UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

February 6, 2020

Mr. Bradley J. Sawatzke
Chief Executive Officer
Energy Northwest
Mail Drop 1023
76 North Power Plant Loop
P.O. Box 968
Richland, WA 99352-0968

SUBJECT: COLUMBIA GENERATING STATION - ISSUANCE OF AMENDMENT NO. 255
RE: CONTROL ROOM AIR CONDITIONING SYSTEM (EPID L-2019-LLA-0034)

Dear Mr. Sawatzke:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 255 to Renewed Facility Operating License No. NPF-21 for the Columbia Generating Station (Columbia). The amendment consists of changes to the Columbia's Final Safety Analysis Report in response to your application dated February 25, 2019, as supplemented by letter dated July 30, 2019.

The amendment would allow use of the main control room chilled water system or the emergency service water system as acceptable cooling sources in support of the main control room air conditioning system.

A copy of the related Safety Evaluation is also enclosed. Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

L. John Klos, Project Manager
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-397

Enclosures:
1. Amendment No. 255 to NPF-21
2. Safety Evaluation

cc: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

ENERGY NORTHWEST

DOCKET NO. 50-397

COLUMBIA GENERATING STATION

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 255
License No. NPF-21

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Energy Northwest (the licensee), dated February 25, 2019, as supplemented by letter dated July 30, 2019, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, by Amendment No. 255, Renewed Facility Operating License No. NPF-21 is hereby amended to authorize revision to the Columbia's Final Safety Analysis Report, as set forth in the Energy Northwest application dated February 25, 2019, as supplemented by letter dated July 30, 2019. The licensee shall update the Final Safety Analysis Report to incorporate the changes as described in the licensee's application dated February 25, 2019, as supplemented by letters dated July 30, 2019, and the NRC staff's safety evaluation enclosed with this Amendment.

3. The license amendment is effective as of its date of issuance and shall be implemented within 90 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Jennifer L. Dixon-Herrity, Chief
Plant Licensing Branch IV
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Date of Issuance: February 6, 2020

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 255 TO

RENEWED FACILITY OPERATING LICENSE NO. NPF-21

ENERGY NORTHWEST

COLUMBIA GENERATING STATION

DOCKET NO. 50-397

1.0 INTRODUCTION

In the license amendment request (LAR) dated February 25, 2019 (Reference 1), as supplemented by letter dated July 30, 2019 (Reference 2), Energy Northwest (the licensee) requested changes to the Columbia Final Safety Analysis Report (FSAR).

The proposed changes would revise and allow use of the main control room (MCR) chilled water system or the emergency service water (SW) system as acceptable cooling sources in support of the MCR air conditioning (AC) system.

The supplemental letter dated July 30, 2019, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC or the Commission) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on June 4, 2019 (84 FR 25836).

2.0 REGULATORY EVALUATION

2.1 System Description - Control Room Air Conditioning System

In the LAR dated February 25, 2019, the licensee describes the MCR AC system and its temperature limits. The MCR AC system is located in Columbia's radwaste building. The MCR AC system is designed and qualified to operate under all design basis event (DBE) conditions and transients assuming a single failure of any active component.

The MCR temperature control during normal station operation is capable of removing sensible and latent heat loads to maintain the equipment qualification temperature limit of 104 degrees Fahrenheit (°F) and for personnel comfort. During normal operation, the MCR is maintained at an ambient temperature of approximately 75 °F dry bulb. The MCR AC system is designed to support 30 days continuous occupancy, and the MCR design condition for long-term, steady-state, operator habitability of 85 °F.

In the LAR, the licensee stated, in part:

> 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.

The section referred to in the FSAR (Reference 3) was Section 9.4.1.3, “Safety Evaluation.” In the supplement to the LAR dated July 30, 2019, the licensee described that the capability to maintain habitability design condition is functional between December 1 and February 1 and is challenged during other timeframes of the year.

In the LAR, the licensee described the normal control room AC system lineup, supported by Figure 1, to describe the current Division 1 alignment utilizing SW to the AHU, and Figure 2 to describe the current Division 2 alignment utilizing CCH supplying the AHU. The licensee stated, in part, that:

> 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.
>
> ….
>
> 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 [SW and] 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 Proposed Change

In the LAR, the licensee described the proposed change. Specifically, the licensee stated that it is proposing to utilize CCH as a cooling source to the control room AC system to meet the MCR 104 °F equipment qualification temperature limit. The current identified cooling source to meet the 104 °F limit is SW. There is no station design change or design modification required to support this change.

The licensee provided the following information in the LAR to further describe implementation of the proposed change:

- 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 85 °F long term, steady state temperature that supports 30 days continuous MCR occupancy and bounds the 104 °F 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.

- 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.

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

No changes are proposed to Technical Specification (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 licensee’s justification, as stated in part, is:

> 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. … Consequently, TS 3.7.4 LCO [limiting condition for operation] 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.

The availability of the cooling options are described in the markup of the TS Bases and the Columbia FSAR.

Licensee Controlled Specification (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 Columbia TS 3.7.4. Surveillance Requirement (SR) 3.7.4.1 requires verification that each control room AC subsystem has the capability to remove the assumed heat load at a frequency in accordance with the Surveillance Frequency Control Program.

In the LAR, the licensee also described that the proposed change would provide maximum flexibility with regard to allowable control room AC system cooling sources, while also addressing the SW capability limitations.

Additional MCR emergency cooling capacity is available by utilizing the CCH system as the preferred cooling source, to address future equipment additions. The licensee clarified that the LAR is not tied to implementation of any specific station heat load addition modification and that future MCR heat load additions would be evaluated by the station modification process and only allowed after evaluation with acceptable results in accordance with licensee change processes.

The proposed change relies on additional active components (the CCH system loop, including CCH chiller and pump) for the purpose of equipment cooling during and following a DBE.

2.3 Applicable Regulatory Requirements and Guidance

The NRC staff identified the following regulatory requirements and guidance as applicable to the proposed amendment.

- Title 10 of the *Code of Federal Regulations* (10 CFR) paragraph 50.36(c)(2) requires a TS LCO of a nuclear reactor must be established for each item meeting one or more of the four criteria states in the regulation. The MCR AC system is subject to Criterion 3, which states:

  > A structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier.

- The regulation under 10 CFR 50.48, "Fire Protection," requires each operating nuclear power plant to provide the means to limit fire damage to structures, systems, or components (SSCs) important to safety to ensure the ability to safely shut down the reactor.

- Appendix A to 10 CFR Part 50, "General Design Criteria for Nuclear Power Plants," General Design Criteria (GDC) 3, "Fire Protection," states, in part:

  > Structures, systems, and components important to safety be designed and located to minimize, consistent with other safety requirements, the probability and effect of fires and explosions.

- NUREG-0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [Light Water Reactor] Edition (SRP), Section 9.2.7, "Chilled Water System," dated September 2015 (Reference 4) and Section 9.4.1, Revision 3, "Control Room Area Ventilation System," dated March 2007 (Reference 5).

- Regulatory Guide (RG) 1.189, Revision 3, "Fire Protection for Nuclear Power Plants," dated February 2018 (Reference 6), which provides for a means to meet the fire protection provisions of 10 CFR 50.48.

- NUREG-1852, "Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire" (Reference 7).

3.0 TECHNICAL EVALUATION

The CCH system was installed in response to Columbia's License Condition 2.C.(21), Control Room Chillers Installation. As stated in the safety evaluation for Amendment No. 223, dated March 30, 2012 (Reference 8), the licensee installed the chillers before prior to May 31, 1984.

In the LAR, the licensee stated, in part, that Columbia purchased, installed and has maintained redundant, Seismic Category I CCH systems.

The NRC staff assessed if, with the proposed changes, the use of the facility, and the TSs collectively provide reasonable assurance that the applicant will comply with the regulations and that the health and safety of the public will not be endangered.

3.1 Non-impacted System Design Attributes

In Section 3.1, "System Design Attributes that are Not Impacted," of Enclosure 1 to the LAR, the licensee addresses amendment elements which did not impact system design attributes.

3.1.1 Quality and Seismic Classification and Failures of Non-Seismic Equipment, External Missiles

The maintenance and modification history of the CCH components indicates 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. In the LAR, the licensee stated, in part, that components are two ground fault reset buttons and two inlet temperature indicators. These 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 Class I portion of the radwaste building and thus protected from natural phenomena such as tornadoes and tornado generated missiles, hurricanes, tsunamis, and seiches. The licensee stated in the LAR that the CCH system is classified as Seismic Category 1 and, therefore, has the proper seismic restraints and qualifications to ensure operation following a design basis earthquake. Therefore, the CCH system is designed to be protected against natural phenomenon, including failures of non-seismic equipment."

The NRC staff's review confirmed there is no change or impact to the system's safety-related components nor any impact to the system's protection again natural phenomena within the current licensing basis.

3.1.2 Single Active Failure Cannot Result in a Loss of System Functional Performance Capability

In the LAR, the licensee stated, in part, that

> 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 [Category] 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).

In the supplement to the LAR dated July 30, 2019, the licensee stated, in part, additional information regarding the rupture disk and vent header, as follows:

> Each chiller unit is equipped with a frangible carbon rupture disk assembly…. for the purpose of quickly relieving excess pressure of the refrigerant charge to the

> atmosphere as a safety precaution in case of emergency, such as a fire. Rupture in the event of a fire could occur during standby or chiller unit operation. It is also plausible that the rupture disk could rupture due to condenser pressure fluctuations during chiller unit operation. The two-inch diameter rupture disk is set to relieve at 30 psig [pounds per square inch gauge]. It is located on the compressor suction connection.
>
> ….The vent header availability is not required for the chiller to startup nor is it required 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 either CCH chiller unit to fulfill its safety-related function.
>
> ….The rupture disk is rated to rupture at 30 psig and the burst rating of the disk is approximately 50% higher in the reverse direction, providing protection from a burst disk in the opposite chiller unit.

Each Seismic Category 1 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 (LOOP), will not impair the ability of the control room AC system to perform its cooling function.

The NRC staff's review confirmed there is no change or impact to the system's design to support MCR cooling, therefore, there also is no impact on the single active failure design within the current licensing basis.

3.1.3 Protection Against Radiation and Hazardous Chemical Releases

MCR heating, ventilation, and air conditioning (HVAC) radiological air filtering functions and the isolation functions in the event of a hazardous chemical release are independent of the CCH and SW MCR cooling support functions.

Therefore, the NRC staff's review confirms that the proposed change does not affect protection against radiation releases and the current licensing basis remains the same.

3.1.4 Function during a LOOP (Station Blackout)

In the LAR, the licensee stated that during the 4-hour coping period, the control room AC system is not relied upon for MCR cooling. Further, there is no CCH or SW cooling support function required during a LOOP.

The NRC staff's review indicates that the proposed change has no impact nor change to the current licensing basis related to the system's function during a LOOP.

3.1.5 Flooding

External flooding evaluations are not necessary as the CCH system is located above the control room on the 525-foot elevation of the radwaste building, above the maximum postulated external flood elevation. A postulated SW line break would introduce the greatest volume of water into the room containing the CCH chillers. The maximum flood height does not affect safety-related CCH equipment.

The NRC staff's review confirms that flooding is not impacted or changed based on the proposed change.

3.1.6 Equipment Qualification

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.

The NRC staff's review, based on the above, confirms that the system's equipment qualification is not changed or impacted by the LAR's proposed change.

3.1.7 Instrumentation and Controls (I&C) and Electrical Controls

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. No additional I&C or electrical controls are required for this proposed change.

The NRC staff's review confirmed that the I&C and electrical control systems are not impacted and there is no alteration to the current licensing basis.

3.2 Changes to System Design Attributes to Establish Design Basis

In Section 3.2, "Changes to System Design Attributes to Establish Safety Basis," of Enclosure 1 to the LAR, the licensee addresses the impact on system design attributes as a result of the proposed change. The licensee also provides evaluation summaries for each topical area discussed within the review areas and acceptance criteria in SRP Sections 9.2.7 and 9.4.1 (References 4 and 5, respectively).

3.2.1 Maintenance of MCR Personnel and Equipment Temperature All Planned Operations

In the LAR, the licensee stated, in part, that:

> 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 (≥ [greater than or equal to] 24 hours) to verify MCR temperature remains less than the long term, steady state 85 °F habitability temperature which also bounds the 104 °F equipment qualification temperature.

The proposed change will align the Division 1 CCH system as the preferred cooling source in support of the control room AC system. The licensee also stated, in the LAR, that five valves in Division 1 (four designated as SW valves and one designated as CCH) will be positioned as open or closed, as needed, that supports the CCH as the standby emergency cooling source. This will be done by directing SW to the CCH chiller condensers, isolating SW from the control room AC AHUs, and providing an available closed loop CCH system is supplied to the AHU emergency cooling coils.

Currently, Division 2 is already aligned with the CCH system as the preferred cooling source for the control room AC system. After implementation of the proposed change, both Divisions 1 and 2 CCH systems will be aligned as the preferred cooling sources during normal and accident conditions.

In addition, one valve in each of the divisions (the CCH AHU emergency cooling coil bypass) will be locked in a throttled position to provide the minimum 100 gallons per minute (gpm or 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 by the operators when the control room temperature rises above 78 ºF and the control room AC recirculation fans auto-start on various accident signals.

The licensee further stated in the LAR that:

> 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 [applicable valves]…. Additionally, valves SW-V-104C(D) and SW-V-106C(D) on the outlet of the AHU emergency cooling coils … 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 [LOCA] 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 ≤ [less than or equal to] 96 °F transient temperature and nine hours are available to initiate cooling before the 104 °F 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.

In Enclosure 1 of the LAR, Section 3.2.5, “Inspection and Testing,” the licensee stated, in part, that:

> CCH system operation is periodically tested to verify proper function and heat removal capability to maintain the MCR less than or equal to 85 °F. The surveillance satisfies IST [inservice testing] 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 NRC staff’s review, based on the above information, determined that the proposed change adequately maintains MCR personnel and equipment temperature limits for all planned operations.

3.2.2 Bounding Design Basis Heat Loads

In the supplement to the LAR, the licensee provided additional information regarding the calculations that support the requested change. The following is an overview summary of the calculations followed by specific calculations to support the LAR:

Calculation E/I-02-92-14 determined that the MCR heat loads for various station conditions, including a LOCA with or without a LOOP, normal operations, and station blackout. The current

heat load for the MCR (without MCR lighting) is determined to be 29.83 kilowatts (kW), which occurs during the LOCA with or without a LOOP.

Calculation ME-02-92-43 determines that the heat load required to provide one division (bounding) of emergency lighting for the MCR is 6.7 kW.

3.2.2.1 MCR Cooling Using SW to Control Room AC AHU – Ability to Meet 104 °F Equipment Qualification Temperature Limit

Calculation ME-02-92-43 evaluated MCR cooling when using SW at a temperature of 89.6 °F (UHS value) and a flow of 110 gpm supplied directly to the AHU emergency cooling coil. The results indicate that the SW system is capable of removing 34 kW electrical heat load, plus one division of emergency lighting, 6.7 kW, while maintaining the MCR at ≤ 104 °F, the MCR equipment qualification temperature limit. In this condition, the heat removal capability represents an available heat load margin of approximately 4 kW when using SW supplied directly to an AHU for meeting the 104 °F equipment qualification temperature limit.

The NRC staff's review determined that the proposed change adequately maintains the equipment qualification temperature limit and provides the necessary heat load removal capability.

3.2.2.2 MCR Cooling Using SW to Control Room AC AHU – Ability to Meet 85 °F to Support Continuous MCR Occupancy

Calculation ME-02-14-01 evaluated the SW historical performance to determine the SW system capability to support continuous MCR occupancy. The calculation concludes that SW, when supplied directly to the AHU emergency cooling coil, can maintain the MCR temperature ≤ 85 °F when the outdoor ambient temperature is ≤ 75 °F and the associated SW temperature is ≤ 72.1 °F, assuming an MCR heat load of 34 kW and emergency lighting heat load of 6.7 kW. In addition, the calculation evaluated site-specific historical conditions for the years 1984 through 2014 and concluded that SW can ensure the 85 °F MCR design condition temperature for 30 days continuous MCR occupancy for a LOCA occurring between December 1 and February 1 of each year analyzed (30-year history). During other times of the year, SW did not always meet the 85 °F capability for 30 days continuous MCR occupancy.

The NRC staff's review determined that the proposed change adequately supports and meets the MCR continuous occupancy requirements.

3.2.2.3 MCR Cooling Using CCH Chiller Unit

Calculation ME-02-92-43 also evaluated MCR cooling using a CCH system chiller unit with SW supplying the chiller condenser. In the supplement to the LAR, the licensee stated that:

> The calculation determined the maximum heat load that could be supported while maintaining the MCR less than or equal to the personal comfort temperature of 85 °F, the MCR design condition temperature that supports 30 days continuous MCR occupancy. The evaluation determined that a single CCH chiller unit can

> maintain 115 kW electrical heat load, plus one division of MCR lighting, 6.7 kW, when supplying 100 GPM chilled water at a temperature of 42 °F to the AHU.

Calculation ME-02-92-43 concluded that a single chiller unit can remove 115 kW of heat load, which provides a significant margin over the calculated post-accident MCR heat load, 29.83 kW, identified in Calculation E/I-02-92-014.

The licensee stated that all the above calculations (E/I-02-92-14, ME-02-92-43, ME-02-14-01) were performed under steady-state conditions using bounding heat load values. In addition, there are no notable heat removal capacity differences identified between Divisions 1 and 2. The efficiency of the AHU emergency cooling coil differs between the two divisions, however, the MCR heat removal analyses credit a heat removal efficiency that bounds both divisions.

The NRC staff's review of the above determined that the proposed change adequately maintains MCR cooling while utilizing the CCH chiller unit to support the MCR personnel limit while considering bounding heat load cases.

3.2.2.4 MCR Heatup Rates Prior to Restoring Cooling and Impact on Habitability

Calculation NAI-1948-002 documents the MCR temperature response following a loss of control room cooling coincident with a LOCA with a LOOP. In the supplement to the LAR, the licensee stated, in part that:

> A detailed GOTHIC model of the Columbia Generating Station (CGS) control room was built which represents the physical room geometry with separation between the control room and space above the acoustic ceiling (HVAC return plenum). Blockages and volume variations were placed at locations to represent how the presence of control boards and instrument racks may disrupt air flow in the room.
> ….
>
> The Control Room AHUs (WMA-AH-51A, WMA-AH-51B) were modeled in detail with fan and heat exchanger components representing both the non-safety related normal cooling coil supplied by the Radwaste Building Chilled Water System (WCH), and the safety-related emergency cooling coil supplied by the CCH or SW systems.

The licensee detailed the conservative assumptions used in the analysis, including when cooling is lost at the beginning of the transient, the operating AHU fan continues to run, adding mechanical work in the form of heat to the air. The constant heat loads that contribute to the MCR transient heatup event were also considered including electrical equipment, emergency lighting, personnel, and AHU fan work.

In its supplement to the LAR, the licensee stated that:

> No load shedding is credited. Additionally, no operator actions such as opening doors or removing ceiling tiles are credited to mitigate the temperature rise. The first operator action that is credited is at two hours, when a CCH chiller is assumed to have been manually started, loaded, and supplying emergency chilled water flow (44 °F at 100 GPM) to the AHU emergency cooling coil.

> Prior to initiation of the transient event, the MCR volume, the MCR concrete walls, floor, and ceiling, as well as the air temperature of rooms adjacent to the MCR are all initialized at 78 °F, except for the Turbine Building which is initialized at 90 °F. Following event initiation, the rooms surrounding the MCR are instantly stepped up to a design basis temperature of 104 °F.
> ….
>
> During the transient event, the MCR emergency filtration fan, WMA-FN-54A(B), is operating and drawing in 1,000 CFM [cubic feet per minute] of outdoor makeup air at 105 °[F] dry bulb and 71 °F wet bulb. The MCR AHU fan moves 22,000 CFM of airflow through the Control Room AC System with no cooling prior to start of a CCH chiller unit. The total AHU flow is made up of 21,000 CFM of recirculation air from the control room and 1,000 CFM of outdoor make up air.
>
> The results of the transient control room heat up show that at the end of the two hour heat up period, a maximum temperature of 95.8 °F would be observed at the local MCR thermostat. As soon as the CCH system chilled water flow is circulating, the control room temperature falls from the peak of 96 °F and is easily maintained long-term below the MCR design condition of 85 °F that supports 30 days continuous MCR occupancy.

In its supplement to the LAR, the licensee also stated that:

> Calculation ME-02-17-02 evaluated MCR habitability to support an unlimited stay time in the MCR following a loss of normal MCR cooling due to a bounding event (LOCA with a LOOP). The calculation evaluated the MCR maximum transient temperature of 96 °F, determined by calculation NAI-1948-002, associated with manual start of a CCH chiller unit assuming a 2-hour delay.

In its supplement to the LAR, the licensee further stated that:

> The evaluation compared a series of industry standards for assessing and managing heat stress to identify the most limiting standard. Based on the review, Criteria for a Recommended Standard: Occupational Exposure to Heat and Hot Environments (National Institute for Occupational Safety and Health [NIOSH], [Department of Health and Human Services (NIOSH) Publication Number 2016-106, dated] February 2016), was selected. The maximum stay time allowed in the MCR during a post-accident event was assessed using the methodology in the standard by evaluating the wet-bulb globe temperature (WBGT), type of clothing, and type of work performed (metabolic rate). The evaluation determined the maximum WBGT in the MCR for the transient condition to be 78.4 °F. The WBGT (78.4 °F) was determined to be less than the calculated recommended alert limit (79.7 °F), therefore, it was determined that there are no stay times associated with the work environment. Consequently, the control room conditions are acceptable for habitability during the bounding event (LOCA with a LOOP) and with the CCH emergency chillers aligned for MCR cooling.

In addition, an analysis was completed to support direct SW supply to the emergency cooling coils during certain conditions of SW temperature. The licensee will perform an additional analysis/evaluation to support operability at other SW temperature conditions, prior to entering

Condition A with direct SW supply to the cooling coils. The licensee will also conduct monitoring of SW temperature and take actions to ensure that SW conditions remain acceptable to remain in Condition A or enter an appropriate TS Condition if SW temperature was found to be not acceptable.

The NRC staff's review determined that the proposed change adequately accounts for MCR heatup rates and impacts to MCR habitability while appropriately applying conservative assumptions for heat loads considered in the proposed change.

3.2.3 Review of High and Moderate Energy Line Breaks

In the LAR, the licensee stated that:

> 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.

The NRC staff's review of the above determined that the proposed change does not include any HELB factors for review consideration.

3.3 NRC Staff Technical System Conclusion

Based on the NRC staff's review in Section 3.2 above, and its related findings, the NRC staff concludes that there is reasonable assurance that the requirements of 10 CFR 50.36(c)(2) will be met. Therefore, the NRC staff finds the proposed change acceptable.

3.4 Post-fire Safe Shutdown Capability, License Condition 2.C.(14), and Fire Protection Program

Enclosure 1 of the LAR, Section 2.4, "Reason for the Proposed Change," the licensee stated, in part, that the proposed change "requires the emergency cooling function, when supplied by the CCH, to rely on additional equipment (the CCH system loop, including CCH chiller and pump) for the purpose of equipment cooling" and "results in crediting additional active components that are required to perform the designed function of maintaining the MCR equipment qualification temperature."

It was unclear whether the additional systems and components described above were credited to achieve and maintain safe shutdown following accident events, including fire events, and whether an evaluation was performed to ensure that one train of safe shutdown equipment would remain free from damage.

In the supplement to the LAR (Reference 2), the licensee stated that the Columbia's post-fire safe shutdown (PFSS) equipment and strategy is unchanged for a fire in Division 1 fire areas. For a fire in Division 2 fire areas (except for Fire Area RC-13), the Division 1 CCH chiller unit (CCH-CR-1A) is now credited instead of the previously credited SW directly to the Division 1 AHU. Consequently, the PFSS strategy for Division 2 fire areas will be revised, and cables associated with equipment supporting MCR cooling using the Division 1 CCH chiller unit, their routing, and fire-induced failure modes will be added to the PFSS analysis as part of the LAR implementation.

The NRC staff finds that the licensee's actions above confirmed that the post-fire availability of newly credited safe shutdown equipment, including its associated cables and related components into the PFSS analysis will maintain long-term compliance with Columbia's Fire Protection Program. Based on these findings, the NRC staff concludes there is reasonable assurance that one train of safe shutdown equipment will remain free from damage in an event of a fire in accordance with RG 1.189, Revision 3 (Reference 6). Therefore, the staff finds the proposed change acceptable.

Enclosure 1 of the LAR, Section 3.2.2, "Ability to Isolate and Function Under Fires, Failures and Malfunctions," the licensee stated, in part, that "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."

This statement implies that redundant CCH trains can be damaged by a single fire. The NRC staff requested the licensee to describe the credited alternative equipment lineup when both CCH trains are affected by a single fire, and to confirm that the alternative equipment has been evaluated to be free from damage and can be manually operated for this particular fire scenario. In the supplement to the LAR, the licensee stated that for a fire occurring in Fire Area RC-13, both Division 1 and Division 2 CCH chiller units are exposed, not protected, and assumed to be nonfunctional. Therefore, the PFSS strategy for Fire Area RC-13 includes operator manual actions (OMAs) to align SW directly to the Division 1 AHU emergency cooling coil to support safe shutdown. The licensee also stated that the manual valves that will be used to realign Division 1 SW directly to Division 1 AHU emergency cooling coil are located outside of Fire Area RC-13 and are accessible. These valves will be added to the safe shutdown equipment list (SSEL) as part of the LAR implementation.

3.4.1 NRC Staff Technical Post-fire Shutdown Conclusion

Additionally, manually operated equipment can be successfully utilized to support post-fire safe shutdown. Based on these additional findings, the NRC staff concludes there is reasonable assurance that the licensee is in accordance with RG 1.189 because the newly credited manual valves are located outside of the postulated fire areas and can be feasibly and reliably operated to support post-fire safe shutdown. The licensee also added these valves to the SSEL to maintain long-term compliance with Columbia's Fire Protection Program. Therefore, the staff finds the proposed change acceptable.

The NRC staff also noted that although the proposed LAR does not impact any active or passive fire protection systems, the post-fire safe shutdown equipment and strategy, which is part of the Fire Protection Program is impacted. In the supplement to the LAR, the licensee clarified that compliance with GDC 3 is achieved by minimizing the effects of fires and explosions on redundant components, use of noncombustible and fire-resistant materials, fire barriers and administrative controls that minimize the probability and consequences of fires and explosions, and fire areas are also delineated such that fire damage is localized to a single fire area. The LAR does not propose changes to any active or passive fire protection at Columbia. Furthermore, as discussed earlier, the licensee confirmed that for any postulated fire, at least one safe shutdown success path will be free from fire damage, and any required OMAs can be successfully performed to support post-fire safe shutdown. The NRC staff finds that the licensee will continue to meet GDC 3 because the proposed change does not affect any existing active or passive fire protection features, and one success path remains available to achieve

and maintain post-fire safe shutdown capability, therefore, the proposed change is found acceptable.

The NRC staff determines that the use of the CCH system or SW system as cooling sources in support of the control room AC system is acceptable and has no adverse impact on 10 CFR 50.48 compliance at Columbia because the proposed changes has no adverse impact on any active or passive fire protection features and the newly credited safe shutdown equipment and post-fire OMAs were confirmed to ensure the post-fire safe shutdown capability at Columbia.

Based on the above and as stated in the LAR, OMAs performed during a fire response are evaluated using the criteria of NUREG-1852 (Reference 7), the NRC staff concludes that the licensee ensured that one safe shutdown success path remains free of fire damage. Therefore, the NRC staff finds the proposed change acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Washington State official was notified of the proposed issuance of the amendment on December 10, 2019. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration published in the *Federal Register* on June 4, 2019 (84 FR 25836), and there has been no public comment on such finding. Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6.0 CONCLUSION

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

7.0 REFERENCES

1. Javorik, A. L., Energy Northwest, letter to U.S. Nuclear Regulatory Commission, "Columbia Generating Station, Docket No. 50-397, License Amendment Request for Licensing Basis Change to Control Room Air Conditioning System," dated February 25, 2019 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML19057A549).

2. Javorik, A. L., Energy Northwest, letter to U.S. Nuclear Regulatory Commission, "Columbia Generating Station, Docket No. 50-397, Related to License Amendment Request for Licensing Basis Change to Control Room Air Conditioning System," dated July 30, 2019 (ADAMS Accession No. ML19212A263).

3. Energy Northwest, Amendment 64 to Final Safety Analysis Report, Chapter 9, Auxiliary Systems for Columbia Generating Station (ADAMS Accession No. ML17355A667).

4. U.S. Nuclear Regulatory Commission, "Chilled Water System," NUREG-0800, Section 9.2.7, Revision 0, dated September 2015 (ADAMS Accession No. ML15103A559).

5. U.S. Nuclear Regulatory Commission, "Control Room Area Ventilation System," NUREG-0800, Section 9.4.1, Revision 3, dated March 2007 (ADAMS Accession No. ML070550045).

6. U.S. Nuclear Regulatory Commission, "Fire Protection for Nuclear Power Plants," Regulatory Guide 1.189, Revision 3, dated February 2018 (ADAMS Accession No. ML17340A875).

7. U.S. Nuclear Regulatory Commission, "Demonstrating the Feasibility and Reliability of Operator Manual Actions in Response to Fire," NUREG-1852, Final Report, dated October 2007 (ADAMS Accession No. ML073020676).

8. Thadani, M. C., U.S. Nuclear Regulatory Commission, letter to Mr. Mark E. Reddemann, Energy Northwest, "Columbia Generating Station – Issuance of Amendment Re: Deletion or Modifications of License Conditions that have been Completed or are no Longer in Effect (TAC No. ME5903)," dated March 30, 2012 (ADAMS Accession No. ML120800078).

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Date: February 6, 2020

SUBJECT: COLUMBIA GENERATING STATION - ISSUANCE OF AMENDMENT NO. 255 RE: CONTROL ROOM AIR CONDITIONING SYSTEM (EPID L-2019-LLA-0034) DATED FEBRUARY 6, 2020

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