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Nuclear LLC

10 CFR 50.90

LR-N11-0250

AUG 29 2011

U.S. Nuclear Regulatory Commission
ATTN: Document Control Desk
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Hope Creek Generating Station
Renewed Facility Operating License No. NPF-57
NRC Docket No. 50-354

Subject: **Response to Request for Additional Information – License Amendment Request: Add Action for Two Inoperable Control Room Air Conditioning Subsystems**

References: (1) LR-N11-0068, "Application for Technical Specification Change TSTF-477, Revision 3, Add Action for Two Inoperable Control Room AC Subsystems to the Technical Specifications Using Consolidated Line Item Improvement Process," dated 2/28/2011

In Reference 1 PSEG Nuclear LLC (PSEG) requested an amendment (H11-01) to Renewed Facility Operating License No. NPF-57 for Hope Creek Generating Station (HCGS). The proposed amendment would modify the technical specifications (TS) by adding an action statement for two inoperable control room AC subsystems to the plant specific TS.

The NRC provided PSEG a Request for Additional Information (RAI) related to the Reference 1 request, dated July 5, 2011. Attachment 1 to this submittal provides the responses to the RAI. PSEG has determined that the information provided in this response does not alter the conclusions reached in the 10 CFR 50.92 no significant hazards determination previously submitted.

There are no commitments contained in this letter.

If you have any questions or require additional information, please do not hesitate to contact Ms. Emily Maguire at (856)339-1023.

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

Executed on AUG 29 2011
(date)

Sincerely,

John F. Perry
Site Vice President – Hope Creek

Enclosures:
1. Response to RAI

cc: Mr. W. Dean, Administrator, Region I, NRC
Mr. R. Ennis, Project Manager, NRC
NRC Senior Resident Inspector, Hope Creek
Mr. P. Mulligan, Manager IV, NJBNE
Mr. L. Marabella, Corporate Commitment Tracking Coordinator
Mr. K. Yearwood, Hope Creek Commitment Tracking Coordinator

Containment and Ventilation Branch Request for Additional Information (RAI) Questions

1. In accordance with the amendment request, the licensee is proposing to establish a separate Limiting Condition for Operation (LCO) for the Control Room AC portion of the Control Room Heating, Ventilation, and Air Conditioning (HVAC) System. Are the CRS and the HVAC the same system?

Question 1 Response:
No. "HVAC" is a more general term and applies to the subsystems and equipment described in HCGS UFSAR Subsection 9.4.1, which includes the Control Room Supply (CRS) system described in UFSAR Subsection 9.4.1.1.1. The CRS components include the inlet plenum, the dampers, H1GK -1A(B)-VH403 CRS fan and filter units including CRS sub components, and the air ducts that transfer air. Air is drawn from the outside or from the recirc / recycle loop. Depending on the operating mode, the air is directed to the A(B)-VH403 train and CREF (if in service). When in service, the CREF trains exhaust to the control room via the A(B)-VH403 trains. Air is exhausted to the atmosphere or recycled back to A(B)-VH403 trains, and the CREF (if in service). Reference Table 1 for air flow rates during different operating modes.

The Control Room Air Conditioning portion of the HVAC system (Control Room AC) supplies chilled water to the temperature control components in all three system operating modes, as described further below. Chilled water is used to control the CRS air temperature. The Control Room AC is comprised of chilled water pumps, water chillers, A(B)-VH403 train's fans and cooling coils, temperature control valves, and head tanks, and the piping that circulates chilled water to the required components. Each A(B)-VH403 unit's discharge air temperature is maintained via a temperature control valve which controls chilled water flow to the cooling coil.

Control Room AC and CRS systems have shared components that are used to perform the system function. These components include the coiling coils and the A(B)-VH403 fans. The A(B)-VH403 fans are required to maintain air flow across the coiling coil to maintain temperature and supply the control room.

H1GK -1A(B)-VH403 CRS unit subcomponents
The A(B)-VH403 is comprised of two trains. The A(B)-VH403 trains receive air from the outside, recirc / recycle loop, and CREF (when in service). Each unit is comprised of a low efficiency filter, high efficiency filter, a fan, a cooling coil (cooled by the chilled water system), a heating coil, and a humidifier. Downstream of the A(B)-VH403 units, the air enters the control room. Air is then exhausted to the atmosphere via the A(B)-V-402 fans in the Normal and Isolated with Outside Air modes, or recycled back to the CREF (if in service) and the A(B)-VH403 trains.

H1GK -1A(B)-VH400 CREF unit subcomponents
The A(B)-VH400 is comprised of two units. Each unit draws air from the recirc / recycle loop, and the outside supply. The outside air supply is closed during the Isolated with Recirc Air mode of operation. Each unit is comprised of a fan, a heating coil, a low efficiency filter, a HEPA filter, a charcoal bed, and a second HEPA filter. Air leaving the A(B)-VH400 unit enters the A(B)-VH403 unit.

Control Room AC Chilled water trains
The control room chilled water system consists of two trains. Each chiller train supplies cooling water to a respective A(B)-VH403 cooling coil and returns the cooling water to the chiller. The chilled water trains each consist of a pump (H1GJ -A(B)-P-400), a chiller (H1GJ -A(B)-K-400),

and a temperature control valve (H1GJ -1GJTV-9637A(B)), which will vary the flow to the A(B)-VH403 cooling coil to maintain air temperature. The chilled water returns from the cooling coil to the A(B)-P-400 pump and is pumped to the chiller unit, where it is chilled and returned to the A(B)-VH403 cooling coil. The head tank (H1GJ -1A(B)-T-410) maintains constant pressure on the chilled water loop.

The CRS operates in one of three modes; Normal, Isolated with Outside Air, and Isolated with Recirc Air. In all three modes, the chilled water, A(B)-VH403 fan and filters are in service controlling the air temperature and providing filtration.

In the Normal mode, air is supplied from outside and is directed to the A(B)-VH403 fan and filters and then enters the control room. Most of the air is recycled back to the A(B)-VH403 fans and filters and the rest is exhausted back to the outside via the A(B)-V-402 fans. In this mode the CREF and all of the CREF subcomponents are not in service and are isolated from the air flow. The flow rates for the Normal mode are indicated in Table 1.

In the Isolated with Outside Air mode, air is supplied from the outside and is directed to the CREF fan for filtration. The air is then directed to the A(B)-VH403 units where it is filtered and supplied to the control room and recycled back to the CREF and A(B)-VH403 units. Downstream of CREF filtration, the air combines with the recycled air that bypassed the CREF train and flows to the A(B)-VH403 units, where it is filtered and supplied to the control room. Reference Table 1 for Isolated with Outside Air flow rates.

In the Isolated with Recirc Air mode, no air is drawn from or exhausted back to the outside. The air exhausts from the control room and is recycled to the A(B)-VH403 and CREF trains. Downstream of CREF filtration, the air is returned to the A(B)-VH403 train and is combined with the rest of the recycled air, filtered and returned to the control room. Reference Table 1 for air flow rates when in Isolated with Recirc Air mode.

Reference UFSAR Figures 9.4-1 and 9.2-15 for the components described above. Please reference Table 1 for nominal flow rates for the three operating modes.

Table 1

	Normal [with outside air, without CREF] (CFM)	Isolated with Outside Air [with CREF In-service] (CFM)	Isolated with Recirc Air [with CREF In-service] (CFM)
From Atmosphere	3000	1000	0
Recycled	15500	17500	18500
Recycled to A(B)-VH403	15500	14500	14500
Recycled to CREF	0	3000	4000
Exhausted to Atmosphere	2500	0	0
Supply to CREF Train (from outside)	0	1000	0
Combined Supply to CREF Train	0	4000	4000

2. If the CRS and the HVAC are different systems, please provide a discussion describing the difference between the two systems and the function of each system.

Question 2 Response:
See reply to Question #1. The Control Room AC system function, as proposed by this amendment request, is to provide temperature control. The CRS provides habitability controls for the Control Room Envelope, including support of CREF operations. This function satisfies the requirements described in 10CFR50 Appendix A General Design Criteria 19 (Control Room), Regulatory Guide 1.197, and NEI 99-03 Revision 0.

3. If the HVAC system is inoperable will the CREF also be inoperable?

Question 3 Response:
HVAC system inoperability may result in CREF inoperability. In the event of a A(B)-P-400 chilled water pump trip, the A(B)-K-400 chiller will trip, which will trip the A(B)-VH403 and the CREF system. Due to these interlocks, if the Control Room AC subcomponents trip, then CREF will also be inoperable. However, the CREF function is to maintain habitability within the Control Room Envelope via filtration. The CREF trains are independent of the Control Room AC system and would be functional for conditions that do not result in a trip of the Control Room AC system, for example reduced chiller heat removal capability.

The requested amendment, in combination with a potential plant modification to remove the interlocks, would enable entry into the limiting conditions for operation (LCO) for Control Room AC, and potentially avoid entry into the CREF LCO due solely to Control Room AC inoperability, e.g., due to a chilled water pump trip.

4. If the CRS is inoperable will the CREF also be inoperable?

Question 4 Response:
Yes, CREF would be inoperable. Refer to Question #5 for additional information regarding the functional relationship between CRS and CREF.

5. Can the CREF perform its design functions with the associated CRS unit inoperable?

Question 5 Response:
No. The CREF is designed to maintain control room envelope positive pressure and filter 4000 CFM of air through HEPA filtration and charcoal adsorption. The CRS unit A(B)-VH403 fans must be available for CREF to perform this function. The outlet of the CREF unit is supplied to the inlet of the CRS unit, which then supplies the control room envelope. Chilled water to the CRS unit cooling coils is not required to maintain this function.

6. With the proposed change, will the CREF continue to operate in series with the CRS?

Question 6 Response:
Yes. The CREF unit will continue to operate in series with the A(B)-VH403 train. Implementation of the requested amendment requires no changes to the flow path.

7. With the proposed change, will the CREF operate in series with the HVAC?

Question 7 Response:
Per Subsection 9.4.1 of the UFSAR, the CREF system is one of the systems that comprises the "Control Room and Control Area HVAC Systems". Implementation of the requested amendment requires no changes to the HVAC flow paths.

8. What will be the impact of increased humidity levels on control room operators and control room instrumentation with both trains of CRS and/or HVAC out of service for 72 hours?

Question 8 Response:
With both trains of CRS out of service, the plant would enter TS 3.0.3 for an inoperable Control Room Emergency Filtration (CREF) system, since CREF is required to be operable under TS 3.7.2 and requires a CRS unit to be operable. Assuming that the CRS supply and exhaust fans are functional (but without chilled water to the cooling coils), the impact on humidity levels is evaluated in response to this question.

Per UFSAR Section 9.4.1.1.1, the CRS system is designed to maintain the spaces served at a nominal relative humidity between 20% and 60% for personnel comfort and equipment performance. Since humidity is more of a long-term effect on people and equipment than measured temperature, humidity outside of the 20% to 60% range is not considered to be an immediate or credible threat to operation within the control room over a 72 hour period. Also, low humidity is not a concern because the potential for moisture condensation is minimal.

The meteorological design conditions for all safety-related HVAC systems at the station per UFSAR Table 9.4-22 is a high of 94°F dry bulb/78°F wet bulb for summer, and a low of 5°F dry bulb for winter. With respect to humidity, a dew-point temperature of 72°F is assumed corresponding to summer design dry and wet bulb temperatures. The ASHRAE Fundamentals psychrometric chart shows that the 94°F dry-bulb and 78°F wet-bulb temperatures correspond to a 50% relative humidity. Consequently for the design basis hot summer day, with no air conditioning chillers available[1], the relative humidity inside the control room can be expected to equalize with outside air humidity and therefore would settle at approximately 50% or decrease because temperature would increase. This assumes a 1% summertime day, which implies that temperatures above these levels occur only 1% of the time from June to September. During other times from June to September, lower ambient air temperatures can be expected which will generally contain less moisture by mass.

For example, if outside air is taken into the control room at 80°F and 50% relative humidity and this air is heated to 90°F due to heat from control room electrical equipment, the final relative humidity in the room would be 38% as shown on the ASHRAE Fundamentals psychrometric chart by holding the moisture content constant at 0.011 pounds of moisture per pound of dry air. Similarly, for the design basis dew-point temperature of 72°F or 0.017 pounds moisture per pound dry air at 90°F would result in approximately 55% relative humidity.

[1] Note: Both trains of CRS are available under this scenario, with only the air conditioning (AC) subsystems of CRS unavailable. Hence, while the ability to remove humidity from the air would be lost, ventilation and air movement to and from outdoors would remain in operation. As noted above, if CRS is completely unavailable, plant operators would enter TS 3.0.3 for inoperable CREF.

Thus, given Hope Creek meteorological design conditions, it would be highly unlikely that high temperature conditions in the control room would result in relative humidity in excess of the 60% design maximum. Given the outside air intake flow rate and size of the control room, latent heat due to control room personnel would be considered insignificant with respect to final humidity levels. In addition, given that all instrumentation and equipment would be either at ambient temperature (standby) or higher than ambient (energized); there would not be any condensing mechanisms; any humidity in the air would remain in the air and not adversely affect equipment.

From an operator standpoint, and based on the heat-index chart from the National Weather Service, a 90°F temperature with 50% relative humidity feels like 95°F. While 95°F would not be comfortable, it is not extremely unusual when considering the types of environmental conditions to which operators at nuclear plants are frequently exposed. Operations under these ambient conditions would be controlled by plant procedures.

The design specification for control room instruments (10855-J-200) anticipates relative humidity to be between 20% (winter) and 50% (summer) under both normal and emergency conditions. These values would be expected to be maintained as described above. In addition, the specification identifies a maximum of 90% humidity (non-condensing) and a maximum temperature of 120°F under non-service conditions. For the instruments in-service under a postulated air-conditioning failure, the relative humidity would remain non-condensing, because temperature would be increasing; the instruments would be unaffected by relative humidity.

Consequently, neither the operators nor the MCR equipment would be adversely affected by 72 hours at temperatures of 90°F and anticipated relative humidity (approximately 50% to 60%).

9. If proposed TS 3.7.2.2 Action a.2.b is not met, has an evaluation been conducted demonstrating the control room temperature will not exceed the limits of any required instrumentation before the unit is in cold shutdown?

Question 9 Response:

An evaluation of control room temperature rise during plant shutdown following a failure to meet the proposed Action a.2.b has not been conducted. If 90°F can not be maintained with temporary mitigation measures in effect (such as portable fans, open doors, or additional outside air, etc.), control room temperatures may increase slightly above 90°F, and there would be ample margin to any equipment limits.

An evaluation to support the original LAR submittal shows that substantial margins exist between the specified 90°F and specified equipment limits. The proposed control room temperature allowable limit of 90°F is bounded by the HCGS design specification 10855-J-200 Abnormal Temperature requirement.

If temperatures quickly increase above 90°F, the action required by TS 3.7.2.2 Action a.2.b is no different than the action required by current technical specifications. Under current TS, a loss of all control room air conditioning would require plant shutdown under TS 3.0.3. The time frames for shutdown due to failure to meet TS 3.7.2.2 Action a.2.b and TS 3.0.3 are the same and are sufficiently time-limited such that adverse impact on instruments during the shutdown and cool-down are not considered credible. Whether the initial starting temperature in the Control Room is 85°F (as allowed by existing surveillances in TS 3.7.2) or 90°F under proposed TS 3.7.2.2 is a minimal distinction that is not considered to be technically significant.

Based on the above discussion it is concluded that shutdown under proposed TS 3.7.2.2 Action a.2.b and current TS 3.0.3 are essentially the same (with a minor difference in initial temperature), and no additional temperature rise analysis is considered necessary.

10. With the proposed change, has an analysis been conducted to show that the CREF accident mitigation functions will be met when the CRS/HVAC is out of service? If not, why not? If an analysis has been conducted, has the results been included in the licensing basis analyses of DBA consequences?

Question 10 Response:
No. The design basis for CREF has not changed, and no specific analysis is required. The design basis for CREF is to maintain control room habitability to ensure exposure to operators does not exceed 5 Rem during accident conditions. This function is dependent upon maintenance of the Control Room Envelope (CRE) through pressurization and filtration. These functions are not affected by loss of the Control Room AC temperature control function. As stated in response to Question #5, the CRS is integral to the CREF system, and having the CRS fan out of service (inoperable) also dictates that the CREF function is inoperable.

Technical Specification Branch RAI Questions

1. 10 CFR 50.36 contains regulatory requirements for TSs. The amendment request did not discuss the regulatory requirements of 10 CFR 50.36 as they pertain to the proposed new LCO. Please state how or if the proposed TS 3.7.2.2 LCO and surveillance requirements meet the requirements of 10 CFR 50.36.

Question 1 Response:
The proposed amendment request for the Control Room AC subsystems will satisfy Criterion 3 of 10 CFR 50.36(c)(2)(ii)(C) for establishing LCOs. The proposed TS 3.7.2.2 LCO will provide the lowest functional capability of the systems, structures, and components required for safe operation of the facility. The proposed surveillances will validate the required heat removal capabilities of the Control Room AC subsystems to assure the necessary quality of systems and components is maintained.

2. Section 2.0 of Attachment 1 of the amendment request and "Bases Insert 2" of Attachment 4 of the amendment request contain a description of the Control Room AC system. Neither section stated whether or not the AC system components are safety-related. Please describe the Control Room AC System components in further detail, specifically discussing whether or not components are safety-related and how the quality of the components is maintained.

Question 2 Response:
Components in Control Room AC system are safety-related. The system description and components are described in Basis Insert 2 of the License Amendment Request.

3. Section 2.0 of Attachment 1 of the amendment request stated that a CREF subsystem is considered inoperable when the associated Control Room AC subsystem is inoperable. How will an inoperable AC system impact the operability of the filtration function once a new LCO is placed in the TSs?

Question 3 Response:
Filtration is not affected by loss of the Control Room AC subsystem. The system consists of a low efficiency filter, 1E electric heating elements, high efficiency (HEPA) filter, deep-bed charcoal adsorber, and a second high efficiency filter. None of these components require cooling to function. The charcoal adsorber, however, is dependant upon the CREF heating elements to maintain humidity levels < 70% to maintain the adsorber's function.