Alex L. Javorik
Columbia Generating Station
P.O. Box 968, PE04
Richland, WA 99352-0968
Ph. 509.377.8555 | F. 509.377.4150
aljavorik@energy-northwest.com

February 25, 2019
GO2-19-027

10 CFR 50.90

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

Subject: **COLUMBIA GENERATING STATION, DOCKET NO. 50-397 LICENSE AMENDMENT REQUEST FOR LICENSING BASIS CHANGE TO CONTROL ROOM AIR CONDITIONING SYSTEM**

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, Energy Northwest hereby requests approval of changes to the Columbia Generating Station (Columbia) licensing basis. The proposed amendment would allow use of the Control Room Chilled Water (CCH) system or the Emergency Service Water (SW) system as acceptable cooling sources in support of the Control Room Air Conditioning (AC) system for the safety related function of maintaining the Main Control Room (MCR) less than or equal to the 104ºF equipment qualification temperature limit during and following design basis events (DBEs), and maintaining the long term, steady state MCR design condition temperature less than or equal to 85ºF that supports 30 days continuous MCR occupancy. The proposed change would utilize the CCH system as the preferred cooling source in support of the Control Room AC system due to SW heat removal capability limitations.

The proposed change has been evaluated in accordance with 10 CFR 50.91(a)(1) using criteria in 10 CFR 50.92(c) and it has been determined that this change involves no significant hazards considerations. The bases for these determinations are included in Enclosure 1 of this submittal.

No changes are proposed to the Technical Specifications (TS). TS Bases and Final Safety Analysis Report (FSAR) marked up pages are included as Enclosures 2 and 3 to this submittal for information only.

This letter and its enclosures contain no regulatory commitments.

Approval of the proposed amendment is not tied to implementation of any station modification. Approval is requested within one year of the date of the submittal. Once approved, the amendment shall be implemented within 90 days.

In accordance with 10 CFR 50.91, Energy Northwest is notifying the State of Washington of this amendment request by transmitting a copy of this letter and enclosures to the designated State Official.

If there are any questions or if additional information is needed, please contact Ms. D. M. Wolfgramm, Licensing Supervisor, at 509-377-4792.

I declare under penalty of perjury that the foregoing is true and correct.
Executed this 25th day of February, 2019.

Respectfully,

A. L. Javorik
Vice President, Engineering

Enclosures: As stated

cc: NRC RIV Regional Administrator
NRC NRR Project Manager
NRC Senior Resident Inspector/988C
CD Sonoda – BPA/1399 (email)
EFSECutc.wa.gov – EFSEC (email)
RR Cowley – WDOH (email)
WA Horin – Winston & Strawn

Evaluation of Proposed License Basis Change

1.0 SUMMARY DESCRIPTION

Energy Northwest is submitting a request for approval of changes to the Columbia Generating Station (Columbia) licensing basis. The proposed amendment would allow use of the Control Room Chilled Water (CCH) system or the Emergency Service Water (SW) system as acceptable cooling sources in support of the Control Room Air Conditioning (AC) system for the safety related function of maintaining the Main Control Room (MCR) less than or equal to the 104ºF equipment qualification temperature limit during and following design basis events (DBEs), and maintaining the long term, steady state MCR design condition temperature less than or equal to 85ºF to support 30 days continuous MCR occupancy. The proposed change would utilize the CCH system as the preferred cooling source in support of the Control Room AC system due to SW heat removal capability limitations.

2.0 DETAILED DESCRIPTION

2.1 System Design Basis and Operation

MCR Temperature Limits

The MCR is located in the Columbia Generating Station (Columbia) Radwaste Building. The temperature control for the MCR during normal station operation is provided by the Radwaste Mixed Air (WMA) system. The WMA system (hereafter referred to as the Control Room AC system) is capable of removing sensible and latent heat loads from the MCR for maintaining the equipment qualification temperature and for personnel comfort. During normal operation, the MCR is maintained at an ambient temperature of approximately 75°F dry bulb. The Control Room AC system is designed to maintain the MCR temperature to support equipment qualification and to support 30 days continuous occupancy. The MCR temperature limit is 104°F for equipment cooled by the Control Room AC system. The MCR design condition for personnel habitability is 85°F long term, steady state.

The Control Room AC system is designed and qualified to operate under all DBE conditions and transients assuming a single failure of any active component.

Control Room AC System Operation

The Control Room AC system at Columbia consists of two independent, redundant subsystems that provide cooling of the MCR. Each subsystem includes an air handling unit (AHU) that contains an air filter, two cooling coils (one normal use coil and one emergency cooling coil) and an electric heater. Only one of the two redundant trains is required to operate to meet the MCR cooling requirements. During normal operations, the MCR ambient conditions are maintained by the Control Room AC system supported by the Radwaste Building Chilled Water (WCH) system chillers. The WCH system is not safety-related and is not designed to operate under all emergency conditions. Therefore, under emergency conditions, either the safety-related Standby Service Water (SW) system or the Control Room Emergency Chilled Water (CCH) system are used to support the Control Room AC system to cool the MCR. Both the SW system and the CCH system are safety-related and are designed to operate under transient and accident conditions as described in the Final Safety Analysis Report (FSAR).

The SW system provides the heat sink for emergency equipment during and after transient or accident conditions. Therefore, when the emergency cooling coils are aligned with SW, the MCR is cooled directly by SW and the ultimate heat sink. The SW system is currently capable of maintaining the MCR within the equipment qualification limit at all times, but during warmer months the capability of SW to maintain the MCR within the habitability design condition temperature is limited. Therefore, the CCH system is relied upon to maintain the bounding MCR temperature.

When the CCH system is aligned to the Control Room AC system AHU, CCH chilled water flows through the AHU emergency cooling coil to remove heat from air circulated from the MCR. The hot leg of the Control Room AC system AHU emergency cooling coil is fed through the CCH pump and into the CCH chiller. The CCH chiller interfaces with the SW system to transfer the heat from the CCH chilled water loop’s hot leg to the SW system through an internal refrigerant loop. The cold leg of the CCH chiller then feeds back to the Control Room AC system AHU emergency cooling coil, completing the CCH cooling loop.

<u>Normal Control Room AC System Lineup (Current Configuration)</u>

Columbia has two redundant, independent Control Room AC system subsystems each with an AHU that make up two divisions. Division 1 is normally aligned with SW supplying the Control Room AC system AHU emergency cooling coil (WMA-CC-51A1) and the CCH system isolated from the emergency cooling coil. Division 2 is normally aligned with CCH supplying the Control Room AC system AHU emergency cooling coil (WMA-CC-51B1) with SW aligned to provide cooling to the CCH chiller condenser (CCH-CU-1B). Within a single division, the SW system is not operated with SW flow to both the CCH chiller and the AHU emergency cooling coil.

Figure 1 displays the current lineup of Division 1 with SW aligned to the AHU emergency cooling coil. Figure 2 displays the current lineup of Division 2 with CCH aligned to the AHU emergency cooling coil and SW aligned to the CCH chiller condenser.

Figure 1 – Division 1 Current Configuration
Emergency Standby Alignment: SW Supplied to AHU

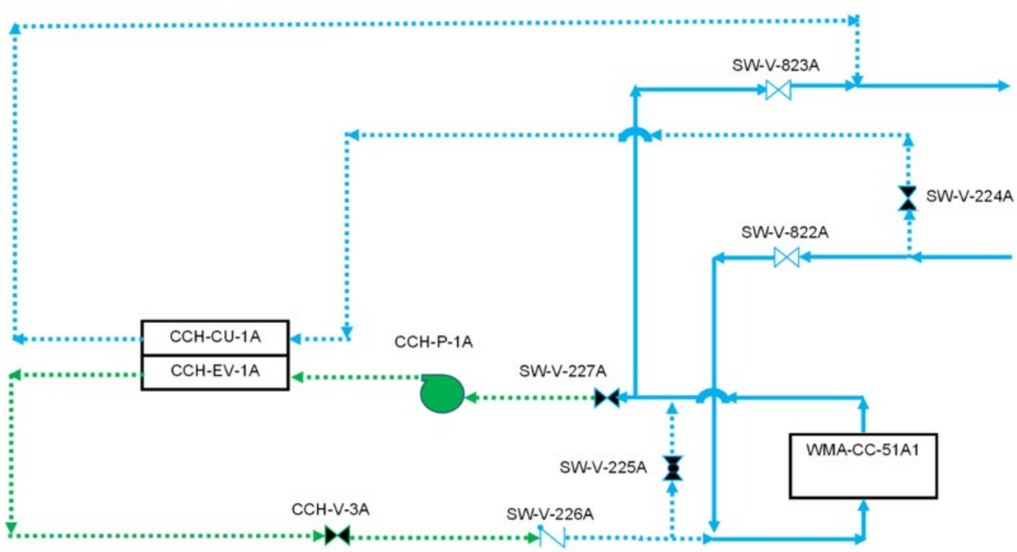
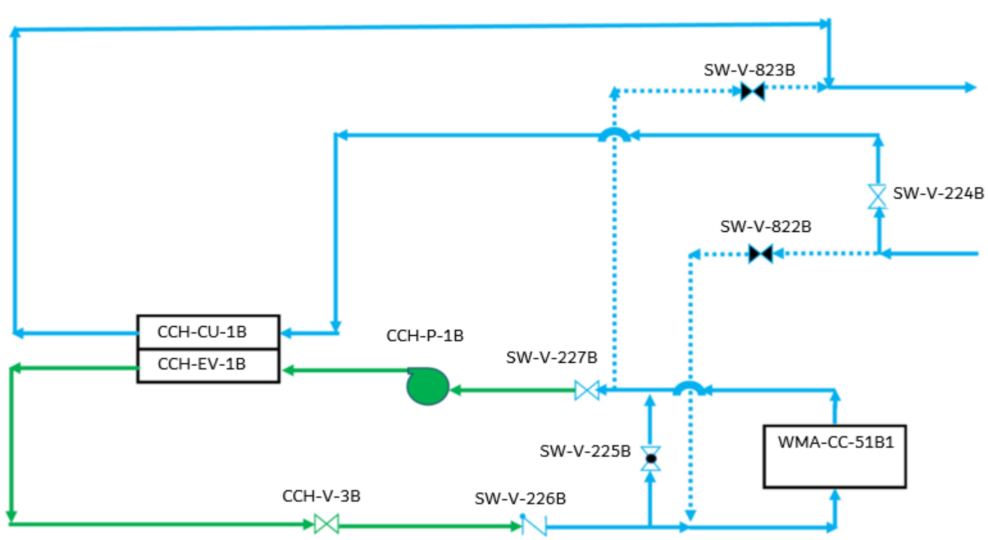


Figure 2 – Division 2 Current Configuration
Emergency Standby Alignment: CCH Supplied to AHU, SW Supports CCH



Currently, Division 1 of the SW system starts automatically on a start signal for Diesel Generator 1, Residual Heat Removal (RHR) Train A actuation or Low Pressure Core Spray (LPCS) actuation. SW provides flow to the AHU emergency cooling coil in the

Control Room AC system to maintain the MCR below its equipment operability limit of 104°F. The ability of Division 1 to maintain temperature below the long term, steady state, habitability design condition of 85°F without manually realigning SW to utilize the CCH system is conditional based on outdoor ambient temperature conditions.

Division 2 of SW starts automatically on a start signal for Diesel Generator 2, Reactor Core Isolation Cooling (RCIC) actuation, or start of either RHR Train B or RHR Train C. The SW system provides cooling flow to the CCH chiller condenser and the CCH loop is in a standby alignment to utilize the CCH system to provide cooling to the Division 2 Control Room AC system AHU. If operation of the CCH system is required, the CCH pump and chiller are started manually using a control room switch, followed by local field operator action to load (adjust) the chiller for the required heat removal.

2.2 Current Licensis Basis Requirements

The CCH system was installed in response to License Condition 2.C.(21), Control Room Chillers Installation. The License Condition stated:

> *"The licensee shall have operable before May 31, 1984, redundant, seismic Category I environmentally qualified water chillers for control room HVAC."*

The CCH license condition was created in response to NRC staff concern regarding maintaining ambient conditions in the control room compatible with the comfort zone as defined by the American Society of Heating, Refrigerating and Air-Conditioning Engineers (Reference 1). The license condition was subsequently deleted on March 30, 2012, during removal of implemented license conditions (ML120800078).

TS 3.7.4, Control Room Air Conditioning (AC) System, requires two Control Room AC subsystems to be OPERABLE when in MODES 1, 2 or 3. A Control Room AC subsystem is defined in the Bases for TS 3.7.4 as consisting of an air filter, two AHU cooling coils (one normal use coil and one emergency cooling coil), a control room recirculation fan, ductwork, dampers, and instrumentation and controls to provide for control room temperature control. The Bases for TS 3.7.4 further states that only the emergency cooling coil in the Control Room AC AHU is required for the TS 3.7.4 Limiting Condition for Operation (LCO). The AHU emergency cooling coil is supplied with water from the CCH system, which consists of a closed CCH cooling loop with a CCH chiller and a CCH pump, or from the SW system. There are two redundant CCH systems, one for each division of Control Room AC cooling. When the CCH system is used, SW provides cooling for the CCH chiller condenser.

The Columbia FSAR, Section 9.4.1, states:

- SW is the cooling source supplied to the Control Room AC system for ensuring the safety related 104ºF equipment qualification temperature is met.

- CCH is the cooling source supplied to the Control Room AC system to ensure the long term, steady state control room habitability environmental design condition temperature of 85ºF is met. SW can maintain the control room within the steady state, long term 85ºF habitability temperature during colder weather.

- Prior to manual start of the CCH system, the control room could temporarily exceed the long term, steady state habitability temperature of 85ºF but will remain below the National Institute for Occupational Safety and Health wet-bulb globe temperature for unlimited duration habitability.

Licensee Controlled Specification (LCS) 1.7.2, Control Room Emergency Chilled Water System, allows use of the SW system to maintain the control room long term, steady state habitability temperature of 85ºF when it is evaluated as capable of the required heat removal.

2.3 Description of Proposed Changes

This License Amendment Request (LAR) proposes to utilize CCH as a cooling source to the Control Room AC system to meet the MCR 104ºF equipment qualification temperature limit. SW is currently the identified cooling source to meet the 104ºF limit.

The following information is provided to fully describe implementation of the proposed change:

- The CCH system is already used to meet the long term, steady state control room habitability temperature of 85ºF, which bounds the equipment qualification temperature limit.

- SW will continue to be utilized when CCH is unavailable (e.g., CCH failure or routine maintenance), and when the SW system is evaluated as capable of the required heat removal. When SW is the credited cooling source for operability of the Control Room AC system, it would be required to meet the 85ºF long term, steady state temperature that supports 30 days continuous MCR occupancy and bounds the 104ºF equipment qualification temperature limit.

- Upon approval of this LAR, the station will align CCH as the preferred cooling source to both Division 1 and Division 2 Control Room AC AHU emergency cooling coils. CCH and SW valves will be pre-set in the configuration that results in CCH supplied to the Control Room AC AHU emergency cooling coils and SW supplied as cooling to the CCH chiller condensers (see Figures 3 and 4).

- The current CCH design, which will be retained, requires manual start of the CCH system from the control room and local field operator action to load (adjust) the chiller for the required heat removal.

Figure 3 – Proposed Configuration (Division 1)
Emergency Standby Alignment: CCH Supplied to AHU, SW Supports CCH

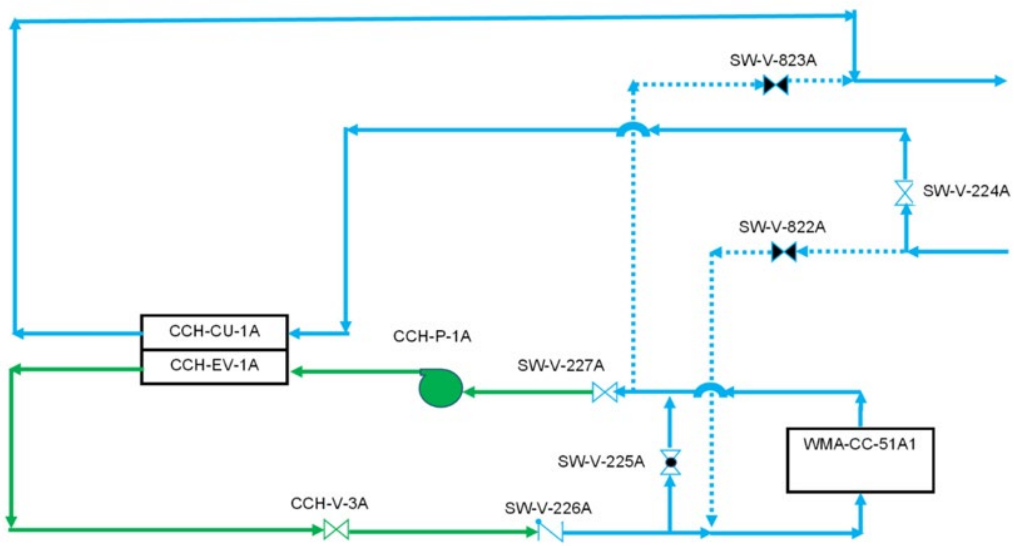
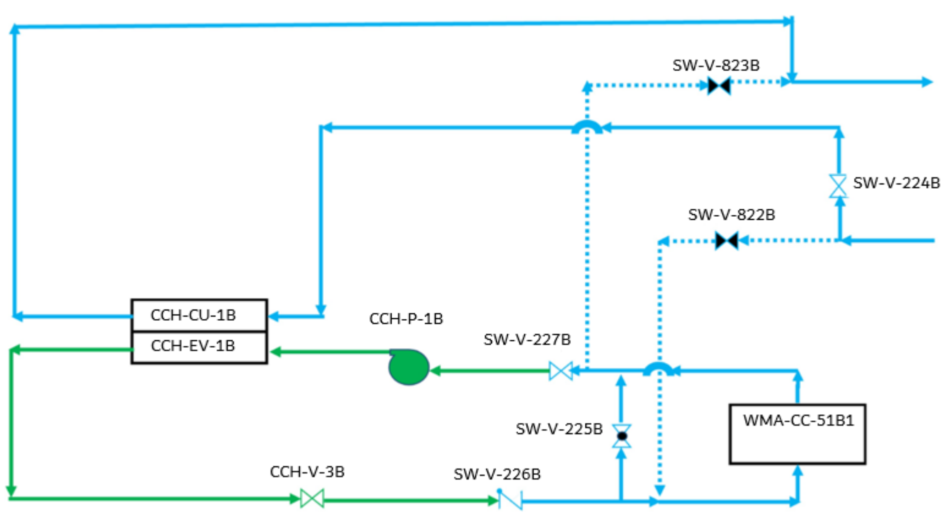


Figure 4 – Division 2 (no change)
Emergency Standby Alignment: CCH Supplied to AHU, SW Supports CCH



No changes are specified to TS 3.7.4, Control Room Air Conditioning (AC) System, as a result of this LAR, and there is no need for any new specification. The Control Room AC system is included in Columbia's TS as a system satisfying Criterion 3 of 10 CFR 50.36. CCH and SW are support systems for the Control Room AC system providing cooling water necessary for the Control Room AC system to perform the safety function of cooling the main control room. This consideration of CCH and SW as support systems to the Control Room AC system is consistent with the definition of OPERABLE-OPERABILITY in TS 1.1, Definitions. Consequently, no dedicated TS requirement is required for CCH since its performance in support of the Control Room AC system is embedded in TS 3.7.4 operability requirements. SW operability when supporting the Control Room AC system is also addressed by TS 3.7.1, Standby Service Water (SW) System and Ultimate Heat Sink (UHS), as SW provides cooling to remove heat from various station equipment to result in and maintain safe shutdown of the reactor.

There are two trains of CCH and two trains of Emergency SW that can provide cooling to the Control Room AC system AHU emergency cooling coils credited in TS 3.7.4. Therefore, up to four cooling supply options are available when both CCH trains are available and SW is available to the CCH chiller condensers, and when the two trains of SW are evaluated as capable of the required heat removal to provide direct cooling flow to the AHU. TS 3.7.4 states that two Control Room AC cooling subsystems shall be OPERABLE in MODES 1, 2, and 3, which will include cooling provided by either CCH or SW, or a combination of those cooling sources. Upon approval of this LAR, the Bases for TS 3.7.4 will be revised to document the use of either CCH or SW, when capable of the required heat removal, as acceptable cooling sources to meet the long term, steady state 85ºF control room habitability temperature which bounds the 104ºF equipment qualification temperature limit. Consequently, TS 3.7.4 LCO would only be entered, with regard to cooling sources available, when no cooling source is available to supply the respective Control Room AC subsystem for DBE response, or neither cooling source (CCH, SW) is capable of providing the required cooling. Additionally, in the event that future heat load additions surpass the ability of SW to support Control Room AC system operability, SW will be available to provide limited cooling to the control room as defense in depth.

The existing LCS CCH periodic surveillance will be retained and will be credited, in part, for meeting TS Surveillance Requirement (SR) 3.7.4.1 upon approval of this LAR. The frequency will be determined by the Surveillance Frequency Control Program.

LCS 1.7.2, Control Room Emergency Chilled Water System, will be deleted upon approval of this LAR as the Control Room AC system cooling requirements will be fully addressed by TS 3.7.4. The deletion of LCS 1.7.2 will be performed under 10 CFR 50.59 and does not require prior NRC approval.

2.4 Reason for the Proposed Change

The reason for the proposed change is to provide maximum flexibility with regard to allowable Control Room AC system cooling sources which will also address SW capability limitations.

The SW system is currently capable of maintaining the MCR within the equipment qualification temperature limit of 104°F, however, the capability of SW to maintain the MCR within the long term, steady state 85°F habitability design condition temperature is limited during the warmer months. Future MCR equipment additions have the potential to exhaust the margin available when using SW for meeting the equipment qualification temperature limit. Additional MCR emergency cooling capacity is available by utilizing the CCH system as the preferred cooling source. The CCH system has more than adequate capacity for the MCR heat load to ensure the steady state MCR habitability temperature is met, which bounds the equipment qualification temperature limit (refer to Section 3.2.1). This LAR is not tied to implementation of any specific station heat load addition modification. Future MCR heat load additions will be evaluated by the station modification process and only allowed after evaluation with acceptable results and in accordance with the appropriate regulatory reviews.

This proposed change requires the emergency cooling function, when supplied by CCH, to rely on additional equipment (the CCH system loop, including CCH chiller and pump) for the purpose of equipment cooling during and following a DBE. This results in crediting additional active components that are required to perform the design function of maintaining the MCR equipment qualification temperature. This proposed change is requested under 10 CFR 50.90 based on the 10 CFR 50.59 evaluation concluding that crediting of the CCH system for MCR equipment qualification during and following a DBE, due to the additional active components, results in a reduction in design function reliability. This was considered a more than minimal increase in the likelihood of occurrence of a malfunction of a structure, system or component (SSC) important to safety and prior NRC approval is required to implement the proposed change.

3.0 TECHNICAL EVALUATION

3.1 System Design Attributes that are Not Impacted

This section describes design attributes of the Control Room AC system that are not affected by the changes proposed by this LAR. The discussions in this section are presented in topical areas discussed within the review areas and acceptance criteria in NUREG-0800, Standard Review Plan (SRP) for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition, Section 9.2.7, Chilled Water System, and Section 9.4.1, Control Room Area Ventilation System (References 2 and 3). It is concluded that the Control Room AC system continues to meet applicable regulatory requirements in the following areas.

3.1.1 Quality and Seismic Classification and Failures of Non-Seismic Equipment

In accordance with Operating License NPF-21, License Condition 2.C.(21), Control Room Chillers Installation, Columbia purchased, installed and has maintained redundant, Seismic Category I CCH systems (chillers, pumps, electrical support systems, and associated piping and valves). Both chiller loops are supplied by Class 1E power in a Loss of Offsite Power (LOOP) event. The LAR does not change or affect the seismic qualification of any CCH components, nor does it affect the redundant power source available to the CCH system.

The maintenance and modification history of the CCH components was reviewed to support the proposed change. The review verified that all CCH components have been maintained as safety-related with the exception of four components which are classified as Augmented Quality and Seismic Class 1M (meets Regulatory Guide 1.29, Revision 3, position C.2). The four components are two ground fault reset buttons and two inlet temperature indicators. The four components do not perform any safety-related functions and their failure will not prevent the associated CCH chiller from performing its safety-related cooling function.

The CCH system is located in the Quality Level Class I portion of the Radwaste Building. Therefore, the CCH system is protected from natural phenomena such as tornadoes and tornado generated missiles, hurricanes, tsunamis and seiches. The CCH system is classified as Seismic Class I and, therefore, has the proper seismic restraints and qualifications to ensure operation following a design basis earthquake. Other non-CCH components in the vicinity of the CCH system are either Seismic Class I or II/I. Therefore, the CCH system is designed against natural phenomenon, including failures of non-seismic equipment.

There are no changes to the design of the SW system with respect to supporting MCR cooling. The interface between the SW system and the Control Room AC system contains multiple flow paths and supports use of either the SW system or the CCH system as the cooling source to the AHU emergency cooling coil. The proposed change uses the current system design without requiring any physical changes beyond establishing new normal valve lineups. There is no impact on the quality or seismic classification of the applicable SW components and there is no impact from failures of non-seismic equipment.

3.1.2 <u>Single Active Failure Cannot Result in a Loss of System Functional Performance Capability</u>

A single active failure of a component in the CCH system, assuming a loss of offsite power, does not impair the ability of the system to perform its design function. The CCH system is designed in accordance with Seismic Class I requirements and Columbia confirmed redundant components between Divisions 1 and 2. The only common component is a vent header that is tied to both CCH chiller units. The vent header removes discharged refrigerant in the event the chiller refrigerant overpressure protection device is actuated (rupture disk). The vent header availability is not required for the chiller to startup nor for the refrigerant to transfer heat from the evaporator to the condenser. Therefore, loss of the common vent header would not impact the ability of the CCH chillers to fulfill their safety-related function.

Each CCH subsystem is capable of maintaining MCR temperature within the FSAR limits to meet the personnel habitability design condition temperature and MCR equipment qualification temperature limit (see Section 3.2.1). Each division is powered by separate Class 1E power sources. Therefore, a single active failure of a component in the CCH system, assuming a loss of offsite power, will not impair the ability of the Control Room AC system to perform its cooling function.

There are no changes to the design of the SW system with respect to supporting MCR cooling, therefore, there is no impact on the SW single active failure design.

3.1.3 <u>Protection Against Radiation and Hazardous Chemical Releases</u>

MCR heating, ventilation and air conditioning (HVAC) radiological air filtering functions are independent of the CCH and SW MCR cooling support functions. Therefore, the proposed change does not affect protection against radiation releases. In the event of a hazardous chemical release, the control room HVAC is manually isolated into the recirculation mode without filtration through the emergency filter units by closing the normal fresh air isolation damper. This proposed change does not affect the Control Room AC system’s ability to be manually isolated into the recirculation mode.

3.1.4 <u>Capability to Actuate Components Not Normally Operating that are Required to Operate During an Accident</u>

MCR cooling using the CCH system or SW as cooling support will be manually initiated on loss of normal MCR cooling. Analyses were performed to evaluate control room heat up without cooling, acceptable temperature levels/stay times for operators, and time available to bring cooling back online. The results demonstrated that temperatures would not exceed acceptable limits during manual operation. Additional details of the analysis are in Section 3.2.1. Under the current design, CCH is initiated manually and no changes are being made to this operator action. Manual initiation of MCR cooling is also addressed in this LAR in Section 3.2.1, Ability of Control Room AC System to Maintain Suitable Temperature for MCR Personnel and Equipment for All Planned Operations, and Section 3.2.2, Ability to Isolate and Function Under Fires, Failures and Malfunctions.

3.1.5 <u>Function During a Loss of Offsite Power (Station Blackout)</u>

Columbia complies with the Station Blackout Rule as outlined in 10 CFR 50.63, Loss of All Alternating Current Power, and Regulatory Guide 1.155, Station

Blackout. The Station Blackout coping period for Columbia is 4 hours. During the 4 hour coping period, the Control Room AC system is not relied upon for MCR cooling and there is no CCH or SW cooling support function required. Within 30 minutes of event initiation, procedures direct compensatory measures that include removing unnecessary loads to limit MCR heat up and opening MCR cabinet doors to compensate for the loss of HVAC. These actions are sufficient to achieve the 4 hour coping period without HVAC restoration.

3.1.6 External Missiles

As noted above in Section 3.1.1, the CCH system is located in the Quality Level Class I portion of the Radwaste Building. Therefore, the CCH system is protected from natural phenomena such as tornado generated missiles and other externally generated missiles. The proposed change does not affect external missile protection.

There are no changes to the design of the SW system with respect to supporting MCR cooling, therefore there is no impact on the SW system external missile protection.

3.1.7 Flooding

The CCH system is located above the control room on the 525 ft. elevation of the Radwaste Building, above the maximum postulated external flood elevation. Therefore, external flooding evaluations are not necessary to support the proposed change to utilize CCH as the preferred cooling source to support the Control Room AC system.

A postulated SW line break would introduce the greatest volume of water into the room containing the CCH chillers, resulting in the maximum possible internal flood. The maximum flood height does not affect safety related CCH equipment. Thus, flooding would not result in inability to provide cooling to the MCR.

3.1.8 Equipment Qualification

Use of the CCH system to provide MCR cooling for the function of MCR equipment qualification was evaluated. The CCH system is seismically qualified. The CCH system and SW in support of CCH operation are in a mild post-accident environment in the Radwaste Building. Therefore, environmental qualification is not required for the CCH and SW components that provide MCR cooling with respect to temperature, humidity, pressure and radiation exposure.

3.1.9 I&C and Electrical Controls

There are no changes to the design of the CCH or SW systems in support of this proposed change. The CCH system requires manual start from the control room and local field operator action to load (adjust) the chiller for the required heat removal. Manual initiation of MCR cooling is addressed in Sections 3.2.1 and 3.2.2, below. No additional I&C or electrical controls are required for this proposed change.

3.2 Changes to System Design Attributes to Establish Safety Basis

Section 3.2 of this LAR describes the design attributes of the Control Room AC system that required evaluation in support of the changes proposed by this LAR. The discussions in this section are presented in topical areas discussed within the review areas and acceptance criteria in SRP Sections 9.2.7 and 9.4.1 (References 2 and 3).

The ability to manually initiate MCR cooling is addressed in Sections 3.2.1 and 3.2.2. No new operator actions are introduced by this LAR as the existing CCH system design features and operation are retained. MCR cooling is a support function for DBE mitigation and is not discussed in FSAR Chapter 15, Accident Analyses. Consequently, a graded approach for evaluating manual initiation of MCR cooling, as described in SRP Section 18, Human Factors Engineering, was utilized whereby elements of a feasible and reliable manual action were evaluated, including time available to initiate cooling, accessibility of the CCH system post-accident, environment, procedures and operator training.

Evaluation summaries are provided for each topical area. This information represents the basis upon which Energy Northwest is requesting the proposed changes and the conclusion that the design of the Control Room AC system continues to meet regulatory requirements.

3.2.1 Ability of Control Room AC System to Maintain Suitable Temperature for MCR Personnel and Equipment for All Planned Operations

Section I.2 of SRP 9.4.1 states a specific staff review area includes confirming the ability of the MCR cooling subsystems to maintain a suitable ambient temperature for MCR personnel and equipment. The CCH system with SW supply to the CCH chiller condenser, or the SW system supplying the AHU when evaluated as capable of the required heat removal, will successfully perform the functions of MCR heat removal to maintain suitable temperatures for both personnel and equipment qualification.

The CCH system is a safety-related system designed and qualified to perform its design basis functions under normal plant operations or design basis events. The system includes two redundant 50 ton capacity chillers that each have more than adequate capacity to remove the heat load in the MCR. CCH operation is controlled by detailed station operating procedures and is periodically tested by a current LCS surveillance for proper function and ability to remove heat. The CCH surveillance verifies adequate flow through the CCH cooling loop and performs an extended chiller run (≥ 24 hours) to verify MCR temperature remains less than the long term, steady state 85ºF habitability temperature which also bounds the 104ºF equipment qualification temperature. The MCR heat loads during normal station operation and during routine testing bound the heat loads present during a DBE.

Station analyses conclude a single CCH system train can maintain 115 kW electrical heat load plus one division of MCR lighting with a SW temperature of 90ºF and 100 GPM CCH flow through the AHU emergency cooling coil and maintain the MCR at 85ºF. In contrast, the SW system is capable of removing 34 kW electrical heat load plus one division of emergency lighting with an analyzed SW temperature of 89.6ºF and 110 GPM SW flow directly to the AHU emergency cooling coil to maintain the MCR at 104ºF, the MCR equipment qualification temperature limit.

Upon approval of this LAR, the CCH system will be aligned as the preferred cooling source in support of the Control Room AC system. The following valves will be positioned as indicated to support CCH as the standby emergency cooling source by directing SW to the CCH chiller condensers, isolating SW from the Control Room AC AHUs, and providing an available closed loop CCH system supplied to the AHU emergency cooling coils (reference Figures 3 & 4):

- SW-V-822A(B), SW supply to AHU emergency cooling coil, will be in a normally closed position
- SW-V-823A(B), SW return from AHU emergency cooling coil, will be in a normally closed position
- SW-V-227A(B), CCH pump suction isolation, will be in a normally open position
- CCH-V-3A(B), CCH supply to AHU emergency cooling coil, will be in the normally open position
- SW-V-224A(B), SW supply to CCH chiller condenser, will be in a normally open position

Valve SW-V-225A(B), CCH AHU emergency cooling coil bypass, will be locked in a throttled position to provide the minimum 100 GPM design flow rate to the AHU emergency coil with a nominal 45 GPM bypassing the AHU.

Manual initiation of emergency MCR cooling is implemented post-accident when the control room temperature rises above 78ºF. Additionally, the operators in the MCR will identify the need for cooling as they are occupying the MCR. The

Control Room AC recirculation fans auto-start on an F, A, or Z signal. During a LOOP event, the recirculation fan that had been running will restart upon its associated diesel generator start. The control room operator will re-establish MCR cooling using CCH as the preferred cooling source by placing the control room CCH pump switch associated with a running recirculation fan from “OFF” to “AUTO.” This control switch action starts the associated CCH pump and CCH chiller. Local field operation at the CCH chiller will be required to load (adjust) the chiller to obtain the required heat removal. No valve manipulations are required to initiate MCR cooling using the CCH system when it is maintained in the standby emergency cooling configuration.

Use of the SW system to provide cooling for the Control Room AC system in the event of CCH unavailability (e.g., CCH failure or routine maintenance) will require local valve manipulations to isolate the CCH system supply and align SW to the Control Room AC AHU emergency cooling coil(s) by reversing the normally open or closed position of the valves in the bulleted list above. Additionally, valves SW-V-104C(D) and SW-V-106C(D) on the outlet of the AHU emergency cooling coils (ref. drawing M775) will be throttled to provide a target flow range of 130-145 GPM, with a minimum 125 GPM SW flow rate through the AHU coils. This flow rate is the same value previously established by SW system flow balancing and is used in the current SW alignment to the Division 1 AHU emergency cooling coil. Periodic TS surveillance is performed to verify the ability to provide MCR cooling using the current SW flow balancing. No SW flow rate changes are proposed by this LAR. As indicated in this LAR, prior to utilizing SW for MCR cooling when CCH is unavailable, SW heat removal capability will be evaluated. SW heat removal capability is assessed by station calculation that evaluates MCR cooling capability given outdoor ambient temperature and cooling water (spray pond) temperature.

The CCH system design and operation currently utilized for Division 2 is retained, which requires manual start of the CCH system from the control room and local field operator action to load (adjust) the chiller for the required heat removal. No new operator actions are introduced. An analysis was performed that concludes there is sufficient time to manually initiate MCR cooling following a Loss of Coolant Accident with a LOOP and remain below the equipment environmental temperature limit. The MCR has the potential to transiently exceed the long term, steady state 85°F habitability temperature for a short duration before cooling is initiated. The temperature transient was previously analyzed for personnel habitability and determined to be acceptable as the conditions did not result in reaching the National Institute of Occupational Safety and Health (NIOSH) heat stress alert limit. Consequently, no work restrictions are imposed on the operators in the MCR during a postulated two hour delay in initiating MCR cooling. This evaluation is addressed in FSAR Section 9.4. The manual actions associated with MCR cooling initiation are not defined by Columbia as time critical actions as two hours are available to initiate cooling and maintain the

MCR ≤ 96ºF transient temperature and nine hours are available to initiate cooling before the 104ºF equipment qualification limit is reached. Additionally, the local operator action to load (adjust) the CCH chiller is feasible as the area is habitable (the CCH chiller room is a mild environment in terms of temperature and radiation levels) and emergency lighting is provided.

Detailed procedures are available for operating the Control Room AC system and CCH system. Procedure revisions are limited to reflecting the preferred normal alignment of the CCH system that results in CCH cooling to the Control Room AC system AHU emergency cooling coils. No changes are made to equipment controls in the Control Room or local controls or equipment operation. Training will be provided to address the alignment of CCH as the preferred cooling source to both Division 1 and Division 2 following approval of this LAR.

3.2.2 Ability to Isolate and Function Under Fires, Failures and Malfunctions

An evaluation was performed in accordance with License Condition 2.C.(14), Fire Protection Program, to determine the effects of the proposed change to provide cooling for the Control Room AC system using the CCH system. The change was determined not to require prior NRC approval. A Fire Protection Engineering Evaluation was performed using the Feasibility and Reliability Criterion in NUREG-1852 to evaluate the manual actions performed during a fire response. The evaluation concluded that the manual actions, which included actions for fires impacting a single division of MCR cooling or a fire affecting both CCH trains, can be successfully performed and would not impact the Post-Fire Safe Shutdown strategy for Columbia.

The proposed change in alignment of CCH as the preferred source of cooling for the Control Room AC system does not create new missiles (see Section 3.2.3 below). No postulated cracks from moderate energy lines will occur that could impact any of the CCH components. Control room personnel will continue to be protected from radiological and chemical hazards since the proposed change does not impact radiological air filtering functions or the ability to isolate the MCR (See Section 3.1.3). Additionally, the CCH system is a closed loop, filled system and is not subject to water hammer. The startup procedure for the CCH system includes venting the CCH closed loop prior to system startup if SW had been utilized as the cooling source to the AHU. The SW line to the CCH chiller has not exhibited water hammer during routine CCH system testing. A single active failure of a component of the CCH, SW or Control Room AC system, assuming a loss of offsite power, does not impair the ability of the Control Room AC system to perform its cooling function (see Section 3.1.2). The overall layout and design of the Control Room AC system is such that fires, failures and malfunctions can be appropriately contained and controlled to prevent complete loss of cooling.

3.2.3 Internal Missiles

Both SRP 9.4.1 and SRP 9.2.7 review procedures include discussion of system protection from internally generated missiles. This proposed change required revision to missile analyses to ensure that safe shutdown requirements were not affected. Potential failure of safety-related components due to CCH pump or CCH chiller generated missiles were evaluated. The evaluation determined no credible missile can be generated. Therefore, the safety-related components of the CCH system, as well as other components located near the CCH pump or compressor, remain protected from internally generated missiles.

3.2.4 Review of High and Moderate Energy Line breaks

No high energy lines are located in the CCH chiller room. Therefore, no High Energy Line Breaks (HELBs) are postulated. The proposed change required moderate energy line crack (MELC) analyses to be evaluated to ensure that safe shutdown requirements are not affected. The MELC analysis concluded no postulated cracks will occur that could impact any CCH components.

3.2.5 Inspection and Testing

The CCH system pumps and valves and the SW valves that support MCR cooling are accessible for periodic testing.

CCH system operation is periodically tested to verify proper function and heat removal capability to maintain the MCR less than or equal to 85ºF. The surveillance satisfies IST Program requirements and the current LCS Surveillance Requirement. The CCH surveillance will be retained and utilized to satisfy, in part, existing TS SR 3.7.4.1.

The surveillance currently performed to meet TS SR 3.7.4.1 supplies SW to the Control Room AC system AHU emergency coils to verify the heat removal capability of the Control Room AC system. This surveillance will also be retained as long as SW has the potential to be utilized to support the MCR cooling requirements.

The components within the scope of the IST Program will be expanded to include applicable components in the CCH and SW system that are utilized for CCH system operation that are not currently in the program.

The CCH and SW system piping in support of the Control Room AC system is within the scope of the ISI program. The ISI program requires piping welds and supports to be visually inspected. No changes are required as a result of this LAR.

The CCH system is currently in the Maintenance Rule Program. The expanded role that CCH will be credited for will not impact its inclusion in the maintenance rule program.

The Columbia Heat Exchanger Program's objective is to maintain high heat exchanger reliability. Preventative Maintenance tasks are currently in place that include periodically inspecting and cleaning the CCH chiller condenser tubes which meets the intent of the Heat Exchanger Program.

3.3 Impact on Submittals Under Review by NRC

One Energy Northwest LAR is currently under review by NRC, however, it does not impact this LAR:

- License Amendment Request to Clean Up Operating License (OL) and Appendix A Technical Specifications (TS) (ML18163A351 dated June 12, 2018)

  The LAR dated June 12, 2018, requested removing the Table of Contents from the TS and placing it under licensee control and requested editorial changes to the OL and TS. The changes proposed by this LAR do not affect the June 12, 2018, administrative LAR.

4.0 REGULATORY EVALUATION

The changes proposed by this LAR do not affect station compliance with the applicable regulations or guidance described in the Columbia FSAR. The changes proposed by this LAR do not adversely affect the functional capabilities of equipment required for safe operation.

4.1 10 CFR 50 Appendix A General Design Criteria (GDC)

The GDC directly relevant to the proposed licensing basis changes to the Control Room AC system were determined based on SRP Sections 9.2.7, Chilled Water System, and SRP 9.4.1, Control Room Area Ventilation System. The relevant GDC are discussed below.

GDC 60 is part of the overall acceptance criteria for the Control Room AC system, however, the changes proposed by this LAR do not impact the functions of the Control Room AC system that control release of gaseous radioactive effluents to the environment. Therefore, GDC 60 is not included in this review.

The review of the GDC requirements concludes the GDC continue to be met for the Control Room AC system.

<u>Criterion 1 – Quality Standards and Records.</u> Structures, systems, and components important to safety shall be designed, fabricated, erected, and tested to quality standards commensurate with the importance of the safety functions to be performed. Where generally recognized codes and standards are used, they shall be identified and evaluated to determine their applicability, adequacy, and sufficiency and shall be supplemented or modified as necessary to assure a quality product in keeping with the required safety function. A quality assurance program shall be established and implemented in order to provide adequate assurance that these structures, systems, and components will satisfactorily perform their safety functions. Appropriate records of the design, fabrication, erection, and testing of structures, systems, and components important to safety shall be maintained by, or under the control of, the nuclear power unit licensee throughout the life of the unit.

The CCH system was purchased, qualified, installed and maintained as safety-related, Seismic Category I and environmentally qualified to fulfill an Operating License Condition from initial plant licensing. Both chiller loops are supplied by Class 1E power in a LOOP event. The quality class of existing CCH system components is not altered by this change, however, applicable station documentation will be revised to reflect the CCH safety related function to maintain MCR temperature within equipment qualification requirements. Energy Northwest maintains a quality assurance program and records management program that meet the requirements of GDC 1, neither of which is impacted by the proposed changes.

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

The CCH system is located in the Quality Level Class I portion of the Radwaste Building. Therefore, the CCH system is protected from natural phenomena such as tornadoes and tornado generated missiles, hurricanes, tsunamis and seiches. The elevation of the CCH system is above the maximum postulated external flood elevation. The CCH system is classified as Seismic Class I and has the proper seismic restraints and qualifications to ensure operation following a design basis earthquake. No changes are made to the SW design as a result of this proposed LAR.

<u>Criterion 4 - Environmental and Missile Design Bases.</u> Structures, systems, and components important to safety shall be designed to accommodate the effects of and to be compatible with the environmental conditions associated with normal operation,

maintenance, testing, and postulated accidents, including loss-of-coolant accidents. These structures, systems, and components shall be appropriately protected against dynamic effects, including the effects of missiles, pipe whipping, and discharging fluids, that may result from equipment failures and from events and conditions outside the nuclear power unit.

The proposed change required missile and moderate energy line crack (MELC) analyses to be evaluated to ensure that safe shutdown requirements were not affected. No credible missiles can be generated by the CCH pump or chiller compressor and no credible missile can be generated from other nearby potential sources. The MELC analysis determined that no postulated cracks will occur that could impact any of the CCH components. A postulated SW pipe crack is still the bounding internal flood scenario and all critical CCH components are above the maximum internal flood height.

<u>*Criterion 5 - Sharing of Structures, Systems, and Components.*</u> *Structures, systems, and components important to safety shall not be shared among nuclear power units unless it can be shown that such sharing will not significantly impair their ability to perform their safety functions, including, in the event of an accident in one unit, an orderly shutdown and cooldown of the remaining units.*

Columbia is a single unit station. Therefore, Criterion 5 does not apply to Columbia or this proposed change.

<u>*Criterion 19 - Control Room.*</u> *A control room shall be provided from which actions can be taken to operate the nuclear power unit safely under normal conditions and to maintain it in a safe condition under accident conditions, including loss-of-coolant accidents. Adequate radiation protection shall be provided to permit access and occupancy of the control room under accident conditions without personnel receiving radiation exposures in excess of 5 rem whole body, or its equivalent to any part of the body, for the duration of the accident.*

Equipment at appropriate locations outside the control room shall be provided (1) with a design capability for prompt hot shutdown of the reactor, including necessary instrumentation and controls to maintain the unit in a safe condition during hot shutdown, and (2) with a potential capability for subsequent cold shutdown of the reactor through the use of suitable procedures.

The changes proposed by this LAR will ensure MCR cooling is maintained for 30 days continuous control room occupancy and to ensure equipment operability is not adversely affected. The proposed changes do not affect the radiological filtering functions or MCR radiological dose estimates. Procedures direct CCH system use. The CCH system is located above the control room on the 525 ft. elevation of the Radwaste Building and is accessible post-accident.

<u>Criterion 44 – Cooling Water.</u> 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.

The CCH system and SW system remain as cooling sources available to the Control Room AC system. The CCH system removes heat from the MCR via the CCH chiller and chilled water cooling loop. SW supports the CCH system by providing heat removal for the CCH chiller condenser. Alternatively, SW may provide cooling water directly to the AHU emergency cooling coils. The WMA system provides cooling during normal station operations. CCH and SW are emergency cooling sources for accident response. CCH will be the preferred cooling source in emergency standby alignment. If CCH is unavailable, SW may be used when it is evaluated as capable of the required heat removal. SW capability is limited at times due to station heat loads and spray pond temperature which is impacted by the environment. Redundant components are available between Division 1 and Division 2 and each Division is supplied by a Class 1E power source (emergency diesel generator) to ensure availability of power during an event with a LOOP.

<u>Criterion 45 - Inspection of Cooling Water System.</u> The cooling water system shall be designed to permit appropriate periodic inspection of important components, such as heat exchangers and piping, to assure the integrity and capability of the system.

The CCH and SW system piping in support of the Control Room AC system is within the scope of the ISI program. The ISI program requires piping welds and supports to be visually inspected. No changes are required as a result of this LAR.

The Columbia Heat Exchanger Program's objective is to maintain high heat exchanger reliability. Preventative Maintenance tasks are currently in place that include periodically inspecting and cleaning the CCH chiller condenser tubes which meets the intent of the Heat Exchanger Program.

<u>Criterion 46 –Testing of Cooling Water System.</u> 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.

The CCH system pumps and the CCH and SW valves are accessible for periodic testing. Routine surveillance of the CCH system will be maintained and will satisfy, in part, TS SR 3.7.4.1. The existing surveillance meeting TS SR 3.7.4.1 supplies SW to the Control Room AC system AHU emergency cooling coils to verify the heat removal capability of the Control Room AC system. This surveillance will also be retained.

The components within the scope of the IST Program will be expanded to include applicable components in the CCH and SW system that are utilized for CCH system operation that are not currently in the program.

4.2 Applicable Regulations

The changes proposed by this LAR have been evaluated to verify that applicable regulations continue to be met.

10 CFR 50.63 – Loss of All Alternating Current Power

SRP 9.4.1 includes 10 CFR 50.63 in the acceptance criteria as it relates to a support system's capability to ensure the coping capability during a station blackout event. 10 CFR 50.63(a)(1) states:

> *"Each light-water-cooled nuclear power plant licensed to operate under this part, each light-water-cooled nuclear power plant licensed under subpart C of 10 CFR part 52 after the Commission makes the finding under § 52.103(g) of this chapter, and each design for a light-water-cooled nuclear power plant approved under a standard design approval, standard design certification, and manufacturing license under part 52 of this chapter must be able to withstand for a specified duration and recover from a station blackout as defined in § 50.2."*

Columbia complies with the Station Blackout Rule as outlined in 10 CFR 50.63, Loss of All Alternating Current Power, and Regulatory Guide 1.155, Station Blackout. The Station Blackout coping period for Columbia is 4 hours. During the 4 hour coping period, the Control Room AC system is not relied upon for MCR cooling and there is no CCH or SW cooling support function that is relied upon to ensure coping. MCR operators remove unnecessary loads to limit MCR heat up and open MCR cabinet doors to compensate for loss of HVAC. These actions are not changed by this proposed LAR. Therefore, compliance with 10 CFR 50.63 continues to be met.

4.3 Applicable Regulatory Guidance

Standard Review Plan acceptance criteria and system considerations presented in SRP 9.2.7, Chilled Water System, and SRP 9.4.1, Control Room Area Ventilation

System (References 2 and 3), were reviewed as part of developing Section 3.0, Technical Evaluation, for this LAR to ensure the applicable regulatory guidance remains met.

5.0 SIGNIFICANT HAZARDS CONSIDERATION

Energy Northwest has evaluated whether a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10 CFR 50.92, Issuance of amendment, as discussed below.

1) Does the proposed amendment involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No.

   The CCH system is not an initiator of an accident and does not have the function of preventing any accidents. Therefore, the proposed change does not involve an increase in the probability of an event.

   The CCH system utilizes active components to perform its design function in support of MCR cooling, however, the CCH system utilizes safety-related equipment which meet the design requirements stated in the Columbia FSAR. System performance and reliability will be monitored by the Maintenance Rule, the IST Program and TS surveillance. Procedures are available for CCH system use and the CCH system components are accessible post-accident. Analyses have been performed and conclude there is adequate time to initiate MCR cooling following a design basis event. The proposed change does not impact radiological consequences of any accident described in the FSAR. Therefore, the proposed change does not involve a significant increase in the consequences of an event.

2) Does the proposed amendment create the possibility of a new or different kind of accident from any accident previously analyzed?

   Response: No.

   The proposed change allows the use of either CCH or SW, when capable of the required heat removal, as cooling support to the Control Room AC system for the purpose of meeting both the equipment qualification temperature limit and the bounding control room habitability steady state temperature. The proposed change will align CCH to both the Division 1 and Division 2 emergency cooling coils for emergency standby service. If normal MCR cooling is lost, emergency MCR cooling will be manually initiated post-accident and is supported by analyses that conclude the manual actions are feasible and adequate time is available to perform the actions. The Control Room AC system cooling function is not an accident initiator and is not postulated to create a new or different kind of accident than previously analyzed.

3) Does the proposed amendment involve a significant reduction in a margin of safety?

Response: No.

The proposed LAR provides additional flexibility to utilize either the CCH or SW system to meet the MCR required equipment qualification temperature limit and the long term steady state temperature for 30 days continuous control room occupancy. The SW system will be evaluated to ensure it is capable of the required heat removal prior to crediting it as the available cooling source. Operator training will be provided to reflect use of CCH as the preferred cooling source to support the Control Room AC system in both Division 1 and Division 2 following approval of this LAR. Analyses have been performed and conclude that there is adequate time to initiate MCR cooling following a design basis event. Surveillances will be performed on both the CCH and SW systems in support of MCR cooling and the systems will be maintained as safety-related. Therefore, the proposed changes do not involve a significant reduction in a margin of safety.

Energy Northwest concludes that the proposed amendment does not involve a significant hazards consideration under the standards set forth in 10 CFR 50.92(c), and, accordingly, a finding of “no significant hazards consideration” is justified.

6.0 CONCLUSIONS

Based on the considerations discussed above: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the applicable regulations as identified herein, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

7.0 ENVIRONMENTAL CONSIDERATION

Energy Northwest has determined that the proposed amendment would change requirements with respect to installation or use of a facility component located within Columbia's restricted area, as defined in 10 CFR 20. Energy Northwest has evaluated the proposed change and has determined that the change does not involve, (i) a significant hazards consideration, (ii) a significant change in the types or a significant increase in the amounts of any effluents that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed change meets the eligibility criteria for categorical exclusion in accordance with 10 CFR 51.22(c)(9). Therefore, pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

8.0 REFERENCES

1. US NRC, NUREG-0892, Safety Evaluation Report Related to the Operation of WPPSS Nuclear Project No. 2, Docket No. 50-397: Washington Public Power Supply System, December 1980

2. Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition — Design of Structures, Components, Equipment, and Systems (NUREG-0800, Chapter 9, Section 9.2.7, Chilled Water System, Revision 0, September 2015)

3. Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition — Design of Structures, Components, Equipment, and Systems (NUREG-0800, Chapter 9, Section 9.4.1, Control Room Area Ventilation System, Revision 3, March 2007)

4. Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR Edition – Design of Structures, Components, Equipment, and Systems (NUREG-0800, Chapter 18, Human Factors Engineering, Revision 3, December 2016)

5. NUREG-1434, Standard Technical Specifications, General Electric BWR/6 Plants, Revision 4.0, Volume 1, Specifications and Volume 2, Bases, dated April 2012

6. NUREG-1852, Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire, Published October 2007

Enclosure 2

Technical Specification Bases Marked Up Pages
For Information Only

B 3.7 PLANT SYSTEMS

B 3.7.4 Control Room Air Conditioning (AC) System

BASES

BACKGROUND

The Control Room AC portion of the Control Room Heating, Ventilation, and Air Conditioning (HVAC) System (hereafter referred to as the Control Room AC System) provides temperature control for the control room following isolation of the control room (from the normal intake and exhaust).

The Control Room AC System consists of two independent, redundant subsystems that provide cooling of recirculated control room air. Each subsystem consists of an air filter, two cooling coils (one normal and one emergency), a control room recirculation fan, ductwork, dampers, and instrumentation and controls to provide for control room temperature control. While there are two cooling coils, only the emergency cooling coil is required by this LCO. The emergency cooling coils are cooled by either the Emergency Chilled Water System, which consists of two chillers and two pumps (one chiller and pump combination for each emergency cooling coil) or by the Standby Service Water (SW) System. The SW System also provides cooling to the Emergency Chilled Water System ~~chillers.~~ chiller condensers.

The Control Room AC System is designed to provide a controlled environment under both normal (using the non-safety related normal cooling coils) and accident (using the safety related emergency cooling coils) conditions. A single subsystem provides the required temperature control to maintain a suitable control room environment with a sustained occupancy of 10 persons. The design condition for the control room environment is 85°F for control room habitability. The environmental qualification temperature for control room equipment is 104°F. ~~When the Emergency Chilled Water System is not functional, an evaluation of the capability of the SW System to maintain control room temperature ≤ 85°F is required per Licensee Controlled Specification (LCS) 1.7.2 (Ref. 1).~~ Insert #1 The Control Room AC System operation in maintaining the control room temperature is discussed in the FSAR, Sections 6.4 and 9.4.1 (Refs. 2 and 3, respectively).

APPLICABLE SAFETY ANALYSES

The design basis of the Control Room AC System is to maintain the control room temperature for a 30 day continuous occupancy and ensure cooling for equipment qualification.

The Control Room AC System components are arranged in redundant safety related subsystems. During emergency operation, the Control Room AC System maintains a habitable environment and ensures the OPERABILITY of components in the control room. A single active failure

, when evaluated as capable of the required heat removal.

BASES

APPLICABLE SAFETY ANALYSES (continued)

of a component of the Control Room AC System, assuming a loss of offsite power, does not impair the ability of the system to perform its design function. Redundant detectors and controls are provided for control room temperature control when the emergency cooling coils are cooled by the Emergency Chilled Water System. The Control Room AC System is designed in accordance with Seismic Category I requirements. The Control Room AC System is capable of removing sensible and latent heat loads from the control room, including consideration of equipment heat loads and personnel occupancy requirements to ensure equipment OPERABILITY.

The Control Room AC System satisfies Criterion 3 of Reference 4.

LCO

Two independent and redundant subsystems of the Control Room AC System are required to be OPERABLE to ensure that at least one is available, assuming a single failure disables the other subsystem. Total system failure could result in the equipment operating temperature exceeding limits.

The Control Room AC System is considered OPERABLE when the individual components necessary to maintain the control room temperature are OPERABLE in both subsystems. These components include the emergency cooling coils (either cooled by the Emergency Chilled Water System or the SW System), control room recirculation fans, Emergency Chilled Water System chillers and pumps (if the Emergency Chilled Water System is being credited with providing cooling to the emergency cooling coils), ductwork, dampers, and associated instrumentation and controls. In addition, during conditions in MODES other than MODES 1, 2, and 3 when the Control Room AC System is required to be OPERABLE (e.g., OPDRVs), the necessary portions of the SW System and the ultimate heat sink are part of the OPERABILITY requirements covered by this LCO.

when evaluated as capable of removing the required heat loads

Insert #2

APPLICABILITY

In MODE 1, 2, or 3, the Control Room AC System must be OPERABLE to ensure that the control room temperature will ~~not exceed equipment OPERABILITY limits following control room isolation.~~

In MODES 4 and 5, the probability and consequences of a Design Basis Accident are reduced due to the pressure and temperature limitations in these MODES. Therefore, maintaining the Control Room AC System OPERABLE is not required in MODE 4 or 5, except during operations with a potential for draining the reactor vessel (OPDRVs).

support 30 days continuous occupancy and not exceed the equipment qualification temperature limit following control room isolation.

ACTIONS

A.1

With one control room AC subsystem inoperable, the inoperable control room AC subsystem must be restored to OPERABLE status within 30 days. With the unit in this condition, the remaining OPERABLE control room AC subsystem is adequate to perform the control room air conditioning function. However, the overall reliability is reduced because a single failure in the OPERABLE subsystem could result in loss of the control room air conditioning function. The 30 day Completion Time is based on the low probability of an event occurring requiring control room isolation, the consideration that the remaining subsystem can provide the required protection, and the availability of alternate cooling methods.

B.1 and B.2

If both control room AC subsystems are inoperable, the Control Room AC System may not be capable of performing its intended function. Therefore, the control room area temperature is required to be monitored to ensure that temperature is being maintained low enough that equipment in the control room is not adversely affected. With the control room temperature being maintained within the temperature limit, 72 hours is allowed to restore a Control Room AC subsystem to OPERABLE status. This Completion Time is reasonable considering that the control room temperature is being maintained within limits and the low probability of an event occurring requiring control room isolation.

C.1

In MODE 1, 2, or 3, if the inoperable control room AC subsystem(s) cannot be restored to OPERABLE status within the associated Completion Time, the unit must be placed in a MODE that minimizes overall plant risk. To achieve this status the unit must be placed in at least MODE 3 within 12 hours.

Remaining in the Applicability of the LCO is acceptable because the plant risk in MODE 3 is similar to or lower than the risk in MODE 4 (Ref. 4) and because the time spent in MODE 3 to perform the necessary repairs to restore the system to OPERABLE status will be short. However, voluntary entry into MODE 4 may be made as it is also an acceptable low-risk state.

Required Action C.1 is modified by a Note that states that LCO 3.0.4.a is not applicable when entering MODE 3. This Note prohibits the use of LCO 3.0.4.a to enter MODE 3 during startup with the LCO not met. However, there is no restriction on the use of LCO 3.0.4.b, if applicable, because LCO 3.0.4.b requires performance of a risk assessment

ACTIONS (continued)

addressing inoperable systems and components, consideration of the results, determination of the acceptability of entering MODE 3, and establishment of risk management actions, if appropriate. LCO 3.0.4 is not applicable to, and the Note does not preclude, changes in MODES or other specified conditions in the Applicability that are required to comply with ACTIONS or that are part of a shutdown of the unit.

The allowed Completion Time is reasonable, based on operating experience, to reach the required unit conditions from full power conditions in an orderly manner and without challenging unit systems.

D.1 and D.2

During OPDRVs, if Required Action A.1 cannot be completed within the required Completion Time, the OPERABLE control room AC subsystem may be placed immediately in operation. This action ensures that the remaining subsystem is OPERABLE, that no failures that would prevent actuation will occur, and that any active failure will be readily detected.

An alternative to Required Action D.1 is to immediately suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Action must continue until the OPDRVs are suspended.

E.1

During OPDRVs if Required Actions B.1 and B.2 cannot be met within the required Completion Times, action must be taken to immediately suspend OPDRVs to minimize the probability of a vessel draindown and subsequent potential for fission product release. Action must continue until the OPDRVs are suspended.

SURVEILLANCE REQUIREMENTS

SR 3.7.4.1

This SR verifies that the heat removal capability of the system is sufficient to remove the control room heat load assumed in the safety analyses. The SR consists of a combination of testing and calculation. The Surveillance Frequency is controlled under the Surveillance Frequency Control Program.

BASES

REFERENCES

1. ~~LCS 1.7.2.~~ Deleted

2. FSAR, Section 6.4.

3. FSAR, Section 9.4.1.

4. 10 CFR 50.36(c)(2)(ii).

5. NEDC-32988-A, Revision 2, Technical Justification to Support Risk-Informed Modification to Selected Required End States for BWR Plants, December 2002.

TS 3.7.4 BASES INSERTS

Insert #1:

The Emergency Chilled Water System is normally aligned to both Division 1 and Division 2 emergency cooling coils and functions to maintain the 85 F habitability design condition for the control room which also bounds the 104 F equipment qualification temperature limit. The Emergency Chilled Water System is the preferred cooling source to support the Control Room AC System, however, SW is an acceptable alternate source when conditions permit. When SW is used, it shall be capable of maintaining the nominal long term 85 F habitability design consideration temperature, which bounds the equipment qualification temperature.

Insert #2:

An OPERABLE Control Room AC subsystem is capable of maintaining the main control room temperature less than 104 F at all times and maintaining a long term steady state temperature of less than or equal to 85 F. Prior to initiating cooling, the control room may transiently exceed 85 F as addressed in Reference 3.

Enclosure 3

Final Safety Analysis Report (FSAR) Marked Up Pages
For Information Only

Chapter 9

AUXILIARY SYSTEMS

TABLE OF CONTENTS (Continued)

9.4 HEATING, VENTILATING, AND AIR CONDITIONING SYSTEMS

The various heating, ventilating, and air conditioning (HVAC) systems serving the plant are designed to provide suitable environmental conditions throughout the plant for personnel comfort and/or equipment operation.

The following performance objectives are implemented in the design of the HVAC systems:

a. Maintain appropriate ambient temperature and humidity conditions for station operating personnel and equipment,

b. Control and monitor all potentially radioactive airborne releases from the plant so that releases are within the limits of 10 CFR Part 20,

c. Control and limit airborne radioactive contaminants within the plant structures by inducing air flow from areas of low contamination potential into areas of progressively higher contamination potential, and

d. Remove all potentially explosive gases, noxious fumes, or smoke from the plant.

In addition, a number of HVAC systems are required to ensure a safe shutdown of the reactor or to mitigate the results of the design basis accident. These systems are designed to continue operation in the event of any or all of the following events:

a. Safe shutdown earthquake (SSE),
b. Loss of offsite power,
c. Single failure of any active component, and
d. Design basis accident.

The effect of a loss of normal ventilation during a station blackout is discussed in Appendix 8A.

The following areas containing engineered safety features (ESF) equipment are serviced by critical HVAC systems:

a. Main control room/cable spreading room/critical switchgear area,
b. Diesel generator building,
c. Standby service water (SW) pump houses,
d. Reactor building emergency pump rooms,
e. Reactor building critical electrical equipment rooms, and
f. Diesel generator cable area corridor.

The balance of the plant structures are serviced by noncritical HVAC systems.

The following outdoor design conditions are used in the design of HVAC systems having ESF:

Summer:	105°F dry-bulb, 71°F wet-bulb
Winter:	0°F dry-bulb

The extreme outdoor conditions are:

Summer:	115°F dry-bulb
Winter:	-27°F

The effect of these extreme outdoor conditions on main control room/cable spreading room and critical switchgear area temperatures is negligible for the frequency and duration of these conditions since the rooms are interior rooms and the total load changes due to fresh air (maximum 5% of total air flow for control room and maximum 10% of total air flow for critical switchgear area) are within equipment capacity limits for maintaining inside design conditions. The mechanical equipment rooms housing these three systems are of extra heavy exterior wall and roof construction and the effect of extreme outside conditions is considered to be negligible for the frequency and duration of these extremes.

Extreme outside conditions have no effect on reactor building emergency pump rooms and reactor building critical electrical equipment rooms since these are interior rooms without any outdoor air supply during emergency. During normal operation the emergency pumps are not running and the critical electrical equipment is operating at a reduced load. The battery rooms are provided with room heaters to prevent excessive cooling from SW that could affect battery capacity.

The effect of extreme outdoor conditions on the diesel generator building ventilation system, diesel generator area cable cooling system, and SW pump house ventilation systems is discussed in Sections 9.4.7, 9.4.8, and 9.4.10 respectively.

9.4.1 MAIN CONTROL ROOM/CABLE SPREADING ROOM/CRITICAL SWITCHGEAR AREA

9.4.1.1 Design Bases

The critical switchgear area, cable spreading room, and main control room are located, one above the other, on three successive levels of the radwaste building, with the main control room on the top level. Each level is served by a separate HVAC system. Redundant HVAC systems are provided for the main control room and the cable spreading room. These three systems are ESF systems and all system components, except the radwaste building chilled water system (WCH) (see Section 9.4.4) to the control room, cable spreading room and critical switchgear area systems, and the plant service water (TSW) system to the switchgear area system, are designed to operate under all emergency modes. During an emergency condition, the SW system is used as the cooling medium for the cable spreading room and switchgear area systems. The control room chilled water (CCH) system or SW system is used as the cooling medium for the control room HVAC system during emergency conditions.

add comma

when capable of the required heat removal,

The three systems are designed to satisfy the following design criteria:

a. Main control room

Insert #1

During normal operation the main control room ambient conditions are normally maintained at 75°F ±3° dry-bulb temperature by the radwaste chillers. ~~In the event both radwaste chillers are inoperative (emergency condition) the control room temperature will be maintained within the habitability limit (85°F) by control room chilled water. SW can maintain the control room temperature limit of 85°F during colder weather. SW will maintain the control room within the environmental qualification temperature limit for control room equipment (104°F).~~ The ingress of smoke or combustion vapors (due to a fire within the plant but external to the control room), or of airborne radioactive contaminants released due to the design basis accident, is minimized by pressurizing the control room. During a loss-of-coolant accident (LOCA), the control room emergency pressurization mode through the emergency filter unit maintains a positive pressure with respect to its surroundings as measured in the cable spreading room.

Three air intakes are provided from which fresh air can be drawn. One local intake is provided for normal operation and two remote intakes are provided for normal and emergency operation. Fire external to the plant and any ingress of smoke or combustion vapors are detected by smoke detectors in the control room fresh air intake ducting, which will alarm in the control room.

Isolation of the control room fresh air intakes would place the control room HVAC in an unfiltered recirculation mode. In the event of a hazardous chemical release, the control room HVAC is manually isolated into the recirculation mode without filtration through the emergency filter units by closing the normal fresh air isolation damper.

b. Cable spreading room

The cable spreading room HVAC system is designed to maintain the cable spreading room and the remote shutdown room at approximately 80°F during normal operation and to limit the temperature below equipment operability limits during all emergency modes of operation. See Table 3.11-1.

c. Critical switchgear area

The critical switchgear area HVAC system is designed to maintain temperatures in the electrical rooms between 55°F and 104°F during normal operation and to limit the temperatures below equipment operability limits during all emergency modes of operation. See Table 3.11-1. The system is also designed to remove any combustible fumes generated by the emergency batteries.

9.4.1.2 System Description

Figures 9.4.1-1 through 9.4.1-3

The HVAC systems of the main control room, cable spreading room, and critical switchgear areas are shown in ~~Figure 9.4-1.~~ The HVAC systems for these three areas are located in equipment rooms above the main control room. These two equipment rooms are separated from each other by a missile barrier. Each equipment room houses three separate and independent systems serving the three areas. Equipment details are given in Table 9.4-1. Equipment seismic information is given in Table 3.2-1.

9.4.1.2.1 Main Control Room

emergency use coil

normal use coil

Each of the main control room's 100%-capacity HVAC systems are composed of a primary air handling system and an emergency filter system. The two HVAC systems share a common outside air intake system and a common duct distribution system within the main control room. A single exhaust system, composed of a fan, shutoff damper, and ductwork, discharges air from the main control room toilet and kitchen. The exhaust fan operates continuously during normal operations.

Each primary air handling system consists of a centrifugal supply fan which blows through an air handling unit consisting of an air filter, two water cooling coils in series (one for radwaste chilled water and one for control room chilled water or SW), and an electric blast coil heater and associated ductwork and dampers.

Separate return air ductwork containing a sound absorber unit is provided from the main control room to each of the primary air handling systems.

During normal operation one air handling system operates, distributing air to the main control room. The temperature is controlled by electronic controllers located in the main control room which modulate the chilled water flow to the cooling coil.

Chilled water is normally supplied to the main control room air handling systems by the WCH. The WCH, which includes two 100%-capacity chillers and two 100%-capacity pumps is not an

radwaste

Insert #2

ESF. ~~During emergency condition, control room chilled water or SW is supplied to the air handling units for cooling. The control room can be maintained below 85°F by the control room chilled water, or SW can be used to maintain less than 104°F (shedding of nonessential loads may be required under some conditions). The control room temperature limit is 85 °F dry bulb for control room habitability. The environmental qualification temperature limit for control room equipment is 104°F.~~

The two 1000-cfm capacity filter systems are normally in standby and operate in the event of an emergency (F, A, Z signal). Each of the emergency filter systems consists of an emergency filter unit, a 5-kW electric heater, bypass and recirculation control dampers, and associated ductwork. Each emergency filter unit consists of a medium efficiency prefilter, high efficiency particulate air (HEPA) filter, activated charcoal filters, and direct drive centrifugal fan, all enclosed in an all-welded sheet metal housing. A deluge water spray system is provided to soak the charcoal filters in the event of high temperatures in the charcoal beds. Check valves are provided on all drain connections from the filter unit, and the drain header is provided with a deep water seal trap to prevent inleakage of air during unit operation. The electric heater located in the fresh air duct to each emergency filter limits the relative humidity of the air entering the filter to 70%.

The medium efficiency prefilters are provided to protect and extend the life of the HEPA filters. They have an 80% to 85% dust spot efficiency by ASHRAE Standard 52.1 (MERV 13 rating by ASHRAE standard 52.2).

Regulatory Guide 1.52 compliance is described in Section 1.8.

Motor-operated outside air intake (bypass) dampers WMA-AD-51A-1 and 51B-1 are spring-loaded fail-closed type and are provided with limit switches to indicate full open and full closed positions on the main control room panel. Each damper is provided with a remote manual switch in the main control room. Dampers are automatically closed when deenergized by isolation signal or by the main control room panel-mounted switch. These dampers have a design leak rate of 0.5% of the rated flow. Main control room supply fan inlet pressure is higher than the emergency filter unit fan; therefore, when the emergency filter unit is operating, a negative pressure is developed on the inlet side of the bypass dampers preventing any contaminated air bypass of the emergency filter unit. In the event that either bypass damper does not close, an alarm will be activated in the main control room.

The three fresh air intakes (one normal and two remote) for the main control room are fitted with two butterfly isolation valves in series. The normal control room fresh air local intake valves are automatic isolation valves which isolate on an F, A, or Z signal. The normal fresh air intake valves have electrohydraulic operators which are powered from the Class 1E buses. All fresh air intakes are connected via ductwork to a common intake header from which both main control room air handling systems and both emergency filter systems draw fresh air. The isolation valves in the purge lines and the normal air intake and position indication on all fresh air intakes, the emergency filter units, and the bypass dampers that direct fresh air through the emergency filter units are division oriented electrically.

The remote air intake valves are manual, and the design is simple and reliable enough that the valve may be manually repositioned in a short period of time.

In the event of a LOCA, the main control room is protected from potential airborne radioactivity by pressurizing the control room with air supplied via the remote air intakes. The system operates in the following manner:

The isolation valves in the normal fresh air intake are closed by any of the F, A, or Z signals. These are the same signals provided for isolating the primary and secondary containments.

Both sets of remote air intake isolation valves are normally locked open. At least one air intake must be maintained open to ensure the control room is pressurized.

Each remote intake header is provided with a purge exhaust system to provide continuous radiation monitoring of the remote intakes while isolation valves are closed. The two purge exhaust systems each consists of two isolation valves in series. One purge valve is equipped with an electrohydraulic operator and is interlocked with its remote intake valve, and the other purge valve is maintained open.

Both purge exhaust systems utilize battery exhaust fans WEA-FN-53A and WEA-FN-53B (which are both ESF) to purge air from the remote intake headers.

Both battery exhaust fans provide the necessary redundancy through cross over ductwork between each set of purge exhaust valves.

The emergency filter units are energized by F, A, Z signals and all outdoor pressurizing air is automatically diverted through the filter units. The main control room kitchen exhaust fan and its isolation damper are also shut off by F, A, Z signals.

Operating in the above manner ensures that the main control room is continuously pressurized with filtered air. The details of the control room dose analysis are discussed in Sections 15.4.9, 15.6.4, 15.6.5 and 15.7.4.

9.4.1.2.2 Cable Spreading Room

The cable spreading room HVAC system consists of two 100%-capacity air-handling units, each with its own duct distribution system, common distribution system inside the cable spreading room, and one purge exhaust fan. The air handling units are similar to those servicing the main control room, i.e., filter, SW coil, chilled water coil, electric heater, and centrifugal fan in the sheet metal housing. Normally one air handling unit operates continuously on a 100% recirculation mode of operation maintaining the cable spreading room and remote shutdown room at approximately 80°F.

The cable spreading room purge exhaust fan does not normally operate. In the unlikely event of fire developing in the cable spreading room, the purge fan can be manually operated to remove any smoke from the cable spreading room prior to personnel access.

If the radwaste chilled water supply to the cable spreading room air handling units is lost, SW is supplied to the units for emergency cooling. Under this mode of operation the cable spreading room and remote shutdown room temperature is limited below equipment operability limits. See Table 3.11-1.

9.4.1.2.3 Critical Switchgear Area

The switchgear and batteries associated with the redundant emergency electric power systems are located in separate equipment rooms below the cable spreading room. A separate heating and ventilation system is provided for each set of equipment rooms. Ventilation of the emergency chiller area at the 525 ft level is also provided by this system. Each of the two heating and ventilating systems consists of an air handling unit, battery room exhaust fans and associated ductwork and controls. The air handling unit consists of a roughing filter, two water coils in series (one for WCH or plant service water, one for SW), an electric blast coil heater, and a centrifugal fan in a sheet metal housing. The two air handling units have different capacities due to heat load differences between the two sets of rooms. Electric heaters are provided in the ducts supplying air to the battery rooms to maintain temperature in those rooms above 60°F.

Both heating and ventilating systems normally operate continuously during all modes of operation. They are both partial recirculation systems with fresh air provided as makeup for the air exhausted from the battery rooms. The battery rooms are continuously exhausted (no recirculation) to prevent the possible buildup of combustible gases generated by the batteries. During normal operation, either WCH or plant service water is provided to the air handling units as the cooling medium.

Under all emergency modes of operation SW is provided to both units as the cooling medium. The critical switchgear area air handling units also provide the normal and emergency ventilation for the HVAC equipment rooms and the emergency chiller area at the 525 ft level. Temperatures in the HVAC equipment rooms are limited to a range of 55°F to 104°F during normal operation and below equipment operability limits during all emergency modes of operation. See Table 3.11-1.

9.4.1.3 Safety Evaluation

cooling and

9.4.1.3.1 Main Control Room

The reliability of the HVAC system serving the main control room is achieved by providing two 100% redundant trains. Only one of the two redundant trains is required to operate to provide adequate dose mitigation. The two HVAC trains are physically separated to preclude simultaneous failure from any one incident. These HVAC trains are cooled normally by the

Insert #3

non-safety related Radwaste Building Chilled Water (WCH) System. ~~During an emergency, the HVAC trains can be cooled either directly by SW or indirectly by SW through the Control Room Chilled Water (CCH) system.~~ All components of the two HVAC trains and the SW and CCH cooling systems are designed to withstand the effects of a SSE and are powered from emergency diesel buses. The emergency chillers are located in a general area. During initial licensing the emergency chillers were installed as directed in License Condition 2.c.(21) of the Operating License. The emergency chillers were required to be redundant, Seismic Category I, and environmentally qualified.

Insert #4

~~The CCH or SW system is used as the cooling medium in the event that WCH is unavailable, thus providing acceptable temperatures in the control room under all modes of operation. SW is capable of maintaining control room temperature within the environmental qualification temperature limit for control room equipment, but during the warmer months the capability of SW to maintain the control room within the habitability limit is limited. During those time periods, the redundant CCH trains ensure acceptable temperatures are maintained once the CCH system is started. Prior to start of the CCH system, which is a manually started system, the control room will temporarily exceed its steady state habitability limit, but remain below the National Institute for Occupational Safety and Health wet-bulb globe temperature for unlimited duration habitability.~~

The normal fresh air intake is provided with two division oriented valves (normally open, fail closed) in series to close in the event of an F, A, Z signal. The valves are a highly reliable butterfly-type with the disc keyed to the pivot shaft. If one of the remote air intake isolation valves should fail it may be easily repositioned or repaired. One remote intake will always remain open to ensure a pressurized control room and prevent infiltration.

The remote fresh air intakes are used to pressurize the main control room through emergency filter units. This limits infiltration of airborne radioactive contaminants and smoke due to a fire within the plant but external to the control room. Infiltration of airborne radioactivity in the main control room is discussed in Section 6.4.

will be cooled

The emergency filter unit starts operating in the event of a LOCA.

The main control room is maintained at 75 $\pm 3°F$ dry-bulb temperature under normal conditions. In the event of an emergency, the control room ~~can be maintained below 85°F~~ by ~~the~~ CCH. ~~SW can be used to maintain less than 104°F. During colder ambient conditions, SW is capable of maintaining the control room less than 85°F dry bulb. The requirements of Licensee Controlled Specifications (LCS) 1.7.2 must be met when crediting SW for maintaining control room temperature within limits.~~

When CCH is unavailable , SW can be an acceptable alternate cooling source when evaluated as capable of maintaining the bounding 85 °F long term steady state control room temperature.

9.4.1.3.2 Cable Spreading Room

The cable spreading room is provided with two 100%-capacity HVAC systems which are physically separated. All components of the two systems, except the chilled water system, are designed to operate through the SSE and are powered from emergency diesel buses. As with the control room HVAC system, SW is used as the cooling water for the cable spreading room handling units to maintain an acceptable temperature in the cable spreading room for equipment operation in the event that the chilled water system is inoperable.

9.4.1.3.3 Critical Switchgear Area

The essential electric equipment for each of the redundant emergency diesel generators is serviced by separate heating and cooling systems. Each system is powered from a Class 1E bus which is supplied by the diesel generator it serves and is designed to operate through an SSE.

Standby service water is used as the system cooling medium whenever WCH or plant service water are not available, thus ensuring cooling during all modes of plant operation. The two systems are physically separated and arranged in such a manner that the failure of one system can affect only the diesel generator that it services.

9.4.1.4 Testing and Inspection Requirements

The performance of the HVAC systems servicing the main control room, cable spreading room, and critical switchgear areas can be verified while the systems are operating. The operability and performance of standby equipment is determined by alternating the duty of redundant systems.

The control room system ductwork was subject to leak tests during erection and was balanced for air flows in accordance with the procedures of the Associated Air Balance Control Council (AABC). All system components were subject to preoperational testing. All piping systems components were subject to hydrostatic tests during erection.

The emergency filter housings and filters were subject to both shop and field efficiency tests.

The HEPA and charcoal adsorber filters are periodically tested as required by the Technical Specifications. Charcoal samples laboratory test results are required within 31 days of removal.

9.4.1.5 Instrumentation Requirements

All essential controls for the control room, cable spreading room, and critical switchgear area HVAC systems are electric or electronic except the remote air intake isolation valves. Pneumatic controls are used only on nonessential components.

9.4.1.5.1 Main Control Room

The following controls are provided in the main control room in addition to those discussed in Section 9.4.1.2.1.

Both air handling systems serving the main control room can be started from separate selector switches located in the main control room. When an air handling unit fan is started, all controls associated with that system are energized via electrical interlocks initiating the following operations:

a. The fresh air intake damper is opened, and

radwaste

b. The electronic thermostat in the main control room modulates the chilled water valve and energizes the two stages of electric heaters, as required, to satisfy the heating/cooling requirements of the main control room. (The heater breakers are normally locked open in modes 1, 2, and 3.)

Insert #5

~~In the emergency condition (loss of radwaste building chilled water during design basis accident), the cooling coil WMA-CC-51A1 serving air handling unit WMA-AH-51A is supplied with SW. When the Off-Auto control switch in the control room, which is normally in the Off position, is set to Auto, the cooling coil WMA-CC-51B1 will be automatically supplied with emergency chilled water. If necessary, cooling coil WMA-CC-51A1 can be supplied with CCH by manual opening or closing of valves in SW and CCH lines to chiller CCH-CR-1A. Also, if necessary, cooling coil WMA-CC-51B1 (which is normally lined up for CCH) can be supplied by SW by manually opening or closing of the appropriate valves in SW and CCH lines to chiller CCH-CR-1B.~~

Control switches are provided in the main control room for all fans, local air intake isolation valves, and dampers so that all components can be controlled manually as well as automatically. The remote air intake isolation valves are manual valves.

9.4.1.5.2 Cable Spreading Room

The air handling units serving the cable spreading room are started from separate selector switches located in the main control room. When an air handling unit fan is started, an associated solenoid valve is energized permitting the air handling unit pneumatic chilled water control valve and electric heating coils to receive a pneumatic control signal from a temperature controller sensing temperature in the air return duct from the cable spreading room (the heater breakers are normally locked open in modes 1, 2, and 3). The starting of the fan also energizes the air handling automatic roll filter control circuit permitting the filter drive motor to change media at selected preset timer intervals. Redundant temperature switches located in the cable spreading room will annunciate alarms in the main control room in the event of a temperature rise to 90°F thus alerting the operator of a possible equipment malfunction. A differential pressure switch across the air handling unit filter will alarm in the event of high differential pressure.

Smoke detectors in the cable spreading room return air ducts annunciate alarms in the main control room in the event of smoke so that the operator can activate the fire protection system (see Appendix F).

There are no control valves associated with the SW coils in the cable spreading room units. Whenever SW is on, there is full water flow through the coil. During normal operation any heat added to the space by the SW coil is compensated for by the air handling units chilled water coil.

9.4.1.5.3 Critical Switchgear Area

The two air handling units and the two battery room exhaust fans which service the critical switchgear area each have their own selector switch located in the main control room. When an air handling unit fan is started, an associated solenoid valve is energized permitting the air handling unit pneumatic plant service water valve and electric heating coils to receive a pneumatic control signal from a temperature controller sensing temperature in the supply air duct to the critical switchgear area. The temperature controller is set to maintain the temperature as described in Table 3.11-1. The starting of the fan also energizes the air handling unit automatic roll filter control circuit, permitting the filter drive motor to change media at selected preset timer intervals.

Temperature switches located in each of the electrical equipment rooms serviced by the critical switchgear system annunciate alarms in the main control room in the event of abnormally high temperatures thus alerting the operator of a possible malfunction of the cooling system. Smoke detectors in the main return air ducts to the air handling unit and in the battery room exhaust ducts will annunciate alarms in the main control room in the event of fire in the switchgear area. Differential pressure switches across each of the battery room exhaust fans and across the filter of the air handling units will annunciate alarms in the main control room in the event of low differential pressure across fan or high/low differential pressure across filter.

As with the cable spreading room air handling units, there are no control valves associated with the SW coils in the switchgear area units. Whenever SW is on, there is full water flow through the coil.

9.4.2 REACTOR BUILDING

9.4.2.1 Design Bases

The reactor building, or secondary containment, is provided with a HVAC system designed to meet the requirements for all general areas of the building, the spent fuel pool, potentially contaminated areas and the primary purge as follows.

provided in each of these areas to pump the condensate to the return tank. Equipment details are given in Table 9.4-9. Equipment seismic information is given in Table 3.2-1.

9.4.16.3 Safety Evaluation

The auxiliary boiler and associated steam systems were originally intended to be free from radiological contamination. During operation, however, the system has become contaminated with tritium. Possible sources of the tritium activity are tube leaks in the feedwater heaters or the steam evaporator. As is discussed in Section 11.1.3, all tritium produced in the reactor is eventually released to the environs. Tritium may be released from the heating system in vapor and gaseous form or in auxiliary boiler water blowdown. The boiler blowdown tank drains to a turbine building sump (see Section 9.3.3.2.3.1) which is directed to radwaste processing. The tritium contamination in the auxiliary boiler and associated steam systems is monitored and efforts are made to minimize the levels of activity. The tritium does not necessitate changes in system design or operation and will not cause significant radiological impacts.

The plant HS system has no safety function. Any rupture in HS or HCO piping does not impair safe reactor shutdown as discussed in Sections 3.6.1.15.3 and 3.6.1.18.3.6. All system piping except that in the reactor building is Seismic Category II. All system piping in the reactor building is analyzed and supported to Seismic Category I loading requirements.

9.4.16.4 Testing and Inspection Requirements

The performance of plant HS system was verified by tests prior to startup and is verified during system operation. All components in the system were tested and inspected at the manufacturers plant for conformance with specifications. After installation, the major components were checked and the system hydrostatically tested to ensure leaktightness.

9.4.16.5 Instrumentation Requirements

Adequate instrumentation is provided to monitor and control operation of the system.

9.4.17 REFERENCES

9.4-1 Calculation ME-02-17-02, Control Room Habitability during a LOCA with LOOP and Emergency A/C Coils Aligned to Emergency Chillers (CCH)

FSAR SECTION 9.4 INSERTS

Insert #1 (page 9.4-3) – new text shown in color:

In the event both radwaste chillers are inoperative (emergency condition), the control room temperature will be maintained to ensure 30 days continuous occupancy of the control room and ensure the equipment qualification temperature limit is not exceeded. The control room habitability design condition is 85F with a sustained occupancy of 10 persons. The equipment qualification temperature limit for equipment cooled by the control room HVAC system is 104F. The CCH system is the preferred cooling source to the control room HVAC system, however, SW is an acceptable alternate cooling source when evaluated as capable of maintaining the bounding 85F long term steady state control room temperature.

Insert #2 (page 9.4-5) – new text shown in color:

During emergency conditions, CCH water is supplied to the air handling unit emergency cooling coil for control room cooling. The CCH system is normally in standby alignment for emergency use and is manually initiated. The CCH system is capable of maintaining the control room below the control room habitability design condition of 85F which also bounds the 104F equipment qualification temperature limit for the control room. SW can be used as an acceptable alternate emergency cooling source when CCH is unavailable and when SW is evaluated as capable of maintaining the bounding 85F long term steady state control room temperature.

Insert #3 (page 9.4-8) – new text shown in color:

During an emergency, the HVAC trains are cooled by the CCH system, or can be cooled by the SW system when CCH is unavailable and SW is evaluated as capable of the required heat removal.

Insert #4 (page 9.4-8):

The CCH system is normally aligned for emergency standby service. The CCH system is manually started post-accident upon a loss of normal control room cooling. Analyses were performed to evaluate control room heat up without cooling, acceptable temperature levels/stay times for operators, and time available to bring cooling back online. The results demonstrated that temperatures would not exceed acceptable limits during manual operation. At no time will the control room exceed the 104 F equipment qualification temperature limit. Prior to start of the CCH system, the control room may temporarily exceed the steady state habitability temperature of 85 F but would remain below the National Institute for Occupational Safety and Health wet-bulb globe temperature for unlimited duration habitability (Reference 9.4-1).

Insert #5 (page 9.4-10) – new text in red:

In the emergency condition (loss of radwaste building chilled water during a design basis accident), the emergency cooling coils in the HVAC air handling units are supplied from the CCH system. The CCH system is manually initiated. The HVAC air handling unit recirculation fans auto-start on a F, A, Z signal. During a LOOP event, the recirculation fan that had been running will restart upon its associated diesel generator start. The control room operator will re-establish control room cooling from the control room, however, local field operation at the CCH chiller is required to load (adjust) the chiller to obtain the required heat removal. No valve manipulations are required to initiate control room cooling using the CCH system when it is maintained in the standby emergency cooling configuration.

Use of the SW system to provide cooling, in lieu of the CCH system, and when evaluated as capable of the required heat removal, requires local valve manipulations to isolate the CCH system supply and align SW to the HVAC air handling unit emergency cooling coil. To support the use of SW, valves SW-V-104C(D) and SW-V-106C(D) on the outlet of the air handling unit emergency cooling coils will be throttled to provide a minimum 125 GPM SW flow rate through the air handling unit coils.

Figures

New FSAR Figure 9.4.1-3:

Drawing M775, Flow Diagram Emergency Chilled Water Piping System Control Room