4-12. The CAV system is capable of maintaining the temperatures of the Control Area Rooms below the acceptance criteria temperatures during AB CH system cross-tie operations for both normal operation and accident conditions. Acceptable operation of the CAV system during AB CH system cross-tie requires the isolation of non-essential AB CH system loads and other restrictions designated in the proposed TS changes.

Table 4-12 Maximum Control Area Temperatures LCO 3.7.10c

Condition	Maximum Temperature (ºF)	Acceptance Criteria (ºF)
Normal Operations: CRE and Non-CRE (CAACS)	75.6 (U2 EER)	76
Accident Conditions: Non-CRE (CAACS)	75.0 (U2 EER)	76
Accident Conditions: CRE (CREACS)	77.6 (Control Room)	85
	78.2 (U1 Data Logging Room)	90

*4.3.4.5 Single Filtration Train Operation Alignment During Cross-Tied LCO 3.7.10*c

A scoping analysis was performed in Reference 4 to examine the single filtration train (maintenance mode) alignment[10] of the Salem CAV system with the Unit 2 CREACS out of service. The Control Room temperatures calculated in the scoping analysis were as high as 89.9°F (Unit 2 Control Room) which exceeds the acceptance criterion. Having a CREACS train out of service when the CH systems are cross-tied results in too large of a demand on the remaining CREACS train cooling coil and the CAV system is not able to maintain Control Room temperatures (removing a train limits the amount of heat that can be rejected). The CAV system cannot be operated in single filtration train (maintenance) mode when the AB CH systems are cross-tied, even with non-essential loads removed from the AB CH system.

4.3.5 Summary and Required Cross-Tied LCO 3.7.10c Configuration/Limitations

The evaluations support operation of Salem Units 1 and 2 AB CH systems in the Cross-Tied configuration with all chillers in one unit out of service. The cross-tie configuration analyses demonstrate the system will continue to provide required cooling capability to the control room and safety related areas during normal operation and in the event of an accident. To accommodate Cross-Tied configuration, limitations must be established and maintained as shown below.

[10] As allowed per TS 3.7.6.1 (Unit 1) and TS 3.7.6 (Unit 2) ACTION a.

Table 4-13 Limitations and Required Configuration for AB CH System Cross-Tied Operations

Equipment or Condition	Operating Condition	
	Normal Operations	Accident Conditions at either Unit
AB CH Pumps	1 pump operating (normal condition)	
Existing AB CH Chillers in Service	3 chillers from supplying unit (one chiller failure postulated, see Note 1)	
Unit 1 and Unit 2 CAACS	Operating	
Unit 1 and Unit 2 CREACS	Not Operating	Operating
Unit 1 and Unit 2 ECACs	Isolated from Chilled Water (Note 2)	
Unit 1 and Unit 2 PACUs	Isolated from AB CH system	
Laboratory and Room Coolers (Unit 2 Only)	Isolated from AB CH system	
Operation of the SW Chiller Condenser Recirculation Pump	Allowed	
Operation of CAV System in Single Filtration Alignment (Maintenance) Mode	Not Allowed	
Maximum SW Temperature	81.7°F	79.9°F (limiting value)
Maximum Mean Outside Air Temperature	75°F	
Maximum Peak Outside Air Temperature	84°F	
Period of Acceptable Cross-Tie Operation	November through April	

Note 1 - The supporting calculations demonstrate that only two chillers are required to be operating for normal operation and accident conditions. This supports operating with three chillers available and the potential loss of a chiller during an accident as the single failure or the unexpected loss of a chiller during normal operation resulting in entering a TS LCO Action statement until the chiller is restored.

Note 2 - The ECACs must be isolated from the AB CH system.

4.4 Assessment of New LCOs, Actions Statements, and Surveillances

The supporting calculations were performed for both LCO 3.7.10b and 3.7.10c assuming that one of the required chillers is unavailable due to either a single failure or being out of service. This supports operating with the required chillers available and on loss of a chiller entering a limiting condition of operation (LCO) action statement until the chiller is restored. This is similar to the existing three chiller TS (i.e., LCO 3.7.10a) which permits a 14-day allowed outage time (AOT) to restore the inoperable chiller. One chiller can support continued operation; in the Two Chiller configuration; required operating conditions will be verified every 24 hours in the proposed new SR 4.7.10d. Two chillers in one Unit can support continued operation in the cross-tie configuration; required operating conditions will be verified every 24 hours in the proposed new SR 4.7.10e.

If the one inoperable chiller in the Two-Chiller configuration cannot be restored within the 14 day AOT then the unit in that configuration must be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6).

If the one inoperable chiller in the Cross-Tied configuration cannot be restored within the 14 day AOT then both the units must be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6).

If two Chillers become inoperable in Two Chiller configuration the option exists to exit LCO 3.7.10b and enter LCO 3.7.10c (Cross-tied). If this is not possible then (a) the control room emergency air conditioning system (CREACs) must be aligned for single filtration operation using the opposite Unit train within 4 hours AND (b) the Unit must be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6).

If two Chillers become inoperable in Cross-Tied configuration then both units must be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6). This conservative action addresses the fact that control room envelope cooling cannot be switched over to the other Unit (single filtration train alignment) in cross-tie configuration as discussed in Section 4.3.4 5 above.

The proposed ACTION statements for loss of a pump in Two chiller or Cross-Tied configuration are equivalent to those when in Three Chiller configuration: on the loss of a pump restore the chilled water pump to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6). The Two Chiller and Cross-Tied evaluations are based on only one pump in operation, the same as three chiller operation.

4.5 Margin, Assumptions and Conservatisms

While the operating margin is less during AB CH system Two Chiller and Cross-Tied operations, the reduction in operating margin does not prevent the system from operating within its design requirements. There is also additional inherent margin due to the four conservative assumptions used in the calculations as discussed below.

1. **Chilled Water Flow Margin** - The calculation of the chiller heat removal capacity with the service water recirculation line in operation assumes a chilled water flow rate (G_{cw}) of 100 gpm. Reference 2 calculates the minimum AB CH flow through the chillers for the Cross-Tied and Two Chiller configurations. The minimum flows (Reference 2) and associated conservatism relative to the design AB CH flow (Reference 3) are provided below.

Table 4-14 Chiller Chilled Water Flow Margin

	Design Chiller AB CH Flow (Reference 3)	**Cross-Tied Operation**		**Two Chiller Operation**	
		Normal (Reference 2)	**Accident (Reference 2)**	**Normal (Reference 2)**	**Accident (Reference 2)**
Chiller AB CH Flow	100 gpm	131.5 gpm	131.5 gpm	174.3 gpm	125.9 gpm
Margin	-	31.5%	31.5%	74.3%	25.9%

2. **Service Water Flow Margin** - The calculation of the chiller heat removal capacity assumes a service water flow rate (G_{sw_riv}) of 130 gpm. Reference 1 calculates the minimum SW flow to the chiller condenser. The minimum flows (Reference 1) and associated conservatism relative to the design flow (Reference 3) are provided below. Note that the normal and accident flows are applicable to both Cross-Tied operations and Two Chiller operations.

Table 4-15 Chiller Service Water Flow Margin

	Design Flow (Reference 3)	**Normal (Reference 1, Table 9-3)**	**Accident (Reference 1, Table 9-4)**
Chiller SW Flow	130 gpm	143.5 gpm	133.3 gpm
Margin	-	10.4%	2.5%

3. **Control Area Heat Loads Margin** - The normal and accident control area heat loads were assumed to be 2.5% higher than the actual values to account for potential future design changes (Table 6-8, Note 5 of Reference 4). There are no design changes currently being implemented that would utilize this additional heat load.

The accident heat loads used in Reference 4 are based on an accident occurring in both Unit 1 and Unit 2. The total heat load for an accident in both units is approximately 0.9% higher than the total heat load for an accident in only Unit 1 or Unit 2. It is not required to assume an accident occurs simultaneously in both units but the calculation used the accident heat loads from both units to bound an accident at either Unit.

The total heat load used for the Control Area in Reference 4 bounds the worst case heat load that could occur by 2.5% for normal operation and 3.4% (2.5% + 0.9%) for accident conditions. These margins are applicable to both Cross-Tied operations and Two Chiller operations.

4. **Cooling Coil Flow Margin** - The Control Areas are evaluated during cross-tied operations and two chiller operations with bounding AB CH flow to the operating Control Area cooling coils (CAACS and CREACS). Reference 2 calculates the minimum total flow to the operating Control Area cooling coils for both normal operations and accident conditions. The minimum flows (Reference 2) and associated conservatism relative to the design flows (Reference 4) are provided below.

Table 4-16 Cooling Coil Chilled Water Flow Margin for Cross-Tied Operations

	Cross-tied - Normal			**Cross-tied - Accident**		
	Design AB CH Flow (Ref. 4)	**AB CH Flow U1 Supply (Ref. 2)**	**AB CH Flow - U2 Supply (Ref. 2)**	**Design AB CH Flow (Ref. 4)**	**AB CH Flow - U1 Supply (Ref. 2)**	**AB CH Flow - U2 Supply (Ref. 2)**
U1 CAACS	135.9 gpm	152.8 gpm	135.9 gpm	135.9 gpm	152.8 gpm	135.9 gpm
U1 CREACS	N/A	N/A	N/A	72.7 gpm	81.7 gpm	72.7 gpm
U2 CAACS	99.1 gpm	99.1 gpm	108.4 gpm	99.1 gpm	99.1 gpm	108.4 gpm
U2 CREACS	N/A	N/A	N/A	75.5 gpm	75.5 gpm	82.6 gpm
Total	235.0 gpm	251.9 gpm	244.3 gpm	383.2 gpm	409.1 gpm	399.6 gpm
Margin	-	7.2%	4.0%	-	6.8%	4.3%

Table 4-17 Cooling Coil Chilled Water Flow Margin for Two Chiller Operations

	Two Chiller Operation - Normal		**Two Chiller Operation - Accident**		
	Design AB CH Flow - (Reference 4)	**AB CH Flow - (Reference 2)**	**Design AB CH Flow - (Reference 4)**	**AB CH Flow - U1 Accident (Reference 2)**	**AB CH Flow - U2 Accident (Reference 2)**
U1 CAACS	174.0 gpm	174.1 gpm	174 gpm	191.4 gpm	174.1 gpm
U1 CREACS	0	0	93 gpm	102.4 gpm	93.1 gpm
U2 CAACS	122.0 gpm	122.2 gpm	122 gpm	122.2 gpm	143.2 gpm
U2 CREACS	0	0	93 gpm	93.2 gpm	109.2 gpm
Total	296.0 gpm	296.3 gpm	482 gpm	509.2 gpm	519.6 gpm
Margin	-	0%	-	5.6%	7.8%

Summary

Table 4-18 Margin Summary

Parameter	**Cross-tied Conservatism**		**Two Chiller Conservatism**	
	Normal	**Accident**	**Normal**	**Accident**
Chiller Chilled Water Flow	31.5%	31.5%	74.3%	25.9%
Service Water Flow	10.4%	2.5%	10.4%	2.5%
Control Area Heat Loads	2.5%	3.4%	2.5%	3.4%
Cooling Coil Chilled Water Flow	4.0%	4.3%	0%	5.6%

The four parameter conservatisms provide assurance that there is overall system performance margin for the AB CH system when operating in the Cross-Tied or Two Chiller configuration.

4.6 General Design Criterion (GDC) 5 - Sharing of structures, systems, and components (LCO 3.7.10c).

GDC 5 states that structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.

The cross-tied configuration parameters provided in Table 4-13 support operation of both units, including one unit in accident conditions. The chillers from one unit can provide the required cooling capability; in cross-tie configuration the analyses demonstrate the system will continue to provide required cooling capability to the control room and safety related areas during normal

operation and in the event of an accident. The restrictions identified in Table 4-8 have been incorporated into the proposed TS for cross-tie operation. The cooling capability of the AB CH system complies with GDC 5 requirements for sharing of systems using steady state heat loads and required flow rates for design basis combinations of operating modes. In addition, the analysis is based on conservatisms (Table 4-18) that ensure design requirements will be met for both units with sufficient operating margin.

The sharing of the AB CH system between Units does not impair its ability to perform its safety function for both normal and accident conditions. Design cooling requirements for the accident condition unit continue to be met, and the operating unit cooling requirements are also met such that there can be an orderly shutdown and cooldown.

The UFSAR will be updated to reflect this additional GDC 5 assessment.

5.0 REGULATORY ANALYSIS

5.1 No Significant Hazards Consideration

In accordance with 10 CFR 50.90, PSEG Nuclear LLC (PSEG) hereby requests an amendment to Renewed Facility Operating License Nos. DPR-70 and 75 for Salem Nuclear Generating Station Units 1 and 2.

This license amendment request proposes (1) a reduction in the number of required components (two vs. three required chillers) and (2) use of the cross-tie capability between Unit 1 and Unit 2 (one unit's chilled water system operating and providing chilled water to the cooling coils of both units). PSEG intends to utilize these revised operating configurations to implement chiller replacements and for performing maintenance on common line components. Technical Specification (TS) 3/4.7.10, "Chilled Water System – Auxiliary Building Subsystem" Limiting Condition for Operation (LCO), Action Statements and Surveillance Requirements (SR) would be revised to reflect the conditions necessary for the revised Two Chiller and Cross-Tied configurations . A supporting change is also proposed to the Control Room Emergency Air Conditioning System (CREACS) TS 3.7.6.1 (Unit 1) and TS 3.7.6 (Unit 2) ACTION a.

PSEG has evaluated whether or not a significant hazards consideration is involved with the proposed amendment(s) by focusing on the three standards set forth in 10 CFR 50.92, "Issuance of amendment," as discussed below:

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

Response: No.

The Auxiliary Building Chilled Water (AB CH) system will continue to meet the design cooling requirements for both normal and accident conditions. The Two chiller and Cross Tied configuration analyses verify the capability of the system to perform its design function. The configuration analyses were performed assuming that one of the required chillers is out of service for the supplying unit to account for a possible failure of a chiller, demonstrating that only the remaining required chillers are required to be operating for normal operation and accident conditions. This supports operating with the required chillers available and the potential loss of a chiller during an accident as the single failure, or the unexpected loss of a chiller during normal operation.

The AB CH system is not an initiator or precursor to any anticipated (or abnormal) operational transients or postulated design basis accidents. Operating with only two chillers required does not alter the design requirements of the system; the required cooling capability is still met. The AB CH systems for Salem Unit 1 and Unit 2 are designed to allow the systems to be cross-tied; allowing for the pumps and chillers of one Unit to cool the heat loads of both Units. In cross-tie configuration the analyses demonstrate the system will continue to provide required cooling capability to the control room and safety related areas during normal operation and in the event of an accident. Therefore there is no increase in the probability of any previously evaluated accident.

Two Chiller or Cross-Tied operation has no effect on the consequences of any previously analyzed accident. Evaluations were performed assuming that one of the required chillers is out of service to account for a possible failure of a chiller. The two chiller analyses determined that certain heat loads are required to be isolated, certain environmental conditions are required, and that single filtration alignment of the CREACS must be restricted. The cross-tied analyses determined that certain heat loads are required to be isolated, certain environmental conditions are required, and both trains of the CREACS must be in service. The proposed TS changes incorporate these restrictions ensuring the design requirements of the system will continue to be met. The temperatures of the Control Area Rooms continue to be below the acceptance criteria during AB CH system Two Chiller and Cross-Tied operations for both normal operation and accident conditions.

Therefore this proposed change does 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.

The proposed changes to the TS permitting AB CH system Two Chiller and Cross-Tied operation do not introduce any new accident initiators or create any new failure mechanisms or malfunctions. The analyses demonstrate the system continues to perform its design functions for both normal and accident conditions. To ensure the system has adequate cooling capability, restrictions are placed in TS isolating non-safety related loads, verifying certain environmental conditions, and restricting single filtration train alignment operation. These restrictions do not cause the system to be operated outside its design basis and therefore do not create any new failure mechanisms.

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

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

Response: No.

The proposed amendment does not alter setpoints or limits established or assumed by any accident analyses. The proposed change does not exceed or alter a design basis or safety limit (i.e., Control Room Area temperatures remain below design requirements), therefore it does not significantly reduce the margin of safety. In Two Chiller and Cross-Tied configuration,

restrictions are placed in the TS ensuring the AB CH system will continue to provide adequate cooling during normal and accident conditions. The Control Room area ambient air temperature will not exceed the allowable temperature for continuous duty rating for the equipment and instrumentation and the control room will remain habitable for operations personnel during and following all credible accident conditions.

The sharing of the AB CH system between Units in the Cross-Tied configuration does not impair its ability to perform its safety function for both normal and accident conditions. Design cooling requirements for the accident condition unit continue to be met, and the operating unit cooling requirements are also met such that there can be an orderly shutdown and cool down.

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

Based upon the above, PSEG Nuclear LLC concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10CFR50.92(c), and, accordingly, a finding of no significant hazards consideration is justified.

5.2 Applicable Regulatory Requirements and Criteria

- General Design Criteria (GDC) 1 - Quality standards and records

  Structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. A quality assurance program shall be established and implemented in order to provide adequate assurance that these structures, systems, and components will satisfactorily perform their safety functions. Appropriate records of the design, fabrication, erection, and testing of structures, systems, and components important to safety shall be maintained by or under the control of the nuclear power unit licensee throughout the life of the unit.

- GDC 2 - Design bases for protection against natural phenomena

  Structures, systems, and components important to safety shall be designed to withstand the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, tsunami, and seiches without loss of capability to perform their safety functions. The design bases for these structures, systems, and components shall reflect: (1) Appropriate consideration of the most severe of the natural phenomena that have been historically reported for the site and surrounding area, with sufficient margin for the limited accuracy, quantity, and period of time in which the historical data have been accumulated, (2) appropriate combinations of the effects of normal and accident conditions with the effects of the natural phenomena and (3) the importance of the safety functions to be performed.

- GDC 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.

- GDC 5 - Sharing of Structures, Systems and Components

  Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.

- GDC 44 - Cooling water

  A system to transfer heat from structures, systems, and components important to safety, to an ultimate heat sink shall be provided. The system safety function shall be to transfer the combined heat load of these structures, systems, and components under normal operating and accident conditions.
  Suitable redundancy in components and features, and suitable interconnections, leak detection, and isolation capabilities shall be provided to assure that for onsite electric power system operation (assuming offsite power is not available) and for offsite electric power system operation (assuming onsite power is not available) the system safety function can be accomplished, assuming a single failure.

- GDC 45 - Inspection of cooling water system

  The cooling water system shall be designed to permit appropriate periodic inspection of important components, such as heat exchangers and piping, to assure the integrity and capability of the system.

- GDC 46 - Testing of cooling water system

  The cooling water system shall be designed to permit appropriate periodic pressure and functional testing to assure (1) the structural and leaktight integrity of its components, (2) the operability and the performance of the active components of the system, and (3) the operability of the system as a whole and, under conditions as close to design as practical, the performance of the full operational sequence that brings the system into operation for reactor shutdown and for loss-of-coolant accidents, including operation of applicable portions of the protection system and the transfer between normal and emergency power sources.

In conclusion, based on the considerations discussed above, (1) there is a 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 NRC's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

6.0 ENVIRONMENTAL CONSIDERATION

A review has determined that the proposed amendment 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 amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets 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 amendment.

7.0 REFERENCES

1. PSEG Nuclear Calculation No. S-C-SW-MDC-1967, *Service Water System Thermal Hydraulic Model,* Revision 8.

2. PSEG Nuclear Calculation No. S-C-CH-MDC-2319, *Hydraulic Evaluation of Salem Unit 1 and Unit 2 Chilled Water Systems during Reduced Chiller Availability*, Revision 1.

3. PSEG Nuclear Calculation No. S-C-CH-MDC-2282, *Chiller Service Water Flow Requirements,* Revision 2.

4. PSEG Nuclear Calculation No. S-C-CAV-MDC-2320, *Evaluation of the Control Area Ventilation System during Chilled Water System Chiller Replacement*, Revision 1.

5. PSEG Calculation No. S-5-ZZ-MEE-1680, Historical River Temperature Data, Revision 0

6. PSEG Vendor Technical Document (VTD) 903136(001) Revision 0, MPR-4027 Salem Chilled Water System Evaluation to Support Reduction in Required Chillers

TECHNICAL SPECIFICATION PROPOSED CHANGES

The following Technical Specifications for Renewed Facility Operating License DPR-70 are affected by this change request:

Technical Specification	Page
3/4.7.10	3/4 7-33, 34
3/4.7.6.1	3/4 7-18, 19

The following Technical Specifications for Renewed Facility Operating License DPR-75 are affected by this change request:

Technical Specification	Page
3/4.7.10	3/4 7-28, 29
3/4.7.6	3/4 7-15, 16

3/4.7.10 CHILLED WATER SYSTEM - AUXILIARY BUILDING SUBSYSTEM

LIMITING CONDITION FOR OPERATION

3.7.10 The chilled water system loop which services the safety-related loads in the Auxiliary Building shall be OPERABLE with: [one of the following configurations]

~~a. Three OPERABLE chillers~~

~~b. Two OPERABLE chilled water pumps~~

[Insert A]

~~APPLICABILITY: ALL MODES and during movement of irradiated fuel assemblies.~~

ACTION: [(3)] MODES 1, 2, 3, and 4

a. With one ~~chiller~~ [of the required chillers] inoperable:

1. Remove [(4)] the appropriate non-essential heat loads from the chilled water system within 4 hours and;

2. Restore the chiller to OPERABLE status within 14 days or;

3. Be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With two ~~chillers~~ [of the required chillers] inoperable: [(6)] [(6)]

1. Remove the appropriate non-essential heat loads from the chilled water system within 4 hours and;

2. Align the control room emergency air conditioning system (CREACs) for single filtration operation using the Salem Unit 2 train within 4 hours and;

3. Restore at least one chiller to OPERABLE status within 72 hours or;

4. Be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With one chilled water pump inoperable, restore the chilled water pump to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

LIMITING CONDITION FOR OPERATION (Continued)

(3)
ACTION: MODES 5 and 6 or during movement of irradiated fuel assemblies. *

a. With one ~~chiller~~ inoperable:

1. (4) Remove the appropriate non-essential heat loads from the chilled water system within 4 hours and;

of the required chillers

2. Restore the chiller to OPERABLE status within 14 days or;

3. Suspend CORE ALTERATIONS and movement of irradiated fuel assemblies.

b. With two ~~chillers~~ inoperable: (5) (6)

1. Remove the appropriate non-essential heat loads from the chilled water system within 4 hours and;

2. Align the control room emergency air conditioning system (CREACs) for single filtration operation using the Salem Unit 2 train within 4 hours and;

3. Restore at least one chiller to OPERABLE status within 72 hours or;

4. Suspend CORE ALTERATIONS and movement of irradiated fuel assemblies.

c. With one chilled water pump inoperable, restore the chilled water pump to OPERABLE status within 7 days or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies.

SURVEILLANCE REQUIREMENTS

4.7.10 The chilled water loop which services the safety-related loads in the Auxiliary Building shall be demonstrated OPERABLE:

a. In accordance with the Surveillance Frequency Control Program by verifying that each manual valve in the chilled water system flow path servicing safety related components that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. In accordance with the Surveillance Frequency Control Program, by verifying that each automatic valve actuates to its correct position on a Safeguards Initiation signal.

c. In accordance with the Surveillance Frequency Control Program by verifying that each chiller starts and runs.

Insert B →

Insert C

* During Modes 5 and 6 and during movement of irradiated fuel assemblies, chilled water components are not considered to be inoperable solely on the basis that the backup emergency power source, diesel generator, is inoperable. *This is not applicable to the LCO 3.7.10c configuration.*

Insert A

	a	b	c
CONFIGURATION	*1. Three OPERABLE chillers and,* *2. Two OPERABLE chilled water pumps*	*1. Two OPERABLE chillers and,* *2. Two OPERABLE chilled water pumps*	*1. Three OPERABLE chillers and,* *2. Two OPERABLE chilled water pumps* *from either Unit 1 or Unit 2 (Units Cross-tied)*[(2)]
APPLICABLITY	*1. ALL MODES and during movement of irradiated fuel assemblies*	*1. From November 1 through April 30 in ALL MODES and during movement of irradiated fuel assemblies* *2. The Unit 1 Emergency Control Air Compressor (ECAC) is isolated from the chilled water system* *3. Chilled water flow to the third chiller that is not in service is isolated*[(1)] *4. Control Room Emergency Air Conditioning System (CREACS) single filtration train alignment (TS 3.7.6.1 ACTION a.) restrictions:* *a. Alignment only permitted to Unit 2* *b. Unit 2 must be in the LCO 3.7.10a configuration* *c. Non-essential heat loads are isolated from the chilled water system on BOTH Units*	*1. From November 1 through April 30 in ALL MODES and during movement of irradiated fuel assemblies* *2. The Unit 1 and Unit 2 ECACs are isolated from the chilled water system* *3. Non-Essential heat loads are isolated from the chilled water system on BOTH Units* *4. BOTH CREACS trains are operable per TS 3.7.6.1 (single filtration train alignment is not permitted)* *5. Unit chilled water cross-tie valves are OPEN* *6. Administrative controls are in place for the Unit providing the required components to notify the other Unit if a chiller or pump becomes inoperable*

Insert B

d. *When in the LCO 3.7.10b configuration verify once per 24 hours:*

(i) The Unit 1 ECAC is isolated from the chilled water system,
(ii) Chilled water flow is isolated to the third chiller that is not in service and,
(iii) If CREACS is in single filtration alignment verify non-essential heat loads are isolated from the chilled water system on BOTH Units.

e. *When in the LCO 3.7.10c configuration verify once per 24 hours:*

(i) The Unit 1 and Unit 2 ECACs are isolated from the chilled water system,
(ii) Non-essential heat loads are isolated from the chilled water system and,
(iii) Cross-tie valves are verified OPEN.

Insert C

NOTES

(1) When transitioning from the LCO 3.7.10b to the LCO 3.7.10a configuration, the chiller may be un-isolated (restored to service) under administrative controls

(2) The LCO 3.7.10c (Cross-Tied) configuration is common to both Units; either Unit 1 chilled water components are required operable, OR Unit 2. A combination of both Units chilled water components is not permitted. When transitioning from the LCO 3.7.10c configuration to either the LCO 3.7.10a or LCO 3.7.10b configurations, chilled water components may be restored to service under administrative controls

(3) When in the LCO 3.7.10c configuration ACTIONs are applicable for both Units

(4) When in the LCO 3.7.10c configuration this ACTION has already been implemented

(5) When in the LCO 3.7.10b configuration, implement Action b.2 AND Action b.4 OR transition to the LCO 3.7.10c configuration

(6) When in the LCO 3.7.10c configuration, proceed directly to Action b.4

3/4.7.6 CONTROL ROOM EMERGENCY AIR CONDITIONING SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.6.1 The common control room emergency air conditioning system (CREACS)* shall be OPERABLE with:

a. Two independent air conditioning filtration trains (one from each unit) consisting of:

1. Two fans and associated outlet dampers,
2. One cooling coil,
3. One charcoal adsorber and HEPA filter array,
4. Return air isolation damper.

b. All other automatic dampers required for operation in the pressurization or recirculation modes.

c. The control room envelope intact.

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

APPLICABILITY: ALL MODES and during movement of irradiated fuel assemblies.

ACTION: MODES 1, 2, 3, and 4

a. With one filtration train inoperable, align CREACS for single filtration train operation** within 4 hours, and restore the inoperable filtration train to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With CREACS aligned for single filtration train operation and with one of the two remaining fans or associated outlet damper inoperable, restore the inoperable fan or damper to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With the Control Room Envelope boundary inoperable:

1. Immediately, initiate action to implement mitigating actions, and
2. Within 24 hours, verify mitigating actions ensure CRE occupant exposures to radiological, chemical, and smoke hazards will not exceed limits, and
3. Within 90 days, restore the Control Room Envelope boundary to OPERABLE status, or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

* The CREACS is a shared system with Salem Unit 2

*** Alignment only permitted if the Unit with the operable CREACS train is also in Chilled Water System LCO 3.7.10a configuration. Alignment is not permitted if in the LCO 3.7.10c configuration.*

LIMITING CONDITION FOR OPERATION (Continued)

d. With one or both series isolation damper(s) on a normal Control Area Air Conditioning System (CAACS) outside air intake or exhaust duct inoperable, close the affected duct within 4 hours by use of at least one isolation damper secured in the closed position or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. (Refer to ACTION 25 of Table 3.3-6.)

e. With one or both isolation damper(s) on an outside emergency air conditioning air intake duct inoperable, close the affected duct within 4 hours by use of at least one isolation damper secured in the closed position and restore the damper(s) to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

MODES 5 and 6 or during movement of irradiated fuel assemblies

a. With one filtration train inoperable, align CREACS for single filtration train operation within 4 hours, or suspend movement of irradiated fuel assemblies. **

b. With CREACS aligned for single filtration train operation with one of the two remaining fans or associated outlet damper inoperable, restore the fan or damper to OPERABLE status within 72 hours, or suspend movement of irradiated fuel assemblies.

c. With two filtration trains inoperable, immediately suspend movement of irradiated fuel assemblies.

d. With the Control Room Envelope boundary inoperable, immediately suspend movement of irradiated fuel assemblies.

e. With one or both series isolation damper(s) on a normal CAACS outside air intake or exhaust duct inoperable, immediately suspend movement of irradiated fuel assemblies until the affected duct is closed by use of at least one isolation damper secured in the closed position. (Refer to ACTION 25 of Table 3.3-6.)

f. With one or both series isolation damper(s) on an outside emergency air conditioning air intake duct inoperable, immediately suspend movement of irradiated fuel assemblies until the affected duct is closed by use of at least one isolation damper secured in the closed position. To resume movement of irradiated fuel assemblies, at least one emergency air intake duct must be operable on each unit.

3/4.7.10 CHILLED WATER SYSTEM - AUXILIARY BUILDING SUBSYSTEM

LIMITING CONDITION FOR OPERATION

3.7.10 The chilled water system loop which services the safety-related loads in the Auxiliary Building shall be OPERABLE with: one of the following configurations

~~a. Three OPERABLE chillers~~

~~b. Two OPERABLE chilled water pumps~~

Insert D

~~APPLICABILITY: ALL MODES and during movement of irradiated fuel assemblies.~~

ACTION: (3) MODES 1, 2, 3, and 4

a. With one ~~chiller~~ of the required chillers inoperable:

1. (4) Remove the appropriate non-essential heat loads from the chilled water system within 4 hours and;
2. Restore the chiller to OPERABLE status within 14 days or;
3. Be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With two ~~chillers~~ of the required chillers inoperable: (5) (6)

1. Remove the appropriate non-essential heat loads from the chilled water system within 4 hours and;
2. Align the control room emergency air conditioning system (CREACs) for single filtration operation using the Salem Unit 1 train within 4 hours and;
3. Restore at least one chiller to OPERABLE status within 72 hours or;
4. Be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With one chilled water pump inoperable, restore the chilled water pump to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

LIMITING CONDITION FOR OPERATION

[(3)]
ACTION: MODES 5 and 6 or during movement of irradiated fuel assemblies.*

a. With one ~~chiller~~ *of the required* chillers inoperable:

[(4)]
1. Remove the appropriate non-essential heat loads from the Chilled Water System within 4 hours and;

2. Restore the chiller to OPERABLE status within 14 days or;

3. Suspend CORE ALTERATIONS and movement of irradiated fuel assemblies.

[(5)] [(6)]
b. With two ~~chillers~~ *of the required* chillers inoperable:

1. Remove the appropriate non-essential heat loads from the chilled water system within 4 hours and;

2. Align the control room emergency air conditioning system (CREACs) for single filtration operation using the Salem Unit 1 train within 4 hours and;

3. Restore at least one chiller to OPERABLE status within 72 hours or;

4. Suspend CORE ALTERATIONS and movement of irradiated fuel assemblies.

c. With one chilled water pump inoperable, restore the chilled water pump to OPERABLE status within 7 days or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies.

SURVEILLANCE REQUIREMENTS

4.7.10 The chilled water loop which services the safety-related loads in the Auxiliary Building shall be demonstrated OPERABLE:

a. In accordance with the Surveillance Frequency Control Program by verifying that each manual valve in the chilled water system flow path servicing safety related components that is not locked, sealed, or otherwise secured in position, is in its correct position.

b. In accordance with the Surveillance Frequency Control Program, by verifying that each automatic valve actuates to its correct position on a Safeguards Initiation signal.

c. In accordance with the Surveillance Frequency Control Program by verifying that each chillers starts and runs.

Insert E →

Insert F →

* During Modes 5 and 6 and during movement of irradiated fuel assemblies, chilled water components are not considered to be inoperable solely on the basis that the backup emergency power source, diesel generator, is inoperable. *This is not applicable to the LCO 3.7.10c configuration.*

Insert D

	a	b	c
CONFIGURATION	*1. Three OPERABLE chillers and,* *2. Two OPERABLE chilled water pumps*	*1. Two OPERABLE chillers and,* *2. Two OPERABLE chilled water pumps*	*1. Three OPERABLE chillers and,* *2. Two OPERABLE chilled water pumps* *from either Unit 1 or Unit 2 (Units Cross-tied)*[(2)]
APPLICABLITY	*1. ALL MODES and during movement of irradiated fuel assemblies*	*1. From November 1 through April 30 in ALL MODES and during movement of irradiated fuel assemblies* *2. The Unit 2 Emergency Control Air Compressor (ECAC) is isolated from the chilled water system* *3. Chilled water flow to the third chiller that is not in service is isolated*[(1)] *4. Control Room Emergency Air Conditioning System (CREACS) single filtration train alignment (TS 3.7.6 ACTION a.) restrictions:* *a. Alignment only permitted to Unit 1* *b. Unit 1 must be in the LCO 3.7.10a configuration* *c. Non-essential heat loads are isolated from the chilled water system on BOTH Units*	*1. From November 1 through April 30 in ALL MODES and during movement of irradiated fuel assemblies* *2. The Unit 1 and Unit 2 ECACs are isolated from the chilled water system* *3. Non-Essential heat loads are isolated from the chilled water system on BOTH Units* *4. BOTH CREACS trains are operable per TS 3.7.6 (single filtration train alignment is not permitted)* *5. Unit chilled water cross-tie valves are OPEN* *6. Administrative controls are in place for the Unit providing the required components to notify the other Unit if a chiller or pump becomes inoperable*

Insert E

d. When in the LCO 3.7.10b configuration verify once per 24 hours:

(i) The Unit 2 ECAC is isolated from the chilled water system,
(ii) Chilled water flow is isolated to the third chiller that is not in service and,
(iii) If CREACS is in single filtration alignment verify non-essential heat loads are isolated from the chilled water system on BOTH Units.

e. When in the LCO 3.7.10c configuration verify once per 24 hours:

(i) The Unit 1 and Unit 2 ECACs are isolated from the chilled water system,
(ii) Non-essential heat loads are isolated from the chilled water system and,
(iii) Cross-tie valves are verified OPEN.

Insert F

NOTES

(1) *When transitioning from the LCO 3.7.10b to the LCO 3.7.10a configuration, the chiller may be un-isolated (restored to service) under administrative controls*

(2) *The LCO 3.7.10c (Cross-Tied) configuration is common to both Units; either Unit 1 chilled water components are required operable, OR Unit 2. A combination of both Units chilled water components is not permitted. When transitioning from the LCO 3.7.10c configuration to either the LCO 3.7.10a or LCO 3.7.10b configurations, chilled water components may be restored to service under administrative controls*

(3) *When in the LCO 3.7.10c configuration ACTIONs are applicable for both Units*

(4) *When in the LCO 3.7.10c configuration this ACTION has already been implemented*

(5) *When in the LCO 3.7.10b configuration, implement Action b.2 AND Action b.4 OR transition to the LCO 3.7.10c configuration*

(6) *When in the LCO 3.7.10c configuration, proceed directly to Action b.4*

3/4.7.6 CONTROL ROOM EMERGENCY AIR CONDITIONING SYSTEM

LIMITING CONDITION FOR OPERATION

3.7.6 The common control room emergency air conditioning system (CREACS)* shall be OPERABLE with:

a. Two independent air conditioning filtration trains (one from each unit) consisting of:

1. Two fans and associated outlet dampers,
2. One cooling coil,
3. One charcoal adsorber and HEPA filter array,
4. Return air isolation damper.

b. All other automatic dampers required for operation in the pressurization or recirculation modes.

c. The control room envelope intact.

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

APPLICABILITY: ALL MODES and during movement of irradiated fuel assemblies.

ACTION: MODES 1, 2, 3, and 4

a. With one filtration train inoperable, align CREACS** for single filtration train operation within 4 hours, and restore the inoperable filtration train to OPERABLE status within 30 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

b. With CREACS aligned for single filtration train operation and with one of the two remaining fans or associated outlet damper inoperable, restore the inoperable fan or damper to OPERABLE status within 72 hours or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

c. With the Control Room Envelope boundary inoperable:

1. Immediately, initiate action to implement mitigating actions, and

2. Within 24 hours, verify mitigating actions ensure CRE occupant exposures to radiological, chemical, and smoke hazards will not exceed limits, and

3. Within 90 days, restore the Control Room Envelope boundary to OPERABLE status, or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

* The CREACS is a shared system with Salem Unit 1

*** Alignment only permitted if the Unit with the operable CREACS train is also in Chilled Water System LCO 3.7.10a configuration. Alignment is not permitted if in the LCO 3.7.10c configuration.*

LIMITING CONDITION FOR OPERATION (Continued)

d. With one or both series isolation damper(s) on a normal Control Area Air Conditioning System (CAACS) outside air intake or exhaust duct inoperable, close the affected duct within 4 hours by use of at least one isolation damper secured in the closed position or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. (Refer to ACTION 28 of Table 3.3-6.)

e. With one or both isolation damper(s) on an outside emergency air conditioning air intake duct inoperable, close the affected duct within 4 hours by use of at least one isolation damper secured in the closed position and restore the damper(s) to OPERABLE status within 7 days or be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours.

MODES 5 and 6 or during movement of irradiated fuel assemblies

a. With one ** filtration train inoperable, align CREACS for single filtration train operation within 4 hours, or suspend movement of irradiated fuel assemblies.

b. With CREACS aligned for single filtration train operation with one of the two remaining fans or associated outlet damper inoperable, restore the fan or damper to OPERABLE status within 72 hours, or suspend movement of irradiated fuel assemblies.

c. With two filtration trains inoperable, immediately suspend movement of irradiated fuel assemblies.

d. With the Control Room Envelope boundary inoperable, immediately suspend movement of irradiated fuel assemblies.

e. With one or both series isolation damper(s) on a normal CAACS outside air intake or exhaust duct inoperable, immediately suspend movement of irradiated fuel assemblies until the affected duct is closed by use of at least one isolation damper secured in the closed position. (Refer to ACTION 28 of Table 3.3-6.)

f. With one or both series isolation damper(s) on an outside emergency air conditioning air intake duct inoperable, immediately suspend movement of irradiated fuel assemblies until the affected duct is closed by use of at least one isolation damper secured in the closed position. To resume movement of irradiated fuel assemblies, at least one emergency air intake duct must be operable on each unit.

TECHNICAL SPECIFICATION BASES PROPOSED CHANGES

The following Technical Specification Bases for Renewed Facility Operating License DPR-70 are affected by this change request:

Technical Specification Bases	Page
3/4.7.10	B 3/4 7-8
3/4.7.6	B 3/4 7-5d

The following Technical Specification Bases for Renewed Facility Operating License DPR-75 are affected by this change request:

Technical Specification Bases	Page
3/4.7.10	B 3/4 7-8
3/4.7.6	B 3/4 7-5d

3/4.7.10 CHILLED WATER SYSTEM - AUXILIARY BUILDING SUBSYSTEM

The OPERABILITY of the chilled water system ensures that the chilled water system will continue to provide the required normal and accident heat removal capability for the control room area, relay rooms, equipment rooms, and other safety related areas. Verification of the actuation of each automatic valve on a Safeguards Initiation signal includes actuation following receipt of a Safety Injection signal.

The Auxiliary Building Chilled Water (AB CH) system can be operated in three possible LCO configurations:

1. Three Chillers Required (LCO 3.7.10a)
2. Two Chillers Required (LCO 3.7.10b)
3. Units Cross-Tied (LCO 3.7.10c)

Three Chillers Required Configuration:

Removal of non-essential heat loads from the chilled water system in the event one chiller is inoperable ensures the remaining heat loads are within the heat removal capacity of the two operable chillers.

Removal of non-essential heat loads from the chilled water system in the event two chillers are inoperable and aligning the CREACs to the maintenance mode ensures the remaining heat loads are within the heat removal capacity of the operable chiller.

During chiller testing, operator actions can take the place of automatic actions.

During Modes 5 and 6 and during movement of irradiated fuel assemblies, chilled water components do not have to be considered inoperable solely on the basis that the backup emergency power source, diesel generator, is inoperable. This is consistent with Technical Specification 3.8.1.2 which only requires two operable diesel generators.

Two Chillers Required Configuration:

In Two Chiller configuration the analyses demonstrate the system will continue to provide required cooling capability to the control room and safety related areas during normal operation and in the event of an accident in conjunction with a single failure. The analyses for Two Chiller configuration were performed with both trains of Control Room Emergency Air Conditioning System (CREACS) operable and one chiller operating in each unit. This configuration accounts for one of the two required chillers in a unit being out of service and an accident and single failure (loss of chiller) in the opposite unit. The restrictions for entering Two Chiller configuration ensure that the heat loads are within the heat removal capacity of the remaining operable chiller. The heat removal capacity of the chiller is based on the service water and outside air temperatures present during the period of November 1st through April 30th. Removal of the Emergency Control Air Compressor (ECAC) from the CH system ensures that the heat load is within the capacity of the remaining chiller.

If one unit is in the Two-Chiller configuration (LCO 3.7.10b) and the other unit is in the Three Chiller configuration (LCO 3.7.10a), CREACS single filtration train alignment is allowed with the unit that is in Three Chiller configuration supplying the CREACS train. Additionally, non-essential heat loads must be isolated from the chilled water system on BOTH Units. Alignment of the single CREACS train to the unit in the Two-Chiller configuration is not permitted.

When entering the LCO 3.7.10b configuration, the third chiller must have CH flow isolated to prevent recirculation of cooling water flow through the non-operating chiller. When restoring from the LCO 3.7.10b configuration for transitioning to the Three Chiller configuration (LCO 3.7.10a), the third chiller may be un-isolated under administrative controls. The administrative controls will require that an operator be dedicated during restoration activities to re-isolate the chiller, if necessary, in the event an accident occurs during the restoration activities.

The loss of the 2 required chillers requires the unit that has lost the chillers to commence a controlled shutdown (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6 or during the movement of irradiated fuel) and transition the CREACS to single filtration operation with the opposite unit supplying the CREACS train unless both units transition to the Cross-Tied configuration. In the event that the Cross-tied configuration cannot be implemented or the transition to CREACS single filtration train alignment cannot be implemented, both units will commence a controlled shutdown (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6 or during the movement of irradiated fuel).

Required operating parameters will be verified every 24-hours (SR 4.7.10d.) when in the Two-Chiller configuration.

Cross-Tied Configuration:

In Cross-tie configuration the analyses demonstrate the system will continue to provide required cooling capability to the control room and safety related areas during normal operation and in the event of an accident in either unit. The supporting calculations were performed assuming that one of the required chillers is unavailable due to either a single failure or being out of service (two chillers remaining).

The analyses for Cross-Tied configuration determined that both trains of CREACS must be operable. With only a single train of CREACS operable, the remaining CREACS cooling coil cannot maintain the control room envelope temperatures within acceptable limits. Therefore, entry into CH Cross-Tied configuration is only allowed when both trains of CREACS are operable. A note is added to TS 3.7.6.1 Action a. to alert operators that CREACS single filtration operation is not permitted if the units are in the CH Cross-tied configuration.

The restrictions for entering the Cross-Tied configuration ensure that the heat loads are within the heat removal capacity of the remaining two operable chillers. The heat removal capacity of the chillers is based on the service water and outside air temperatures present during the period of November 1st through April 30th. Removal of both units' ECACs and both units' non-essential heat loads from the CH system ensures that the heat load is within the capacity of the remaining chillers.

When restoring from the LCO 3.7.10c configuration, the cross-tie valve can be closed under administrative controls. The administrative controls will require that an operator be dedicated during restoration activities to re-open the cross-tie valve, if necessary, in the event an accident occurs during the restoration activities.

If two Chillers become inoperable in Cross-Tie configuration then both units must commence a controlled shutdown (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6 or during the movement of irradiated fuel).

Required operating parameters will be verified every 24-hours (SR 4.7.10e.) when in the Cross-Tied configuration.

ACTIONS

When one CREACS train is inoperable, for reasons other than an inoperable CRE boundary, action must be taken to align CREACS for single filtration train operation within 4 hours, and restore the inoperable filtration train to OPERABLE status within 30 days. Single filtration alignment is only permitted if the Unit with the operable CREACS train is also in Chilled Water System LCO 3.7.10a configuration. Single filtration alignment is not permitted if in the LCO 3.7.10c configuration. This ensures required cooling coil heat removal capacity is available. In this Condition, the remaining OPERABLE CREACS train is adequate to perform the CRE occupant protection function. With CREACS aligned for single filtration train operation and with one of the two remaining fans or associated outlet damper inoperable, restore the inoperable fan or damper to OPERABLE status within 72 hours. However, the overall reliability is reduced because a failure in the OPERABLE CREACS train could result in loss of CREACS function. The 72 hours completion time is based on the low probability of a DBA occurring during this time period, and ability of the remaining train components to provide the required capability.

If the unfiltered inleakage of potentially contaminated air past the CRE boundary and into the CRE can result in CRE occupant radiological dose greater than the calculated dose of the licensing basis analyses of DBA consequences (allowed to be up to 5 rem TEDE), or inadequate protection of CRE occupants from hazardous chemicals or smoke, the CRE boundary is inoperable. Actions must be taken to restore an OPERABLE CRE boundary within 90 days.

During the period that the CRE boundary is considered inoperable, action must be initiated to implement mitigating actions to lessen the effect on CRE occupants from the potential hazards of a radiological or chemical event or a challenge from smoke. Actions must be taken within 24 hours to verify that in the event of a DBA, the mitigating actions will ensure that CRE occupant radiological exposures will not exceed the calculated dose of the licensing basis analyses of DBA consequences, and that CRE occupants are protected from hazardous chemicals and smoke. These mitigating actions (i.e., actions that are taken to offset the consequences of the inoperable CRE boundary) should be preplanned for implementation upon entry into the condition, regardless of whether entry is intentional or unintentional. The 24-hour completion time is reasonable based on the low probability of a DBA occurring during this time period, and the use of mitigating actions. The 90 day completion time is reasonable based on the determination that the mitigating actions will ensure protection of CRE occupants within analyzed limits while limiting the probability that CRE occupants will have to implement protective measures that may adversely affect their ability to control the reactor and maintain it in a safe shutdown condition in the event of a DBA. In addition, the 90 day completion time is a reasonable time to diagnose, plan and possibly repair, and test most problems with the CRE boundary.

In MODE 1, 2, 3, or 4, if the inoperable CREACS train or the CRE boundary cannot be restored to OPERABLE status within the required completion time, the unit must be placed in a MODE that minimizes accident risk. To achieve this status, the unit must be placed in at least MODE 3 within 6 hours, and in MODE 5 within the following 30 hours. The allowed completion times are reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

PLANT SYSTEMS
BASES

3/4.7.10 CHILLED WATER SYSTEM - AUXILIARY BUILDING SUBSYSTEM

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Removal of non-essential heat loads from the chilled water system in the event two chillers are inoperable and aligning the CREACs to the maintenance mode ensures the remaining heat loads are within the heat removal capacity of the operable chiller.

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If one unit is in the Two-Chiller configuration (LCO 3.7.10b) and the other unit is in the Three Chiller configuration (LCO 3.7.10a), CREACS single filtration train alignment is allowed with the unit that is in Three Chiller configuration supplying the CREACS train. Additionally, non-essential heat loads must be isolated from the chilled water system on BOTH Units. Alignment of the single CREACS train to the unit in the Two-Chiller configuration is not permitted.

When entering the LCO 3.7.10b configuration, the third chiller must have CH flow isolated to prevent recirculation of cooling water flow through the non-operating chiller. When restoring from the LCO 3.7.10b configuration for transitioning to the Three Chiller configuration (LCO 3.7.10a), the third chiller may be un-isolated under administrative controls. The administrative controls will require that an operator be dedicated during restoration activities to re-isolate the chiller, if necessary, in the event an accident occurs during the restoration activities.

The loss of the 2 required chillers requires the unit that has lost the chillers to commence a controlled shutdown (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6 or during the movement of irradiated fuel) and transition the CREACS to single filtration operation with the opposite unit supplying the CREACS train unless both units transition to the Cross-Tied configuration. In the event that the Cross-tied configuration cannot be implemented or the transition to CREACS single filtration train alignment cannot be implemented, both units will commence a controlled shutdown (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6 or during the movement of irradiated fuel).

Required operating parameters will be verified every 24-hours (SR 4.7.10d.) when in the Two-Chiller configuration.

Cross-Tied Configuration:

In Cross-tie configuration the analyses demonstrate the system will continue to provide required cooling capability to the control room and safety related areas during normal operation and in the event of an accident in either unit. The supporting calculations were performed assuming that one of the required chillers is unavailable due to either a single failure or being out of service (two chillers remaining).

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When restoring from the LCO 3.7.10c configuration, the cross-tie valve can be closed under administrative controls. The administrative controls will require that an operator be dedicated during restoration activities to re-open the cross-tie valve, if necessary, in the event an accident occurs during the restoration activities.

If two Chillers become inoperable in Cross-Tie configuration then both units must commence a controlled shutdown (or suspend CORE ALTERATIONS and movement of irradiated fuel assemblies if in MODES 5 or 6 or during the movement of irradiated fuel).

Required operating parameters will be verified every 24-hours (SR 4.7.10e.) when in the Cross-Tied configuration.

ACTIONS

When one CREACS train is inoperable, for reasons other than an inoperable CRE boundary, action must be taken to align CREACS for single filtration train operation within 4 hours, and restore the inoperable filtration train to OPERABLE status within 30 days. Single filtration alignment is only permitted if the Unit with the operable CREACS train is also in Chilled Water System LCO 3.7.10a configuration. Single filtration alignment is not permitted if in the LCO 3.7.10c configuration. This ensures required cooling coil heat removal capacity is available. In this Condition, the remaining OPERABLE CREACS train is adequate to perform the CRE occupant protection function. With CREACS aligned for single filtration train operation and with one of the two remaining fans or associated outlet damper inoperable, restore the inoperable fan or damper to OPERABLE status within 72 hours. However, the overall reliability is reduced because a failure in the OPERABLE CREACS train could result in loss of CREACS function. The 72 hours completion time is based on the low probability of a DBA occurring during this time period, and ability of the remaining train components to provide the required capability.

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