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PSEG
Nuclear LLC

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10 CFR 50.90

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LAR S14-04

U.S. Nuclear Regulatory Commission
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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: Response to Request for Additional Information Regarding Chilled Water System Modifications (CAC Nos. MF6724 and MF6725)

References

1. PSEG letter to NRC, "License Amendment Request Modifying Chilled Water System Requirements," dated September 11, 2015 (ADAMS Accession No. ML15254A387)
2. NRC letter to PSEG, "Salem Nuclear Generating Station, Unit Nos. 1 and 2 Request for Additional Information Regarding Chilled Water System Modifications," dated February 17, 2016 (ADAMS Accession No. ML16013A159)

In the Reference 1 letter, PSEG Nuclear LLC (PSEG) submitted a license amendment request for Salem Nuclear Generating Station (Salem), Unit Nos. 1 and 2. The proposed amendment would revise Technical Specification (TS) 3/4.7.10, "Chilled Water System – Auxiliary Building Subsystem," to 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. A supporting change would also be made to the Control Room Emergency Air Conditioning System TS 3.7.6.1 (Unit 1) and TS 3.7.6 (Unit 2).

In the Reference 2 letter, the U.S. Nuclear Regulatory Commission staff provided PSEG a Request for Additional Information (RAI) to support the NRC staff's detailed technical review of Reference 1. The requested information is provided in Attachment 1.

PSEG has determined that the information provided in this submittal does not alter the conclusions reached in the 10 CFR 50.92 no significant hazards determination previously submitted. In addition, the information provided in this submittal does not affect the bases for concluding that neither an environmental impact statement nor an environmental assessment needs to be prepared in connection with the proposed amendment.

There are no regulatory commitments contained in this letter.

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 MAR 31 2016
(Date)

Respectfully,

John F. Perry
Site Vice President
Salem Generating Station

Attachment 1 Response to Request for Additional Information Regarding Chilled Water System Modifications (CAC Nos MF6724 and MF6725)

cc: Mr. D. Dorman, Administrator, Region I, NRC
Mr. T. Wengert, 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

Attachment 1

Response to Request for Additional Information Regarding Chilled Water System Modifications
(CAC Nos. MF6724 and MF6725)

RAI-SBPB-CROSS-TIE-1

BACKGROUND:

PSEG stated in the application that 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.

PSEG stated in the supplemental letter dated November 5, 2015, that a failure modes and effects analysis (FMEA) was performed on the chilled water system cross-tie and that FMEA is consistent with NUREG-0800, "Standard Review Plan," Chapter 9, Section 9.2.7, "Chilled Water" (ADAMS Accession No. ML 14093A350). In addition, PSEG stated that once opened, there is no failure mechanism that will cause either of these valves to go closed. Administrative controls will be established to ensure the valves stay open for the duration of the cross-tie as needed.

PSEG also stated the applicable regulatory requirements include Title 10 of the Code of Federal Regulations (10 CFR), Part 50, Appendix A, "General Design Criteria for Nuclear Power Plants," General Design Criteria (GDC) 44. In Section 5.2 of the LAR, it states:

> *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.*

ISSUE:

As stated in 10 CFR 50, Appendix A:

> *A single failure means an occurrence which results in the loss of capability of a component to perform its intended safety functions. Multiple failures resulting from a single occurrence are considered to be a single failure. Fluid and electric systems are considered to be designed against an assumed single failure if neither (1) a single failure of any active component (assuming passive components function properly) nor (2) a single failure of a passive component (assuming active components function properly), results in a loss of the capability of the system to perform its safety functions.*

The staff understands that the cross-tie valves 1CH63 and 1CH78 have been closed for the life of the plant (over approximately 25 years). The condition of the manual cross-tie valves to open, remain open, and perform a passive safety function need to be verified.

Industry events have identified passive component failures with valve stem to disc separation. Some industry valves in water systems have been known to be highly susceptible to disc/stem separation. In the case of this proposed unit cross-tie manual valve failure going from a full open to a closed position, it would result in a complete loss of chilled water to one unit (reference 2005 LaSalle County Station Inspection Report 2005002).

RAI:

Provide justification for the statement that once opened, there is no failure mechanism that will cause either of these valves to go closed.

In addition, for configuration c (the cross-tie configuration), please:

a. *Describe FMEA for these valves that includes passive failure causing either CH63 or CH78 to go closed.*
b. *Based on the response to item a., describe if CH63 and CH78 should be replaced with a new configuration, thus removing the possibility of a single failure isolating flow to one unit.*
c. *With an accident on one unit, describe the plant consequence if one of the cross-tie valves was to fail closed.*
d. *Describe how plant operators would know (for example, alarms) if one of the cross-tie valves (CH63 and CH78) was to fail closed.*
e. *Describe the inspection plan (for example, internal valve inspections) and test plan to verify operability of CH63 and CH78.*
f. *Describe the TS surveillance requirements (SRs) for these valves (CH63 and CH78).*
g. *Describe procedures for operator actions in the event that one of the cross-tie valves fails closed (postulating valve stem-disc separation).*
h. *Describe the administrative controls that will maintain the valve open.*
i. *Describe if the manual valves have remote position indicators, and if so, the testing that is performed to verify the indications.*
j. *Describe if there are other passive failures that would result in a complete loss of auxiliary building (AB) chilled water (CH) system function to one unit. Based on the staff's review of Salem's piping diagrams, focus on the following manual valves: 1CH62, 1CH17, 2CH17, and 2CH77.*

PSEG RESPONSE

The 10 CFR 50 Appendix A definition for single failure also includes a footnote: *"Single failures of passive components in electric systems should be assumed in designing against a single failure. The conditions under which a single failure of a passive component in a fluid system should be considered in designing the system against a single failure are under development".* This appears to be consistent with NUREG-0800 Standard Review Plan (SRP) 9.2.7 that does not address passive failures. SRP 9.2.7 Section II, "Acceptance Criteria" addresses the relevant requirements. Section II Item 5 discusses GDC 44 and states in Item 5.B that acceptance criteria are based on meeting the relevant requirements of GDC 44 as to component redundancy for performance of safety functions assuming a single, active component failure coincident with the loss of offsite power (LOOP).

Previously, PSEG addressed passive failures when the AB CH Technical Specifications (TS) were created. Per the LAR (approved by Amendments 199 and 182[1]) that added the AB CH TS, the licensing basis was established that a passive failure is applicable only as an initiating event, consistent with SECY 94-084.

Specific responses to Items a through j are provided below; the Item a response provides justification for the statement that once opened, there is no passive failure mechanism that will cause either of these valves to go closed. Active failures were previously addressed in the PSEG supplement dated November 5, 2015, response to NRC Request 4 on FMEA (ADAMS Accession No. ML15309A750).

a. Both the 1CH63 and 1CH78 valves are 4-inch Velan manually operated gate valves. There are three areas that were investigated for passive closure from the open position.

1. Valve Design

The valve stem has an ACME 2G left hand thread. The stem thread and the matching thread of the yoke sleeve maintain the valve in position by their self-locking design and require no additional braking mechanism for backdriving.

2. Valve Orientation

The 1CH63 valve is mounted at a 45 degree angle with the handwheel pointed down. The 1CH78 valve handwheel is mounted horizontal to the pipe. For both locations, it is not credible that the disk would fall closing the valve, if the disk were to separate from the stem.

3. Corrosion or Structural Failure

The valves are constructed of carbon steel; however, the carbon steel is Parkerized to resist corrosion. Both the wedge and the valve seats are stellite which is a corrosion resistant hard facing. For this valve design, the only dissimilar metal is the valve stem which is made of 410 stainless steel. The high ratio of carbon steel surface area to stainless steel surface area is the most favorable condition for resisting galvanic corrosion. Industry issues involving disk/stem separation occurred with valves in the reverse condition, greater stainless steel surface area compared to carbon steel, which results in a high potential for galvanic corrosion.

Velan was contacted and a search of the INPO data base was performed to address structural failures occurring at the T-Head. Velan was not aware of internal structural failures and the INPO data base search corroborated the information supplied by Velan. Structural failures occurring with other manufacturer's valves also involved the use of electric operators and the resultant high thrust loads. The Salem valves are manually operated so a T-Head failure is not considered a credible failure.

b. Based on the response to Item a, there is no need to reconfigure the current cross-tie isolation valve design.

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1 The AB CH system was added to the TS in 1997 by Amendments 199 and 182 (ADAMS ML011720149) 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.

c. As discussed above, (i) a passive failure is not considered credible, and (ii) a passive failure occurring during a design basis accident does not need to be considered. However, if a cross-tie valve were to fail closed, chilled water would be lost to the isolated Unit and the following actions would be taken:

Entry into procedure[2] S1(2).OP-AB.CAV-0001, Loss of Unit 1(2) Control Area HVAC will be directed due to a loss of chilled water to the control area ventilation (CAV) system. The FIRE INSIDE CONTROL AREA mode of operation/configuration of CAV will be selected on both Units. Several doors will be opened/realigned, fans installed and non-essential personnel removed from the rooms served by CAV in order to minimize the heatup rate. Unit shutdown will be initiated, if necessary, prior to reaching the following temperature limits:

- Control Room Envelope limit 110°F
- Electrical Equipment Room limit 120°F
- Control Area Relay Room limit 122°F

After 24 hours, if chillers on the opposite unit are unable to maintain Control Room temperatures, the Accident Pressurized (Accident SI Configuration) configuration of CAV is selected on the opposite Unit.

NOTE: The FIRE INSIDE CONTROL AREA mode of operation/configuration is described as follows:

During a postulated fire inside the control area, the CAV system is manually switched to a once-through ventilation configuration to "purge" the Control Room, Data Logging Room, Electrical Equipment Room, Relay Room AND Battery Room of smoke. 100% outside air is supplied and the Control Area Air Conditioning System (CAACS) fans exhaust the smoke (and existing air volume) to the outside. CAACS and Emergency Air Conditioning System (EACS) fan alignments remain the same as for normal operation.

d. If one of the Chilled Water cross-tie valves were to fail closed, the Operators would know based on any/all of the following:

1. Control Room temperatures rising
2. High Temperature in Relay Room, (1TD7541, Aux. Annunciator Point 0838)
3. High Temperature in Electrical Equipment Room (1TD7542, Aux. Annunciator Point 0839)

[2] For the designation “1(2)”, the “1” refers to the Unit 1 procedure or valve, and the “2” refers to the equivalent Unit 2 procedure or valve.

e. The plan for the initial use of the 1CH63 and 1CH78 valves will be the following:

Valve Greasing:

1. Prior to operating each valve, grease will be added to the operator assembly using the zerk fitting located on the yoke.
2. Prior to operating each valve, the valve packing will be loosened.

Valve Repacking:

3. The valve will be repacked with the valve on its backseat.

Valve Flush:

4. The flush of the cross-tie lines can be performed using the Unit 1 or Unit 2 CH system.

    a. Flushing the cross-tie lines using Unit 1 CH system:

        1. A freeze seal will be installed in the following locations:

            - Between the 1CH159 drain valve and the Unit 2 cross-tie boundary (ref. DWG 205216 SH. 002)
            - Between the 1CH160 drain valve and the Unit 2 cross-tie boundary (ref. DWG 205216 SH. 002)

        2. The cross-tie valves will be opened to perform a flush at the following locations:

            - Between the 1CH63 cross-tie valve and the 1CH159 drain valve (ref. DWG 205216 SH. 001)
            - Between the 1CH78 cross-tie valve and the 1CH160 drain valve (ref. DWG 205216 SH. 001)

    b. Procedure S1.OP-SO.CH-0003, Chilled Water System Flush, provides guidance to flush the cross-tie line using the Unit 2 CH system. The performance of this procedure isolates the CAACS and CREACS coiling coils on Unit 1 in order to perform the flushing of the cross-tie line.

Valve Flow Test

5. Flow through the 1CH63 and 1CH78 valves will be monitored to ensure it is adequate:

    a. Flow rate may be computed by measuring flow through the drain or vent lines
    b. Alternatively, flow may be monitored directly through external flow instrumentation.

Based upon the information provided in the Item a response, there is no need to perform an internal inspection of the 1CH63 and 1CH78 valves.

f. A new proposed SR 4.7.10.e (iii) is shown in Attachment 1 Section 2 of the LAR, and in Attachment 2 (TS Mark-up). SR 4.7.10.e (iii) requires that the cross-tie valves be verified OPEN once per 24 hours when in the Limiting Condtion for Operation (LCO) 3.7.10c configuration. Visual verification of the rising stem valve open position will be performed by Operations. If the valves were to fail closed at any time this would be detected by Operations as discussed in the response to Item d.

g. See the response to Item c.

h. The proposed TS provides the controls to maintain the valves open; appropriate procedural controls will implement the TS requirements. Applicability item 5 of the LCO 3.7.10c configuration requires that the cross-tie valves be open or the LCO cannot be entered. The new proposed SR 4.7.10.e (iii) requires the valves be verified open once every 24 hours. In addition, inadvertent operation will be prevented by the protected equipment program as discussed below in the response to RAI-SBPB-CROSS-TIE-5.

i. The manual valves do not have remote position indicators, thus testing is not applicable.

j. The 1CH62 valve is the exact same valve as the 1CH63 and 1CH78, and is in the same orientation as the 1CH63. The passive failure analysis would be the same as discussed in Item a. The 2CH77 valve is a 3-inch version of the 4-inch 1CH63 with the stem in the horizontal position. The passive failure analysis would be the same as discussed in Item a.

The 1CH17 and 2CH17 are 4-inch Flowserve plug valves. This valve design does not lend itself to a passive failure. The valve position is maintained due to the high sliding contact friction between the plug and the seal and the taper of the valve plug. For this application the plug is carbon steel and the seal insert is malleable iron. The material make-up does not lend itself to a failure from corrosion. An INPO data base review did not identify any applicable failure modes for 4-inch plug valves (both generic and Flowserve). Internal operating experience also did not identify any applicable failure modes.

RAI-SBPB-CROSS-TIE-2

BACKGROUND:

PSEG stated in the letter dated September 11, 2015, that the reason for the unit cross-tie request was to 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 TSs.

ISSUE:

Details are missing on what common line components need to have maintenance performed and how this maintenance was previously performed.

RAI:

Describe details of the need to have the AB CH cross-tie and why this is preferred over the previous practice.

PSEG RESPONSE

Currently, maintenance (i.e., internal inspection) or replacement on certain components and piping associated with the chillers cannot be performed without impacting multiple chiller trains (i.e., cannot be performed with existing TS) as identified below:

- The CH22/27 isolation valves, which provide chilled water isolation to each chiller. Freeze seals to isolate the CH22/27 valves have been considered in the past: however, this was ultimately deemed impossible without impacting at least two chillers simultaneously.
- Many of the CH23-26 drain valves within the boundary of the isolation valves.
- The chilled water expansion tank.
- Replacement of piping within the boundary of the chillers and chilled water pumps.

Since the cross-tie option was eliminated via Amendments 199 and 182 (ADAMS ML011720149), there has been no available option for performing the above activities.

RAI-SBPB-CROSS-TIE-3

BACKGROUND:

PSEG stated in the LAR, under proposed TS 3/4.7.10, that configuration c is proposed to allow chiller maintenance on common components. PSEG stated that calculations model this configuration.

PSEG also stated in the Section 5.2 of the LAR that the applicable regulatory requirements and criteria included GDC 46, "Testing of cooling water system," which states:

> *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.

ISSUE:

The LAR does not describe the field testing that will take place that validates the calculation/model for TS 3/4.7.10, configuration c.

RAI:

Describe the field testing that will take place that validated the calculation/model for configuration c. This should include, but not be limited to:

- *Near the upper band of service water (SW) temperature for April conditions (highest heat sink temperature).*
- *Two chiller operations (assuming three chiller operations with single failure of one chiller).*
- *Emergency control air compressors (ECACs) isolation (SW in standby mode).*
- *ECAC operation with SW as a heat sink.*
- *Non-essential heat loads isolated on both units.*
- *CREACS in operations per TS 3/4.7.6.1 NOT in single filtration train alignment.*
- *Cross-tie valves open.*
- *Testing of bounding combinations of old and new chillers.*

PSEG RESPONSE

PSEG will measure AB CH flows to individual components in the Cross-Tie configuration (Chillers, CAACS cooler and CREACS cooler) to ensure they agree with the analyzed flow rates. The testing will be performed with the proposed applicability conditions of the LCO 3.7.10c configuration met (i.e., cross-tie valves open, non-essential heat loads isolated on both Units, ECACs isolated, CREACS not in single filtration alignment). For this hydraulic test, it is not necessary to account for single failure of a chiller; the system flows will be the same, as flow through the unavailable chiller will continue.

Testing cannot be performed until after NRC approval of LAR since current TS do not allow alignment of AB CH cross-tie. PSEG proposes the following License Condition to capture the testing requirement:

> Concurrent with the first use of the chilled water cross-tie as allowed by Technical Specification 3.7.10c, PSEG shall confirm the required performance of the chilled water system cross-tie.

Thermal performance testing of the proposed configuration, including combinations of old and new chillers, is not considered necessary based on the following:

- The CAV System model (Reference S-C-CAV-MDC-2306) was thermally benchmarked against plant data as follows:
  - CAV room heat up data was used to benchmark the CAV GOTHIC model. The initial plant conditions were set in the model, and abstract thermal conductors

added to the CAV rooms were adjusted until the model output temperatures agreed with the recorded temperatures.

  - To simulate a loss of the chillers, the air flow around the cooling coils in the CAACS air handling unit (AHU) was bypassed by manipulating unit dampers. The design of the AHU did not allow for 100% flow bypass, so partial cooling existed during performance of the testing. The CAACS cooling coil inputs in the model were set to align with the partial cooling alignment.

  - Additionally, the CAACS and CREACS coolers included in the model were benchmarked against manufacturer's data. Multipliers were applied to the heat transfer coefficients until model output parameters agreed with manufacturer's data.

- The Salem chillers are designed to provide a CH outlet temperature of 44°F up to the design SW temperature of 90°F through the use of various controls:

  - SW flow to the condensers is modulated to maintain condenser pressure. The new chillers will have this same feature.

  - The thermal expansion valve modulates refrigerant flow to maintain a fixed superheat out of the evaporator. The new chillers will have this same feature.

  - Cylinders in the current reciprocating compressors load and unload in response to system load demands. The new chillers will have a screw type compressor, with a slide valve responding to system load demands.

- The chillers operate independent of each other. With both the existing and new chillers providing 44°F AB CH outlet temperature, different combinations of existing and new chillers will not impact cooling to system loads. Therefore, testing of different combinations of existing and new chillers is not required.

- Operating experience has found no challenges to CAV room temperature design limits under summer heat load conditions.

- Based on the response to RAI-SBPB-14, no specific testing is required with SW aligned to the ECAC coolers.

RAI-SBPB-CROSS-TIE-4

BACKGROUND:

PSEG stated in the LAR, under proposed TS 3/4.7.10, that configuration c is proposed to allow maintenance on common components. PSEG stated that calculations modeled this configuration for unit cross-tie.

The existing TS 3/4.7.10 requires that with one chiller water pump inoperable, the chiller water pumps be restored to operable status within 7 days.

<u>ISSUE</u>:

The LAR does not describe actions for when the plant has entered TS 3/4.7.10 - configuration c to perform maintenance on common chiller components with all the applicability conditions met, then later (during maintenance on the common chiller components), one of the chillers or chiller pumps becomes inoperable.

<u>RAI</u>:

Clarify the actions that would occur if configuration c was no longer met (for example, one of three chillers or one of two chilled water pumps was to become inoperable while in configuration c (maintenance)).

Specifically address, why while in configuration c with two of the required chillers becoming inoperable, 72 hours is an acceptable duration for return to service of one chiller.

<u>PSEG RESPONSE</u>

The following discussion is applicable for MODES 1, 2, 3 and 4. The actions are identical for MODES 5 and 6 except that where Unit shutdown is required in MODES 1-4, suspension of CORE ALTERATIONS and movement of irradiated fuel assemblies is required in MODES 5 and 6.

Inoperability of One Chiller

Inoperability of one chiller in Configuration 'c' requires restoration of the inoperable chiller within 14 days per ACTION a.2. If ACTION a.2 cannot be met, then Unit shutdown is required per ACTION a.3 (be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours). These ACTIONs are applicable to both Units per the new proposed Note 3 (shown in Attachment 1 Section 2.0 of the LAR and in the TS Markup (Attachment 2)):

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

Also ACTION a.1 to remove appropriate non-essential heat loads within 4 hours is modified by new proposed Note 4:

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

The non-essential loads have already been isolated as part of Configuration "c" applicability requirements.

Inoperability of One Chilled Water Pump

The inoperability of one chilled water pump requires restoration of the inoperable pump within 7 days or the plant to be in at least HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours per ACTION c. This ACTION is applicable to both Units per the new proposed Note 3 (shown in Attachment 1 Section 2.0 of the LAR and in the TS Markup (Attachment 2):

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

Inoperability of Two Required Chillers

Two new proposed notes (shown in Attachment 1 Section 2.0 of the LAR) and in the TS Markup (Attachment 2) provide the required actions if Configuration 'c' is no longer met:

New Note 3 requires that ACTIONS are applicable to both Units when in Configuration "c":

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

New Note 6 on ACTION (b) requires shutdown if in Configuration "c" (cross-tied) and if two of the required chillers become inoperable:

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

Action b.4 requires Unit shutdown; HOT STANDBY within the next 6 hours and in COLD SHUTDOWN within the following 30 hours. Consequently, new Notes (3) and (6) will require both Units to shutdown on loss of two chillers when cross-tied (Configuration "c"). These two notes eliminate the 72 hour restoration time allowance for Configuration "c".

For discussion of other LCO 3.7.10.c applicability conditions see the response to RAI-SBPB-8.

<u>RAI-SBPB-CROSS-TIE-5</u>

<u>BACKGROUND</u>:

PSEG stated in the LAR, under proposed TS 3/4.7.10, that configuration c is proposed to allow maintenance on common components. The proposed configuration c allows the cross-tie to be open between units so that three chillers support the heat loads of both units.

The Salem Updated Final Safety Analysis Report (UFSAR), Section 13.1.1.1, "Engineering," states the engineering director's responsibilities include the maintenance rule program.

The regulation in 10 CFR 50.65(a)(4) states:

> *Before performing maintenance activities (including but not limited to surveillance, post-maintenance testing, and corrective and preventive maintenance), the licensee shall assess and manage the increase in risk that may result from the proposed maintenance activities. The scope of the assessment may be limited to structures, systems, and components that a risk-informed evaluation process has shown to be significant to public health and safety.*

PSEG procedure OU-AA-103, "Shutdown Safety Management Program," states that protected equipment is equipment (or systems) whose availability has been physically identified as essential to ensure that a key safety function is maintained.

ISSUE:

The Maintenance Rule regulation is referenced in the Salem UFSAR, including the requirements of 10 CFR 50.65(a)(4), which involve online risk assessment. Both of the Salem, Unit Nos. 1 and 2 chilled water system - AB subsystems, consist of three chillers. In the cross-tie configuration, three chillers will be removed from service. The stations risk profile was not described in the LAR.

RAI:

a. *Describe the risk assessment (10 CFR 50.65 (a)(4)) for each unit when in configuration c unit cross-tie. Specifically, describe the results related to core damage frequency and large early release frequency.*
b. *Describe Salem's program related to protected equipment. Specifically, when using the cross-tie, describe the major mechanical and electrical equipment that will be 'protected' against inadvertent operations, inadvertent testing, inadvertent tag-out (lock-out), or inadvertent maintenance that could place the plant at risk.*

PSEG RESPONSE

a. Core damage frequency (CDF) and large early release frequency (LERF) for the LCO 3.7.10c Cross-Tie configuration is not available. The Salem full power internal events (FPIE) probabilistic risk assessment (PRA) model does not currently credit use of the chilled water cross-tie. When the license amendment request (LAR) is granted, the need to include the chilled water cross-tie in the PRA will be assessed per PSEG procedure ER-AA-600-1015, FPIE PRA Model Update during the implementation of the LAR.

b. PSEG work management procedure WC-AA-101, On-line Work Management Process, governs on-line risk assessments. WC-AA-101 is supported by two operations procedures: OP-AA-101-112-1002, On-line Risk Assessment, and OP-AA-108-116, Protected Equipment Program. The on-line risk assessment is a blended approach using qualitative or defense-in-depth considerations and quantifiable PRA risk insights when available to complement the qualitative assessment. Salem communicates on-line plant risk using three risk tiers (GREEN, YELLOW, and RED). The on-line risk level for both Salem Units will be elevated to YELLOW when using the chilled water cross-tie. The YELLOW declaration will alert station personnel that the operational configuration causes an elevated risk condition acceptable for the scheduled maintenance duration. This elevated risk can be managed by reducing equipment outage time and implementing compensatory measures. The primary compensatory measures are to protect equipment necessary to maintain the chilled water function for both Units. This equipment includes all three chillers and both chilled water pumps. The emergency diesel generators (EDG) that provide backup electrical power to the vital AC buses will also be protected to ensure availability of all three chillers if a loss of offsite power (LOOP) occurs. For configurations of this nature, it is common practice to protect the general areas of the plant that contain the chiller and control area ventilation equipment. However, that determination has not been finalized for the new TS configurations.

   Protecting equipment requires posting of signs and robust barriers to alert personnel not to approach the protected equipment. The protected equipment postings are walked down each shift by the duty operators. Work on protected equipment is generally disallowed. Minor exceptions exist for activities such as Operator rounds, security patrols, or emergency operations. Other exceptions must be authorized by the station shift manager in writing. Inadvertent operation will be prevented by the protected equipment program.

As mentioned in this RAI, PSEG procedure OU-AA-103, Shutdown Safety Management Program, states that protected equipment is essential to ensure availability of a key safety function. OU-SA-105, Shutdown Safety Management Program – Salem Annex, supports the shutdown safety program. Salem uses four risk tiers (GREEN, YELLOW, ORANGE, and RED) for communication of risk during plant outages. Outage risk assessments are purely a qualitative analysis representing defense-in-depth. Use of the chilled water cross-tie in outage risk assessment models is not currently credited but may be implemented to support future outage activities. The risk level is likely to be elevated, and the compensatory protected equipment measures will be similar as for on-line operation.

RAI-SBPB-6

BACKGROUND:

PSEG stated in the supplemental letter dated November 5, 2015, that an expansion tank is installed at the suction of the pumps to accommodate chilled water inventory, thermal expansion, and to provide adequate net positive suction head for the chilled water pumps. In addition, it was stated that FMEA S-C-CH-MEE-1139, Revision 1, dated December 10, 1998, was assessed in a technical evaluation for the new chilled water configurations, which include the potable water and nitrogen system.

PSEG also stated in the LAR under proposed TS 3/4.7.10, configuration b, item 4c and configuration c, item 3 that non-essential heat loads are isolated from the chilled water system on both units. Proposed TS 3/4.7.10 SRs (item d(iii)) and 10c (item e(ii)) also have a similar statement that non-essential heat loads are isolated from the chilled water system.

ISSUE:

Standard Review Plan 9.2.7 states, in part, that the system is designed to provide water makeup as necessary. Closed-loop systems with surge tanks (also referred to as expansion tanks) should have sufficient capacity to accommodate expected leakage from the system for 7 days, or a safety-related Seismic Category I automatic source of makeup can be made available within a timeframe consistent with the surge tank capacity (the time period is initiated at the actuation of the low level alarm). Surge tank leakage over a 7-day period should include the possibility of valve seat leakage for chilled water system boundaries, chilled water pump seal leakage, equipment gaskets, and general valve packing leakage.

For the proposed configuration c, only one expansion tank will be aligned for dual unit operations.

RAI:

Describe the design bases of the expansion tank for each unit and sizing for system leakage. Specifically, address if system leakage exceeds water makeup rates when aligned for new configurations b and c. This should include calculations and the following information:

a. *Describe the design and usable volume (gallons) of the two unit expansion tanks.*
b. *Describe the normal leakage rate gallons per minute (gpm) for each unit and how expansion tank water makeup is achieved. Provide historical data to support existing leakage.*
c. *Describe the accident leakage rate (gpm) for each unit and how expansion tank water makeup is achieved assuming loss of offsite power (LOOP).*
d. *Describe the expected leakage rate when in new configuration b, since non-essential loads, emergency control air compressor (ECAC), and one chiller is isolated with boundary valves on one unit, assuming LOOP. Leakage should include worst conditions with SW in service and not in service to the ECAC.*
e. *Describe the expected leakage rate, with one expansion tank now in service for two units of chilled water system leakage when in new configuration c, since non-essential loads and ECAC are isolated on both units, assuming LOOP. Leakage should include worst conditions with SW in service and not in service to the ECAC.*
f. *Describe the test plan or field verification (or new TS surveillance) for system leak rate while in the cross-tie configuration so that the system leakage remains bounding for all conditions, given a LOOP.*
g. *Describe all design or operational changes that are needed to the chilled water expansion tank and potable water makeup flow rates (assuming LOOP) to support possible new leakage rates when in new configurations b and c.*

PSEG RESPONSE

a. Each Unit's expansion tank has a nominal total volume of 306 gallons. From the Primary Plant Log, the tank level is required to be maintained from 50% to 75%, which equates to a nominal volume of 163-230 gallons. The unusable volume is 25 gallons, yielding a net usable volume of 138-205 gallons per tank. At the low level alarm setpoint (26.4%), the nominal volume is 100 gallons, or a net usable volume of 75 gallons per tank.

b. Historical data has found that there is little to no leakage in the system as discussed below.

Currently, the Unit 1 and Unit 2 automatic makeup capabilities of the chilled water expansion tanks are not operational. This is due to previously identified in-leakage past the automatic makeup valve causing expansion tank level to rise, upon which the makeup lines were manually isolated. Operations monitors expansion tank level once per shift and performs makeups of the tank as required per Operator Logs and procedure S1(2).OP-AR.ZZ-0018, Auxiliary Annunciator Alarm List. Makeup to the expansion tank is not typically required unless to support fill and vent of the system following maintenance.

Measurement of system leakage for both the Unit 1 and Unit 2 CH systems was performed under a troubleshooting activity in 2008 and found zero leakage on both Units.

Recent trend data of expansion tank level generally finds no evidence of leakage, i.e., the level remains constant. Per review of historical data, the chilled water expansion tank level may typically vary by 5% from week to week. However, this variation is not consistent, and can be both positive and negative. Based on the historical data and the system leakage measurement results demonstrating little to no leakage, the tank level variation is most likely due to operator interpretation of the level in the expansion tank site glass versus actual leakage.

However, assuming this 5% variation in expansion tank level is real, a conservative estimate for chilled water inventory loss may be made. On 10/05/2015, Unit 1 chilled water expansion tank level was estimated at 70% level. On 10/19/2015, Unit 1 chilled water expansion tank level was estimated at 65% level. This 5% variation in expansion tank level corresponds to approximately a 14 gallon loss. Over the 14 day period observed, this corresponds to a potential 1 gallon/day loss of inventory, or 7 gallons/week.

From Item a, the tank is maintained at a minimum level of 50%, which equates to 138 gallon usable volume. At the low level alarm (26.4%), the usable volume is 75 gallons. Even if it is conservatively assumed the tank drops to this level, there would still be sufficient inventory to mitigate leakage for 7 days.

If tank level is found below 50%, additional potable water is added. At a 7 gallons/week leak rate, the level would be expected to drop from 50% to 26.4% after 9 weeks. Leakage rates of this amount would be effectively mitigated by once per shift monitoring, meaning the low level alarm would never be reached.

c - e. Based on the normal operation leakage discussed in Item b, the expected leakage during off-normal alignments, including accident and LOOP, Two Chiller (LCO 3.7.10b configuration) and Cross-Tied (LCO 3.7.10c configuration), will be minimal.

f. When initially aligned in the Cross-Tied configuration (1CH63 and 1CH78 valves open), the following will be performed to verify system leakage:

1. Monitoring of the chilled water expansion tank level for each Unit over a period of time to quantify actual system leakage, similar to the manner performed in 2008. Duration of monitoring to be determined during the planning process.

2. A walk-down of the in-service chilled water system piping to verify no additional leaks developed following change in alignment.

g. Based on the normal operational leakage discussed in Item b, no design or operational changes are required to the expansion tank and potable water makeup flow rates to support possible new leakage rates when in new LCO configurations b and c.

RAI-SBPB-7

BACKGROUND:

PSEG stated in the LAR under proposed TS 3/4.7.10, configuration b, item 4c and configuration c, item 3 that non-essential heat loads are isolated from the chilled water system on both units. Proposed TS 3/4.7.10 SRs (item d(iii)) and 10c (item e(ii))) also have a similar statement on non-essential heat loads that are isolated from the chilled water system.

ISSUE:

The specific heat loads that are to be isolated and details of how the isolation is accomplished are missing from the LAR.

RAI:

Describe the non-essential heat loads that will be isolated for configurations b and c and the two SRs. Include the following information:

a. *Describe the specific valve numbers that isolated those non-essential heat loads (include both units).*
b. *Describe the assumed valve seat leakage for these boundary valves and if this has been assumed in design calculation for expansion tank sizing.*
c. *Based on the response to item b., describe changes that are needed to the chilled water expansion tank and potable water makeup flow rates (assuming LOOP or loss of instrument air) to support new leakage rates.*
d. *Describe if there is a plan to field verify (testing) that the new boundary valve assumed seat leaking remains bounding.*
e. *Describe how plant operators will know what loads have to be isolated and where this information can be found (i.e., UFSAR, TS Bases, procedures, etc.).*

PSEG RESPONSE

a. Valves that isolate the non-essential heat loads are listed below.

Penetration Area Cooling Units (PACU)

Unit 1

11 - 1CH30, 1CH151
12 - 1CH30, 1CH151
13 - 1CH30, 1CH151

Unit 2

21 - 2CH30, 2CH151
22 - 2CH30, 2CH151
23 - 2CH30, 2CH151

Secondary Lab Coolers (SLC) - 1CH119, 1CH130

Primary Lab Coolers (PLC) - 1CH175, 1CH184

Counting Room Coolers (CLC) - 2CH119, 2CH130

Post Accident Sampling Room Coolers (PASRC) - 2CH211, 2CH208

Unit 1 ECAC - 1CH231, 1CH224

Unit 2 ECAC - 2CH231, 2CH224

b. The CH30 and CH151 PACU isolation valves are control valves and are designed to Class IV leak tightness with a maximum leakage rate of 0.071 gpm. The upstream PACU manual isolation valve (CH31) can also be closed and is designed for a seat tightness of 6 cc/in/hr. The other manual valves listed in Item a have a leakage rate of 3 cc/inch/hr for each inch of nominal size and range in size from 1-1/2" to 2". (ie. 6cc/hr for a 2-inch valve). The leakage rate for manual valves equates to essentially zero seat leakage.

c. No design or operational changes are required to the expansion tank and potable water makeup flow rates.

d. Based on the responses to Item b and RAI-SBPB-6, there is no additional testing required to validate the boundary valve assumed leakage.

e. Guidance for isolating non-essential heat loads currently exists in procedure S1(2).OP-SO.CH-0001, Chilled Water System Operation. This procedure will be updated during the implementation of this amendment to reflect LCO configuration b, applicability condition 4.c, and LCO configuration c, applicability condition 3.

RAI-SBPB-8

BACKGROUND:

PSEG stated in the LAR, under proposed TS 3/4.7.10, configuration b, item 4b, that the opposite unit has to be in Limiting Condition for Operation (LCO) 3.7.10a configuration.

ISSUE:

Details are missing for the condition in which LCO 3.7.10a cannot be met for one unit while the other unit is in Applicability b. For instance, if TS 3/4.7.10, Applicability b is entered for Unit No. 2 and Applicability a is initially met for Unit No. 1, but then one or both of the operable chillers becomes inoperable at some later time (this is just one example).

RAI:

Describe all combinations of actions that will be taken while in either configurations b or c when the applicability conditions can no longer be satisfied. Specifically, address whether a new LCO is needed for these conditions. Clarify if the proposed actions and/or LCO 3.0.3 (shutdown actions) is entered for this condition. Please include the items below in your discussion:

a. ECAC becomes unisolated (b.2) and (c.2).
b. Chilled water flow becomes unisolated to the third chiller (b.3).
c. Control room emergency air condition system is not in single alignment (b.4).
d. Opposite unit does not meet LCO 3.7.10a (b.4.b).
e. Non-essential loads are not isolated (b.4.c) (c.3).
f. Chilled water valves are not full open (c.5).
g. Low expansion tank level.

PSEG RESPONSE

If the applicability conditions of the LCO 3.7.10b or LCO 3.7.10c configurations can no longer be met once the LCO has been entered then the LCO must be exited. If the Unit cannot transition to one of the other LCO configurations, then TS 3.0.3 becomes applicable (Shutdown actions). This applies for all of the applicability conditions of the LCO 3.7.10b and LCO 3.7.10c configurations. Further discussion on each of the items a through g of the RAI is provided below.

a. The ECACs have an alternative source of cooling (SW); therefore there is no reason to unisolate the ECAC once in LCO 3.7.10b or LCO 3.7.10c configurations (also refer to discussion provided in RAI-SBPB-14 response). There is no foreseen circumstance where this could occur inadvertently; procedure and administrative controls will ensure the ECACs remain isolated when in LCO 3.7.10b or LCO 3.7.10c configurations. But as noted above; if they cannot remain unisolated for any reason then the LCO configuration must be exited.

b. New proposed Notes 1 and 2 provide controls for unisolating a Chiller and other chilled water components:

> *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*

Additional discussion is provided in Attachment 3 of the LAR (markup of the TS Bases for the proposed changes). The proposed TS Bases discusses the isolation of the third chiller in the LCO 3.7.10b configuration:

> *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 configuration), 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.*

A chiller will only be unisolated under the above described conditions controlled by the new TS Notes 1 and 2; i.e. when exiting the LCO 3.7.10b or LCO 3.7.10c configurations. But as noted above, if the chiller becomes unisolated for any reason then the LCO must be exited.

c. Placing the Control Room Emergency Air Conditioning System (CREACS) in single filtration train alignment is not in itself an applicability requirement/restriction in the LCO 3.7.10b configuration (refer to the response to RAI-SCVB-1). If single filtration train alignment is required due to unplanned inoperability of a CREACS train while in the LCO 3.7.10b configuration, Applicability items 4.a, b and c provide the necessary restrictions to ensure the Salem Units are operated within the bounds of the analyzed configurations. If 4.a, b, and c cannot be met, then single filtration train alignment is not permitted while in the LCO 3.7.10b configuration.

d. As discussed in the response to Item c, if the 4.a applicability restriction (for the LCO 3.7.10b configuration) cannot be met (opposite Unit is in the LCO 3.7.10a configuration), then single filtration alignment is not permitted.

e & f. If the applicability conditions of the LCO 3.7.10b or LCO 3.7.10c configurations can no longer be met once the LCO configuration has been entered, then the LCO configuration must be exited.

g. The expansion tank has local level indication and remote low level alarm. If tank level cannot be maintained, then the chiller operability will be assessed; if determined to be no longer operable and the required number of chillers is not met, then the appropriate ACTION statement is entered.

RAI-SBPB-9

BACKGROUND:

PSEG stated in the LAR, under proposed TS 3/4.7.10, configurations b and c, item 1, that the time duration starts November 1 and runs through April 30 in all modes. Proposed SRs are described for:

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.*

ISSUE:

The estimated time-line and replacement details for the chiller replacement were not described in the LAR. For example, under configuration b, if the chiller replacement was to begin on April 1 with an expected work duration of 30-40 days, the administrative controls that are in place to prevent exceeding April 30 would need to be identified.

RAI:

a. *Describe the hours planned for one chiller replacement (worst condition). Provide best known time-line based on plant experiences and/or industry bench marking for safety-related chillers. Provide detailed time-line duration (for example, safety tag-outs, chiller skid change out, contingencies, testing, instrumentation and controls verification, refrigerant charging, testing-trouble shooting, safety tag-outs removal, and return to service).*
b. *Describe the controls that are in place to prevent exceeding the time limit (beyond April 30) under configurations b and c. Specifically, describe the controls (with reasonable assurance) that are in place to not start the chiller replacement too late in the winter months, factoring in all contingences, and not jeopardizing exceeding April 30.*
c. *Describe why it was not necessary to add a TS 3/4.7.10 SR for this time (not before November 1 and not beyond April 30), for configurations b and c.*
d. *Describe the actions that would be taken if April 30 is exceeded due to unplanned or unforeseen issues during chiller replacement.*

PSEG RESPONSE

a. Preliminarily, the project anticipates an installation window of approximately 45-60 days per chiller. This is based on the congested area with operable equipment in close proximity to the work and the extent of work being performed. The schedule will be refined as the project proceeds with a detailed schedule anticipated in September 2016.

The Design Change for the chiller replacement is still being developed. The chiller vendor has been selected and the design change preparer has been engaged in preliminary data gathering. The Design Change Package (DCP) process has various milestones, including 30%, 70% and 100%. Normally when the DCP gets to the 30% stage, an installation plan and schedule is developed. Due to the complicated nature of this design change, the installation contractor will be solicited for their input in advance of the 30% milestone to aid in the identification of component removal and installation sequence and obstruction mitigation.

The Modification Testing, which includes component level testing as well as system testing, will start to be developed at the 70% milestone. At that point, the design should be established with only minor changes going forward. The 30% and 70% milestones for Unit 1 are scheduled to be completed in summer of 2016.

b. A detailed schedule will be developed for the chiller replacements with one chiller being replaced and returned to operable status prior to proceeding to the next chiller. The lessons learned will be incorporated into the succeeding replacement schedule and reviewed with Senior Management. Thirty percent (30%) margin will be maintained as a contingency to ensure the April 30 end date of the LCO will not be exceeded (for a 60 day work window 78 days must be available prior to April 30; so the work would not be allowed to start after February 12).

c. This applicability condition establishes a calendar window that is more appropriately managed by administrative controls versus a SR.

d. If the applicability calendar condition/restriction cannot be met, then the LCO must be exited. If none of the other LCOs can be entered (in this case the LCO 3.7.10a configuration), then the Unit must be shutdown in accordance with LCO 3.0.3.

RAI-SBPB-10

BACKGROUND:

PSEG stated in the LAR, under proposed TS 3/4.7.10, Notes (1) and (2), that when transitioning from LCO to LCO, administrative controls are required. Specifically,

> *(1) When transitioning from the LCO 3.7.10b to 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.*

NUREG-1431, Revision 4, "Standard Technical Specifications, Westinghouse Plants" (ADAMS Accession No. ML12100A228), has examples of completion times for the return to service of safety-related components. For example, B 3.4.12, "Low Temperature Overpressure Protection (LTOP) System," states, in part:

> *The LCO is modified by two Notes. Note 1 allows [two charging pumps] to be made capable of injecting for ≤ 1 hour during pump swap operations. One hour provides sufficient time to safely complete the actual transfer and to complete the administrative controls and Surveillance Requirements associated with the swap.*

ISSUE:

The return to service time allowance is not stated in the LAR for TS 3/4.7.10, Notes (1) and (2).

RAI:

a. *Describe during this transition period if automatic chiller functions are bypassed or removed.*
b. *Describe the controls in place to prevent equipment damage (for example, pump run out, pump dead head, water hammer, chiller reverse flow) during transition from cross-tie open to cross-tie closed while maintaining the AB CH system operable.*

c. *Describe the planned duration for 'return to operable service' under administrative controls for Notes (1) and (2).*
d. *Describe if this planned duration (sufficient time allowed) for return to service should be added to Notes (1) and (2) in the TSs.*

PSEG RESPONSE

a. Bypassing/removing automatic chiller functions is not currently required when removing or placing chillers in service; it is not anticipated this will be required for cross-tie operations. The change in system alignment due to transitioning between TS configurations will initially change CH flow through the chillers, then eventually the CH return temperature (chiller inlet). The chiller controls will adjust accordingly to the changing conditions, and the thermal performance will reach a new steady-state condition.

b. Required controls to prevent equipment damage during transition from cross-tie open to cross-tie closed while maintaining the CH system operable will be established via procedural guidance developed during the implementation of the LAR.

c. Technical Specifications do not prescribe limits for use of "administrative controls." Returning chilled water equipment to service for the LCO transition is no different than when current components are returned to service within ACTION statements; i.e. it is performed per existing procedural controls. The use of proceduralized administrative controls provides the necessary compensation for the abnormal equipment configuration while transitioning between LCO configurations. This is discussed further in the response to Item d below.

d. Including return to service times in TS is not necessary or required consistent with existing Salem TS. Similar circumstances currently exist per TS 3.0.6 when equipment removed to comply with ACTIONS is being restored. The restoration of equipment when transitioning from one Chiller LCO to another per the proposed notes is no different in concept than the use of TS 3.0.6 for other Salem TS where equipment is "*returned to service under administrative control.*" Return to service administrative controls are managed by procedures. The new proposed Notes (1) and (2) will similarly be managed by procedural controls.

RAI-SBPB-11

BACKGROUND:

PSEG stated in the LAR, under proposed TS 3/4.7.10, that configuration b is proposed to allow chiller replacement. PSEG stated that calculations modeled this configuration.

PSEG also stated in Section 5.2 of the LAR that the applicable regulatory requirements and criteria include GDC 46.

ISSUE:

The LAR does not describe the field testing that will take place that validates the calculation/model for TS 3/4.7.10, configuration b. Also, the LAR does not describe the testing that will take place to determine the effects of new chillers on the calculation/model.

RAI:

Describe the pre-operational field testing that will take place that validated the calculation/model for configuration b. This should include, but not limited to:

- *Near the upper band of SW temperature for April conditions (highest heat sink temperature).*
- *One chiller operation (assuming two chiller operations with single failure of one chiller).*
- *ECAC isolation (SW in standby mode).*
- *ECAC operation with SW in service as a heat sink.*
- *Chiller water flow isolated for the out of service chiller.*
- *CREACS in single filtration train alignment.*
- *Non-essential heat loads isolated on both units.*
- *Testing of bounding combinations of old and new chillers.*

PSEG RESPONSE

PSEG will measure AB CH flows to individual components in the Two Chiller configuration (Chillers, CAACS cooler and CREACS cooler) to ensure they agree with the analyzed flow rates. The testing will be performed on both Unit 1 and Unit 2, with the proposed applicability conditions of the LCO 3.7.10b configuration met (i.e., cross-tie valves closed, non-essential heat loads aligned on both Units, ECACs isolated, third chiller isolated).

Thermal performance testing, including combinations of old and new chillers, is not considered necessary, based on the following:

- The CAV System model (Reference S-C-CAV-MDC-2306) was thermally benchmarked against plant data as follows:
    - CAV room heat up data was used to benchmark the CAV GOTHIC model. The initial plant conditions were set in the model, and abstract thermal conductors added to the CAV rooms were adjusted until the model output temperatures agreed with the recorded temperatures.
    - To simulate a loss of the chillers, the air flow around the cooling coils in the CAACS air handling unit (AHU) was bypassed by manipulating unit dampers. The design of the AHU did not allow for 100% bypass, so partial cooling existed during performance of the testing. The CAACS cooling coil inputs in the model were set to align with the partial cooling alignment.
    - Additionally, the CAACS and CREACS coolers included in the model were benchmarked against manufacturer's data. Multipliers were applied to the heat

transfer coefficients until model output parameters agreed with manufacturer's data.

- The Salem chillers are designed to provide a CH outlet temperature of 44°F up to the design SW temperature of 90°F through the use of various controls:
  - SW flow to the condensers is modulated to maintain condenser pressure. The new chillers will have this same feature.
  - The thermal expansion valve modulates refrigerant flow to maintain a fixed superheat out of the evaporator. The new chillers will have this same feature.
  - Cylinders in the current reciprocating compressors load and unload in response to system load demands. The new chillers will have a screw type compressor, with a slide valve responding to system load demands.
- The chillers operate independent of each other. With both the existing and new chillers providing 44°F AB CH outlet temperature, different combinations of existing and new chillers will not impact cooling to system loads. Therefore, testing of different combinations of existing and new chillers is not required.
- Operating experience has found no challenges to CAV room temperature design limits under summer heat load conditions.
- Based on the response to RAI-SBPB-14, no specific testing is required with SW aligned to the ECAC coolers.

RAI-SBPB-12

BACKGROUND:

The existing TS 3/4.7.10 ACTION allows 14 days with one inoperable chiller and 72 hours with two inoperable chillers. PSEG stated in the LAR, under proposed TS 3/4.7.10, that configuration b is proposed to allow chiller replacement.

ISSUE:

Over a period of time, all three safety-related chillers on Unit No. 1 will be replaced, and all three safety-related chillers on Unit No. 2 will be replaced.

RAI:

Describe and justify why TS 3/4.7.10 – configuration b is needed for the life of the plant once the three (per unit) chillers have been replaced.

PSEG RESPONSE

While the more urgent need for the LCO 3.7.10b configuration is to support the replacement of the chillers, the justification for the LCO 3.7.10b configuration was not based on a limited use analysis using probabilistic assumptions. The analysis/justification is deterministic based, and demonstrates that with the cooler temperature calendar window and the heat load that needs to be removed from the CH system, the number of required chillers is less (two vs three, considering a single failure).

The new proposed configurations (LCO 3.7.10b and LCO 3.7.10c) have significant restrictions that must be met, as outlined in the proposed applicability sections of the LCOs. Because of these restrictions, the new LCO 3.7.10b and 3.7.10c configurations will be used judiciously. From an operational standpoint, it is preferred to remain in the original LCO 3.7.10a configuration whenever possible and practical (i.e., less likelihood that a Unit, or both Units, would need to make an unplanned transition out of the LCO, or even shutdown).

The use of a calendar window is not unique to the proposed Chilled Water TS. Existing Salem TS 3.9.3 Decay Time uses a similar applicability for core off-load. Similar to TS 3.9.3, PSEG proposes to have the same permanent calendar applicability for the Chiller Water System. This allows not only the chiller replacements but also additional operational flexibility during the cooler months of the year, similar to how TS 3.9.3 is utilized for core offloads during the cooler months of the year. Having this flexibility reduces the possibility of PSEG having to request enforcement discretion in the future for the AB CH system.

Originally, PSEG only explored the proposed Cross-Tied LCO (LCO 3.7.10c configuration) for the chiller replacement project (as well as the maintenance on common line components). Due to the Cross-Tie configuration restrictions required by the analysis (particularly the prohibited use of the CREACS single filtration alignment in the Cross-Tie configuration), the additional Two Chiller LCO 3.7.10b configuration was subsequently evaluated and included in the proposed TS change to allow for the necessary time, flexibility and realistic operating conditions to perform the required work. The LCO 3.7.10b configuration will initially be used to support the chiller replacements; however, use for other operating reasons is not restricted by the analysis supporting the LCO configuration.

RAI-SBPB-13

BACKGROUND:

PSEG stated in the LAR, under proposed TS 3/4.7.10, that configuration b is proposed to allow chiller replacement.

ISSUE:

Over a period of time, all three AB CH chillers on Unit No. 1 will be replaced, and all three safety-AB CH chillers on Unit No. 2 will be replaced. As chillers are replaced between the two units, there will be various combinations of new and old chillers until all six AB CH chillers are installed, tested, and declared operable.

RAI:

Describe how the existing supporting calculation/model includes the various combinations of existing chillers and new chillers. This should include a discussion for the SW control valve (SW102) in maintaining condenser pressure at 210 pounds per square inch gauge and preventing freezing for the new chiller and refrigerant with R143A versus old refrigerant R22.

PSEG RESPONSE

MPR-4027, "Salem Chilled Water System Evaluation to Support Reduction in Required Chillers," and supporting calculations S-C-CH- MDC-2282, S-C-CH-MDC-2319, and S-C-CAV-MDC-2320 evaluate the existing chillers. MPR-4027 (Section 1.3.4) requires that the replacement chiller performance be equal to or greater than the existing chillers. This requirement is satisfied, as discussed in the PSEG supplement dated November 5, 2015, response to NRC Request 1 (ADAMS Accession No. ML15309A750).

The compressor discharge head pressure is maintained by the SW control valve for both the existing and replacement chillers, and not the condenser pressure. The replacement chillers have an oil separator between the compressor and condenser that has a slight pressure drop, so condenser pressure will not equal head pressure. The actual pressure will differ due to the different refrigerant. The other difference is that the head pressure for the replacement chillers varies: valve starts to open at 107 psig, and is full open at 142 psig. The actual value depends on the thermal balancing of the refrigeration loop, which is a function of the loading. Freeze protection is provided by automatic trip of the chiller when head pressure drops below 107 psig.

RAI-SBPB-14

BACKGROUND:

PSEG stated in the LAR, under proposed TS 3/4.7.10, that configuration b, is proposed to allow chiller replacement, and configuration c is proposed to allow maintenance on common components. For configuration b, item 2, the unit ECAC is isolated from the chilled water system. For configuration c, item 2, the ECAC is also isolated from the chilled water system.

PSEG also stated in the LAR that removal of the ECAC from the AB CH system ensures that the heat load is within the capacity of the remaining chillers.

ISSUE:

The ECACs are normally aligned to the AB CH but may be cooled by the SW system if required for emergencies. 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.

Also, the provided chilled water drawing (Figure 4-1 – Simplified AB CH System Diagram) shows the interconnection to the ECAC loads from SW as blind flanges.

Based on Salem, Unit No. 1 drawings of the SW system (205242A8761-83 Sheet 5), there appears to be a safety-classification to non-safety-classification break at the piping spool pieces.

The Salem, Unit No. 2 drawings of SW system (205342A8763-74 Sheet 5) appear to be slightly different from Unit No. 1 and do not show spool pieces.

RAI:

a. *Describe how the ECAC operates during normal, abnormal, and accident conditions.*
b. *Describe the emergency connection types or valve numbers (or spool pieces) for both units that need to be opened from the SW to the chilled water system (provide added detailed drawings, if possible). Also, describe the safety classification and seismic category for these connections.*
c. *Describe the SW calculations that support this configuration and describe any negative affects to SW flow to the adjacent chiller condenser (reference UFSAR, Unit No. 2, Figures 9.2-1A and 9.2-1B).*
d. *Describe if this SW to AB CH configuration was previously licensed for normal, abnormal, and/or accident conditions.*
e. *Describe maximum allowed SW temperature for operability of the ECAC and temperature margins as compared to Table 4-4.1, "Monthly Delaware River Water Temperatures," of the LAR.*
f. *Describe in detail how the SW system is isolated from the balance of the AB CH system (check valves/gate valves with valve numbers).*
g. *Describe any additional testing (that is, Generic Letter 89-13, "Service Water System Problems Affecting Safety-Related Equipment") that will be required for the ECAC heat exchangers, since SW will now flow during normal operation versus emergency.*
h. *Describe any flow and heat loading testing verification for this new configuration with SW flow to the ECAC heat exchangers.*

PSEG RESPONSE

a. The Salem Emergency Control Air Compressors (ECAC) operate similarly under normal, abnormal and accident conditions. The ECAC will auto-start if its respective control air header pressure drops to less than 85 PSIG (Unit 1 ECAC supplies the "B" control air header, Unit 2 ECAC supplies the "A" header). The ECACs will also auto-start if all three Station Air Compressor breakers are open. The Safeguards Equipment Cabinet (SEC) will also start the ECAC during an accident or LOOP. The ECAC is designed to maintain the control air header pressure between 85-95 PSIG. ECAC cooling is normally provided by the chilled water system but can be aligned to service water for cooling by installation of a spool piece.

b. See the response to Item f.

c. Calculation S-C-SW-MDC-1350 performs a hydraulic analysis of the SW System for accident single failure alignments. SW flow to the ECACs is assumed for all alignments. Required flow to the chiller condensers is satisfied for all alignments; there is no negative impact.

d. SW flow to the ECAC coolers is part of the original design of the plant. Due to the brackish water conditions of the SW System, the Cu-Ni tubes experienced erosion/ corrosion, plus silt would build up in the cooler due to the infrequent use of the ECACs. As such, design modifications were implemented in the mid-1980s to make Chilled Water the primary cooling source for the ECAC coolers. The SW System was maintained as a secondary source, requiring the installation of spool pieces to align the system to the coolers. This is discussed further in Items f and g below.

e. Sufficient cooling to the ECAC coolers is provided at the design SW temperature of 90°F. [S-C-SW-MDC-1068]

f. The SW System is normally physically isolated from the AB CH System. Aligning the SW System to the ECAC coolers requires installation of spool pieces, per procedure S1(2).OP-SO.CA-0001. The following is a summary of the procedural actions to ensure separation between SW and CH Systems:

- CH valves 1(2)CH231 and 1(2)CH224 are closed to isolate CH inlet and outlet to the ECAC coolers, respectively, prior to installing the spools. Valves are reopened after the spools have been removed.
- CH drain valves 1(2)CH233 and 1(2)CH225 on the inlet and outlet sides, respectively, are used to drain the CH fluid from the coolers prior to installing the spools, and to drain the SW fluid prior to removing the spools.
- SW valves 1(2)SW401 and 1(2)SW119 on the inlet and outlet sides, respectively, are initially closed to isolate SW prior to installing the spools, opened when the spool pieces are installed to establish SW flow, then closed prior to removing the spools and prior to draining the SW fluid.
- Prior to restoring full CH flow to the coolers after the spools have been removed and SW fluid drained, the coolers and associated piping are flushed with chilled water by opening inlet isolation valve 1(2)CH231 and outlet drain valve 1(2)CH225. Once Chemistry determines water quality is acceptable, valve 1(2)CH225 is closed, and outlet isolation valve 1(2)CH224 is open to reestablish normal CH supply to the coolers.

Drawings 205216-3 (zones F-1 and F-6) and 205242-5 (zones B-2 and B-9) show the applicable valves and spool piece installation locations. Piping specification for the spool pieces/piping is Seismic I, Nuclear Class III as denoted on the drawings.

g. When isolating CH to the ECAC coolers for the Two-Chiller or Cross-Tied configuration, the need to align SW will be determined by on an on-line risk assessment (Maintenance Rule). If it is determined that SW will need to be aligned, the need for any Generic Letter 89-13 related testing will be determined at that time. Considerations include the expected duration that SW would be aligned, and whether or not the ECAC is actually run. Furthermore, SW would only be flowing through the coolers if the ECAC is running, which is minimal.

h. SW flow/alignment to the ECAC coolers is part of the original design of the plant and is included in current design analyses. Therefore, there is no need to perform any testing.

RAI-SBPB-15

BACKGROUND:

PSEG stated in the LAR, under proposed TS 3/4.7.10, that configuration b is proposed to allow chiller replacement and configuration c is proposed to allow maintenance on common components.

ISSUE:

PSEG Nuclear Calculation No. S-C-CAV-MDC-2320, "Evaluation of the Control Area Ventilation System During Chilled Water System Chiller Replacement," Revision 1, Background section states: "Cross-tie operation allows all chillers in a unit to be replaced at one time. Cross-tie operation also allows other maintenance to be performed on common line components."

PSEG Nuclear Calculation No. S-C-CAV-MDC-2320, Approach section also makes a similar statement related to cross-tie configuration for chiller replacement. In addition, PSEG Vendor Technical Document 903136(001), MPR-4027, "Salem Chilled Water System Evaluation to Support Reduction in Required Chillers," Revision 2, Background section also makes a similar statement related to cross-tie configuration for chiller replacement.

RAI:

a. *Describe if the statement related to the purpose of the cross-tie regarding use of the cross-tie for chiller replacement in the noted calculations is made in error.*
b. *Based on the response to item 1, review all support calculations and make necessary adjustments/revisions or restate the purpose of the proposed TS 3/4.7.10, configuration c, unit cross-tie in a supplemental letter to the staff.*

PSEG RESPONSE

a & b. MPR-4027 and supporting calculations evaluated the Cross-Tie configuration for both chiller replacement and common line maintenance. As discussed in the response to RAI-SBPB-12, the Two Chiller configuration was added to also support chiller replacement. Therefore, the statements in the calculations are not in error and no change is required.

RAI-SBPB-16

BACKGROUND:

PSEG stated in the LAR, under proposed TS 3/4.7.10, that configuration b, is proposed to allow chiller replacement and configuration c is proposed to allow maintenance on common components.

ISSUE:

Based on the NRC staff's review of the AB CH system, manual valves are installed on the entrance and exit of each chiller.

For configuration b, LAR Table 4-8, "Limitations and Required Configuration for AB CH System During Two Chiller Operation," Note 1 states:

> *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. [Emphasis added to single failure.]*

For configuration c, LAR Table 4-13, "Limitations and Required Configuration for AB CH Systems Cross-Tied Operations," Note 1 states:

> *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. [Emphasis added to single failure.]*

<u>RAI</u>:

For proposed Configuration b:

a. *Describe how AB CH flow is aligned through the operable chillers during normal operation, that is, if flow is aligned at all times.*

b. *Describe how AB CH flow is aligned during "two chiller" operations during normal and accident conditions. That is, describe if full flow is still aligned at all times through the two chiller.*

c. *Describe how AB CH flow is aligned during "two chiller" operations during normal and accident conditions and one chiller trips (due to a chiller electrical fault).*

d. *Describe if operator actions are required to isolated AB CH water flow through any postulated tripped chillers or is the mixing of hot water system return with any cold water out of the running chillers accounted for in supporting calculations. Describe operator time limits, if applicable.*

For proposed configuration c:

e. *Describe how AB CH flow is aligned through the three operable chillers (unit cross-tie) during normal operation, that is, describe if flow is aligned at all times.*

f. *Describe how AB CH flow is aligned during cross-tie operations if an accident occurs on that unit, that is, describe if full flow is still aligned at all times through the three chillers.*

g. *Describe how AB CH flow is aligned during cross-tie operations if an accident occurs on that unit, and one chiller trips (due to a chiller electrical fault).*

h. *Describe if operator actions are required to isolate AB CH water flow through any postulated tripped chillers or is the mixing of hot water system return with any cold water out of the running chillers accounted for in supporting calculations. Describe operator time limits, if applicable.*

PSEG RESPONSE

Normally AB CH flows through all three chillers regardless if they are running or not. Manual isolation valves CH22 and CH27 (inlet and outlet, respectively) are available to secure flow to the chillers when out of service. Currently flow is not secured when a chiller is removed from service (i.e., for LCO configuration "a"). For Two Chiller Operation (LCO configuration "b") during normal operation, CH22 or CH27 will be closed to secure AB CH flow for the chiller removed from service. During Cross-Tied Operation (LCO configuration "c"), AB CH flows through all three chillers during normal operation.

During an accident, the chiller flow configuration remains the same for its respective Technical Specification configuration. If a chiller trips due to a single failure during an accident, or for any other reason, there is no automatic action or credited operator action to secure AB CH flow to that chiller. This results in warm AB CH water passing through the non-operating chiller mixing with the chilled water from other chillers increasing the average AB CH supply temperature. The methodology used to calculate the final CH supply temperature is provided in Appendix A and B of S-C-CAV-MDC-2320 for Cross-Tied Operation and Two Chiller Operation, respectively.

The chiller flow configurations for RAIs 16 a, b, c, e, f and g are summarized in the table below. For RAIs 16 d and h, no operator action is required to isolate AB CH water flow through any postulated tripped chiller since the mixing of hot water is included in the supporting calculations.

<table>
<tr><th>3.7.10 Configuration</th><th>Case Description (RAI #)</th><th>Chiller A</th><th>Chiller B</th><th>Chiller C</th></tr>
<tr><td>a - Normal Operation (3 Chillers per Unit)</td><td>Normal Operation (16a)</td><td colspan="3">All operating or available. All receiving CH flow. CH flow not isolated for a chiller removed from service</td></tr>
<tr><td rowspan="4">b – Two Chiller Operation</td><td>Normal Operation (16b)</td><td rowspan="4">Operating, receiving CH Flow</td><td rowspan="2">Operating or available; receiving CH flow</td><td rowspan="4">Isolated for replacement, no CH Flow</td></tr>
<tr><td>Accident (16b)</td></tr>
<tr><td>Normal Operation with Chiller Trip (16c)</td><td rowspan="2">Tripped, still receiving CH Flow</td></tr>
<tr><td>Accident with Chiller Trip (16c)</td></tr>
<tr><td rowspan="4">c – Cross-Tied Operation</td><td>Normal Operation (16e)</td><td colspan="3" rowspan="2">All operating or available.
All receiving CH flow.</td></tr>
<tr><td>Accident (16f)</td></tr>
<tr><td>Normal Operation with Chiller Trip (n/a)</td><td colspan="2" rowspan="2">Operating or available, receiving CH flow</td><td rowspan="2">Tripped, still receiving CH flow</td></tr>
<tr><td>Accident with Chiller Trip (16g)</td></tr>
</table>

RAI-SCVB-1

Explain why single filtration alignment is entered in proposed TS 3.7.10, configuration b. On page 10 of 35 of the LAR, it states that single filtration train mode is used when the other unit is removed from service for maintenance. Explain the purpose of this alignment in TS 3.7.10, configuration b.

PSEG RESPONSE

The Control Room Emergency Air Conditioning System (CREACS) is a shared system between Salem Units 1 and 2. The CREACS is a two train system with each Unit providing a single train of the two train system. As discussed in Attachment 1, Section 4.1 (page 10 of 35) of the License Amendment Request, single filtration train mode is used when a train of CREACS is removed from service for maintenance. Removal from service for maintenance for planned evolutions will be controlled by the work week process but removal from service due to the unplanned inoperability of a CREACS train is an evolution that must be accounted for in the new LCO 3.7.10b configuration. The restrictions contained in the applicability statements 4.a., b., and c. ensure that both Salem Unit 1 and 2 are operated within the bounds of the analyzed configurations of the CREACS and the chilled water system in the event that single filtration train alignment is required to be entered when a Unit is in the LCO 3.7.10b configuration.

As discussed in the LAR, single filtration alignment is only permitted if the Unit with the operable CREACS train is also in the Chilled Water system LCO 3.7.10a configuration. The reason for this restriction is that in the single filtration train alignment of CREACS, the heat load from the common control room envelope is placed on the Unit's chilled water system that is providing the operable train of CREACS. Based on the system heat loads while in the single filtration train alignment, two chillers are required to remove the design basis accident heat loads. In order to accommodate a single failure, the Unit providing the single train of CREACS must have all three chillers at the start of an accident. Therefore the Unit that is providing the chilled water to the single filtration train must be in LCO configuration 3.7.10a which requires a minimum all three chillers to be operable.

RAIs-STSB-1 and 2

<u>BACKGROUND</u>:

Section 50.36 of 10 CFR 50 contains regulatory requirements for the content of TSs. LCOs are the lowest functional capability or performance levels of equipment required for safe operation of the facility. SRs provide assurance that an LCO is met. NUREG-0452, "Standard Technical Specifications for Westinghouse Pressurized Water Reactors," contains guidance for the format and content of licensee TSs. The Salem TSs generally follow the guidance of NUREG-0452. Sections 3.0 and 4.0 of the Salem TSs contain usage rules for LCOs and SRs. SR 4.0.1 states that SRs are required to be met at all times when in the applicability, unless otherwise stated in the SR.

The proposed format contains structure, system, or component (SSC) status/lineup requirements in the Applicability statement. Typically, information in the Applicability statement is restricted to the MODE of the plant or status of fuel movement. SSC status/lineup requirement information is generally placed in the ACTION section of the TSs for conditions when the LCO is not met.

The proposed TSs rely on a three-configuration applicability statement that requires the use of copious footnotes that provide caveats and extra information to operators and inspectors regarding configuration-specific requirements.

The proposed format does not appear to provide sufficient clarity to operators or inspectors as to whether or not SRs apply and when they would be required to be met. This lack of clarity could lead to confusion regarding whether or not the LCO is met. Therefore, the TSs may not meet the requirements of 10 CFR 50.36, generally, or 10 CFR 50.36(c)(3) (SRs), specifically.

<u>RAI-1</u>

Please provide a discussion which justifies the proposed TSs with respect to the regulatory requirements of 10 CFR 50.36, generally, and 10 CFR 50.36(c)(3) (SRs), specifically.

<u>PSEG RESPONSE</u>

10 CFR 50.36 establishes that TS are required to have LCOs (50.36(c)(2)) and Surveillance Requirements (50.36(c)(3)). 10 CFR 50.36 does not define format, proscribe format, or provide any requirements concerning applicability and actions.

NUREG-0452 provides basic format for Westinghouse Standard Technical Specifications; Salem TS are generally based on NUREG-0452. NUREG-0452 also does not proscribe format for applicability and actions. Both NUREG-0452 and current Salem TS do provide the following guidance (TS 3.0.1):

> *Compliance with the Limiting Conditions for Operation contained in the succeeding Specifications is required during the OPERATIONAL MODES* ***or other conditions specified therein****; except that upon failure to meet the Limiting Conditions for Operation, the associated ACTION requirements shall be met.*

Consistent with TS 3.0.1, the existing Salem TS include Applicability notations describing conditions related to SSC status/lineup requirements.

In TS Table 3.3-1, the Applicability for the Reactor Trip System trip functions listed below includes the status of reactor trip system breakers and the control rod drive system:

- Functional Unit 1, Manual Reactor Trip
- Functional Unit 2, Power Range, Neutron Flux
- Functional Unit 5, Intermediate Range, Neutron Flux
- Functional Unit 6, Source Range, Neutron Flux
- Functional Unit 21, Reactor Trip Breakers
- Functional Unit 22, Automatic Trip Logic

The Applicability for TS 3.4.1.4, Reactor Coolant System, Cold Shutdown, contains requirements related to the status of reactor coolant pumps, pressurizer water volume, and steam generator secondary water temperature.

These existing Applicability conditions are consistent with the approach proposed for the Chiller TS Applicability conditions.

Current Salem TS 3.9.3, *Refueling Operation, Decay Time*, contains Calendar conditions in the Applicability, which is also consistent with TS 3.0.1 and the proposed Chiller TS format:

APPLICABILITY: 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.

Consistent with TS 3.0.1, specific guidance on Applicability format is provided in TSTF-GG-05-01, *Writer's Guide for Plant Specific Improved Technical Specifications*, Section 4.1.5.a:

> *An Applicability statement is included for each LCO. This consists of a simple listing of the MODES* ***or Conditions*** *during which the LCO is applicable.*

Based on the above guidance the proposed TS changes were formatted with the conditions in the Applicability.

Concerning 10 CFR 50.36(c)(3) (SRs); Salem Operations has reviewed the proposed format and has determined it provides the most clarity. The existing SRs 4.7.10a, 4.7.10b and 4.7.10c remain applicable to the existing LCO 3.7.10a configuration and the new LCO 3.7.10b and c configurations.

Initially only a cross-tie configuration was planned; however due to the restrictions required for the Cross-Tied LCO 3.7.10c configuration, the additional Two Chiller LCO 3.7.10b configuration was evaluated and added to support chiller replacements and long-term operational flexibility. With three LCO configurations it was not optimal to list them sequentially (horizontally) on the page; it was difficult for the Operators to see the relationship between the three. By placing the LCOs in the table format Operations can readily understand the restrictions and requirements when transitioning from one LCO to another. This proposed tiered LCO is equivalent in concept (i.e. a choice in the way the LCO can be satisfied), and similar in format (albeit vertically depicted in a table for better Operator understanding versus horizontally listed) to examples in the current Salem TS (NUREG-0452 based) and in Improved Standard TS (NUREG-1431) as described below:

Current Salem TS

- TS 3.1.2.1, Boration Systems, Flow Paths - Shutdown

  As a minimum, **one of the following** boron injection flow paths shall be OPERABLE:

  a. A flow path from the boric acid tanks via a boric acid transfer pump and a charging pump to the Reactor Coolant System if the boric acid storage system is OPERABLE, per Specification 3.1.2.6a while in MODE 4, or per Specification 3.1.2.5a while in MODE 5 or 6, **or**

  b. A flow path from the refueling water storage tank via a charging pump to the Reactor Coolant System if the refueling water storage tank is OPERABLE per Specification 3.1.2.6b while in MODE 4, or per Specification 3.1.2.5b while in MODE 5 or 6.

- TS 3.1.2.5, Borated Water Sources - Shutdown

  As a minimum, **one of the following** borated water sources shall be OPERABLE:

  a. A boric acid storage system with:
     1. A minimum contained volume of 2,600 gallons,
     2. Between 6,560 and 6,990 ppm of boron, and,
     3. A minimum solution temperature of 63°F.

  b. The refueling water storage tank with:
     1. A minimum contained volume of 37,000 gallons,
     2. A minimum boron concentration of 2300 ppm, and
     3. A minimum solution temperature of 35°F.

- TS 3.4.9.3 (Unit 1), 3.4.10.3 (Unit 2), Overpressure Protection Systems

  At least **one of the following** overpressure protection systems shall be OPERABLE:

  a. Two Pressurizer Overpressure Protection System relief valves (POPS) with a lift setting of less than or equal to 375 psig, or

  b. A reactor coolant system vent of greater than or equal to 3.14 square inches.

- TS 3.9.3, Decay Time

  The reactor shall be subcritical for at least:

  a. 80 hours

  b. 168 hours

Improved Standard TS (NUREG-1431)

- TS 3.2.3A, AXIAL FLUX DIFFERENCE (AFD) (Constant Axial Offset Control (CAOC) Methodology)

  The AFD:

  a. Shall be maintained within the target band about the target flux difference. The target band is specified in the COLR.

  b. **May deviate** outside the target band with THERMAL POWER < 90% RTP but ≥ 50% RTP, provided AFD is within the acceptable operation limits and cumulative penalty deviation time is ≤ 1 hour during the previous 24 hours. The acceptable operation limits are specified in the COLR.

  c. **May deviate** outside the target band with THERMAL POWER < 50% RTP.

The new proposed Notes that modify the ACTIONS are the simplest way to reflect the three LCOs – otherwise duplicate ACTIONS would need to be written for each LCO which would be unnecessarily cumbersome and potentially confusing for the Operations staff. Notations within the ACTIONS are consistent with current Salem TS; the current Chiller TS 3.7.10 contains a notation for the MODE 5 and 6 ACTIONS. In addition the following are examples of other Salem TS that contain notes in the ACTION statements:

- TS 3.4.5 (Unit 1), TS 3.4.6 (Unit 2), Steam Generator Tube Integrity

  a.* With one or more SG tubes satisfying the tube repair criteria and not plugged in accordance with the Steam Generator Program:

  *Separate Action is allowed for each SG tube.

- TS 3.4.8 (Unit 1), TS 3.4.9 (Unit 2), Specific Activity

  MODES 1, 2 and 3*

  *With Tavg ≥ 500°F.

- TS 3.6.1.3, Containment Air Locks

  Notes
  (1) Entry and exit is permissible to perform repairs on the affected air lock components.
  (2) Separate condition entry is allowed for each air lock.
  (3) Required ACTIONS a.1, a.2, and a.3 are not applicable if both doors in the same air lock are inoperable and condition c. is entered.
  (4) Required ACTIONS b.1, b.2, and b.3 are not applicable if both doors in the same air lock are inoperable and condition c. is entered.
  (5) Enter applicable Conditions and required Actions of LCO 3.6.1, "Primary Containment," when air lock leakage results in exceeding the overall containment leakage rate.

- TS 3.6.3.1 (Unit 1), TS 3.6.3 (Unit 2), Containment Isolation Valves

  NOTE 1
  Penetration flow paths, except for the containment purge valves, may be unisolated intermittently under administrative controls.

  Note 2
  A containment purge valve is not a required containment isolation valve when its flow path is isolated with a testable blind flange tested in accordance with SR 4.6.1.2.b. The required containment purge supply and exhaust isolation valves shall be closed. (Valves immobilized in shut position with control air to valve operators isolated and tagged out of service).

NOTE 3
The containment pressure-vacuum relief isolation valves may be opened on an intermittent basis, under administrative control, as necessary to satisfy the requirement of Specification 3.6.1.4.

The proposed TS format has been reviewed by Salem Operations and they concur this is the preferred format from a usability perspective, provides the most clarity, and is the most consistent format with existing TS and available guidance as discussed above.

RAI-2

Given the usage rules and typical format for the current Salem TSs, please provide a justification for the proposed format and discuss how the proposed format aligns with and conforms to the current usage rules and format of other Salem TSs. Alternatively, provide a new proposed format for the chilled water system TS changes that more closely align with the rest of the Salem TSs and NUREG-0452.

PSEG RESPONSE

Discussed above in the response to RAI-STSB-1.