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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 115 TO

FACILITY OPERATING LICENSE NO. NPF-38

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

1.0 INTRODUCTION

By application dated July 18, 1991, as supplemented by letters dated March 16, and December 2, 1994, and March 9, and August 30, 1995, Entergy Operations, Inc. (the licensee), submitted a request for changes to the Waterford Steam Electric Station, Unit 3, Technical Specifications (TSs). The requested changes would revise the Control Room Air Conditioning System (CRACS) TS. The proposed amendment would subdivide TS 3/4.7.6, "Control Room Air Conditioning," into five separate TSs covering the following three distinct functions: control room emergency air filtration, control room air temperature, and control room isolation and pressurization. The licensee also proposed amended bases sections of the TS to reflect the above changes.

The August 30, 1995, letter provided clarifying information that did not change the initial proposed no significant hazards consideration determination.

2.0 BACKGROUND

Habitability systems are provided at nuclear reactor facilities to assure that operators can remain in the control room and take effective action to operate the plant safely under normal operating conditions, and maintain the plant in a safe condition following an accident. To accomplish these functions, the CRACS at Waterford operates in one of the following three modes: normal operation, isolation and recirculation (toxic gas), and isolation and filtered recirculation with provisions for manual initiation of pressurization using filtered air from one of two widely separated emergency air intakes (high radiation). A toxic chemical detection signal automatically initiates the isolation and recirculation mode of operation and overrides other CRACS initiation signals. A safety injection actuation signal or a high radiation detection signal automatically initiates the isolation and filtered recirculation mode of operation. Manual initiation of emergency modes of operation can be initiated by a control room operator at any time.

ENCLOSURE

The CRACS consists of two full-capacity, redundant AH-12 air handling units; two full-capacity, redundant S-8 engineered safety features air filtration units, and non-safety exhaust fans and supplemental computer room air handling units. The AH-12 air handling units are each equipped with a filter, a cooling coil supplied with essential chilled water, an electric heating element, and a centrifugal fan. The S-8 emergency filtration units are each equipped with a filter, an electric heating element for dehumidification of the air stream, two HEPA filters separated by an activated charcoal bed, and a fan. The CRACS also has dual, widely separated emergency outside air intakes, and each intake has two flow paths containing one normally open, fail-as-is butterfly valve and one normally closed, fail-as-is butterfly valve in series. The normal intake and exhaust lines are each isolated by two normally open, fail-closed butterfly valves in series. The ducting between components is constructed such that failure of one of two redundant components performing a specific function does not affect the redundant component performing that same function, nor any components performing complimentary functions.

In the normal operating mode, air is recirculated by one of the two redundant AH-12 air handling units, make-up air is supplied via the normal outside air intake, and non-essential fans exhaust air from certain spaces within the control room envelope. The safety function of the CRACS performs in the normal operating mode to maintain the control room air temperature at a value that is habitable for control room operators, and that does not cause the continuous duty temperature rating for equipment and instrumentation to be exceeded.

In the toxic gas mode, air is recirculated within the control room envelope by the redundant AH-12 air handling units, the exhaust fans are secured, the emergency outside air intake paths are isolated by redundant valves in series, and the normal outside air intake and exhaust paths are isolated by redundant valves in series. In this operating mode, the safety functions of the CRACS are to maintain control room temperature in an acceptable range, and reduce the rate of toxic gas infiltration to an acceptable value for protective action by the operators.

In the high radiation mode, air is recirculated within the control room envelope by the redundant AH-12 air handling units, a portion of the recirculated air is drawn through redundant S-8 emergency filtration units to remove radioactive material from the air, the exhaust fans are secured, and the normal outside air intake and exhaust paths are isolated by redundant valves in series. The CRACS design allows a control room operator to remotely open an emergency air intake path to supply a small amount of outside air to the S-8 emergency filtration unit for pressurization of the control room envelope. In the high radiation mode, the safety functions are to maintain control room temperature in an acceptable range, and to reduce the rate of infiltration of radioactive material by filtration, adsorption, and pressurization such that the calculated dose to operators is in an acceptable range.

The five separate proposed TSs are: TS 3/4.7.6.1, "Emergency Air Filtration (operational modes 1 through 4);" TS 3/4.7.6.2, "Emergency Air Filtration (operational modes 5 and 6);" TS 3/4.7.6.3, "Control Room Air Temperature

(operational modes 1 through 4);" TS 3/4.7.6.4, "Control Room Air Temperature (operational modes 5 and 6);" and TS 3/4.7.6.5, "Control Room Isolation and Pressurization." Inoperability of the S-8 emergency filtration units is addressed by the proposed action statements of TS 3/4.7.6.1 and TS 3/4.7.6.2. The proposed action statements of TS 3/4.7.6.3 and TS 3/4.7.6.4 address inoperability of the AH-12 air handling units. Finally, the proposed action statements of TS 3/4.7.6.5 address inoperability of the control room isolation and pressurization functions.

3.0 EVALUATION

The staff has reviewed the design configuration of the control room habitability systems at Waterford. Based on that review, the staff concluded that the principle components of the system are functionally independent. The staff determined that the components share reliance on the electrical distribution system, but a separate TS addresses the potential effects of electrical distribution system inoperability on the essential components of the CRACS. Therefore, the splitting of TS 3/4.7.6 into functionally independent specifications is acceptable.

The proposed TS 3/4.7.6.1 retains the limiting condition for operation, action statements, and surveillance requirements from the existing TS that are applicable to the S-8 emergency filtration units in operational modes 1, 2, 3, and 4 (power operation, startup, hot standby, and hot shutdown, respectively). The proposed limiting condition for operation specifies that both S-8 control room emergency air filtration units shall be operable.

Proposed action statement 3.7.6.1.a applies to conditions where one control room emergency air filtration train is inoperable. This action statement is consistent with the improved standard technical specifications for Combustion Engineering (CE) plants (NUREG-1432), and the allowed outage time of seven days with one inoperable emergency filtration train is consistent with the safety importance of the system. Therefore, proposed action statement 3.7.6.1.a is acceptable.

Proposed action statement 3.7.6.1.b applies when both control room emergency filtration trains are inoperable. This action statement, as modified by letter dated March 16, 1994, is also consistent with the improved standard technical specifications for CE plants (NUREG-1432), and the required actions, which are identical to those under TS 3.0.3, are also consistent with the safety importance of the system. Therefore, proposed action statement 3.7.6.1.b is acceptable.

The surveillance test requirements of TS 4.7.6.1 implement the guidance of Regulatory Guide 1.52, "Design, Testing, and Maintenance Criteria for Post Accident Engineered-Safety-Feature Atmosphere Cleanup System Air Filtration and Adsorption Units of Light-Water-Cooled Nuclear Power Plants." Therefore, the surveillance test requirements are acceptable.

Proposed TS 3/4.7.6.2 retains the limiting condition for operation, the action statements and the applicable surveillance requirements from the existing TS that are applicable to the S-8 emergency filtration units in operational modes 5 and 6 (cold shutdown and refueling, respectively). The action statement for one inoperable train in operational modes 5 and 6, specifies restoring the inoperable train to operable status within 7 days or placing the remaining operable train in operation in its emergency mode, otherwise it will require suspending activities with the potential to release radioactivity. This action statement ensures that the remaining train is operable, the failures preventing automatic actuation will have no effect, and any active failure will be readily detected. Proposed action statement 3.7.6.2 requires suspension of operations involving core alterations or positive reactivity changes when both control room emergency filtration trains are inoperable. The staff finds the proposed limiting condition for operation for operational modes 5 and 6 consistent with the existing TS for Waterford 3 and with the staff's current position in NUREG-1432. Thus, it is acceptable.

Proposed surveillance requirement 4.7.6.2 invokes the surveillance requirements of proposed TS 3/4.7.6.1 for the S-8 emergency filtration units, thereby implementing the guidance of Regulatory Guide 1.52 (RG 1.52). Therefore, this proposed surveillance requirement is acceptable.

Proposed TS 3/4.7.6.3 and TS 3/4.7.6.4 establish limiting conditions for operation and action statements for the AH-12 air handling units that are similar to the provisions of proposed TS 3/4.7.6.1 and TS 3/4.7.6.2 for the S-8 emergency filtration units. Proposed TS 3/4.7.6.3 applies in operational modes 1, 2, 3, and 4, and proposed TS 3/4.7.6.4 applies in operational modes 5 and 6.

Proposed TS 3/4.7.6.3 maintains a limiting condition for operation that specifies that two independent control room air conditioning units shall be operable. This limiting condition for operation is acceptable because it ensures at least one operable, full-capacity AH-12 air handling unit will remain operable following a postulated single failure.

Proposed action statement 3.7.6.3.a applies to conditions where one control room emergency air conditioning unit is inoperable. This action statement specifies an allowed outage time of seven days to restore the one inoperable AH-12 air handling unit to operable status, which is conservative relative to the 30-day allowed outage time for one inoperable control room cooling system prescribed by the improved standard TSs for CE plants (NUREG-1432). However, the licensee stated that, because maximum outside air makeup flow is less than 10 percent of the AH-12 unit air flow, outside air temperature has little effect on heat removal requirements. Therefore, maintenance of an acceptable control room air temperature is dependent on availability of an AH-12 air handling unit, and a 7-day allowed outage time for one inoperable unit is appropriate. If the inoperable AH-12 unit is not restored to operable status within seven days, the action statement specifies placing the reactor in hot standby in the next six hours, and cold shutdown within the following 30 hours, which the staff concluded is an appropriate set of actions for that condition.

Proposed action statement 3.7.6.3.b specifies an allowed outage time of one hour to restore one AH-12 unit to operable status when both AH-12 air handling units are inoperable. This action statement is consistent with the improved standard TSs for CE plants (NUREG-1432), and the required actions, which are identical to those under TS 3.0.3, are also consistent with the safety importance of the system.

Proposed surveillance requirements 4.7.6.3.a and 4.7.6.3.b are intended to demonstrate operability of the control room air conditioning units. Proposed surveillance requirement 4.7.6.3.a is similar to an existing surveillance requirement, and it specifies verification that average control room air temperature is less than or equal to 80°F at least once every 12 hours. The essential chilled water system, which provides cooling water to the AH-12 units, is governed by a separate TS, so surveillance requirement 4.7.6.3.a involves only the cooling coil and fan portions of the AH-12 air handling unit. Because, as described above, seasonal outside air temperature changes have a minor effect on the heat removal necessary to maintain a stable control room temperature, periodic verification of control room temperature provides acceptable assurance that the cooling coil and fan of the operating AH-12 unit are performing adequately. Surveillance requirement 4.7.6.3.b is an additional surveillance test proposed by the licensee that specifies verification that each AH-12 unit starts and operates on a quarterly basis. The staff concluded that surveillance requirements 4.7.6.3.a and 4.7.6.3.b provide acceptable assurance that both AH-12 units are capable of starting and operating when necessary, and are acceptable.

Proposed TS 3/4.7.6.4 retains the existing limiting condition for operation in operational modes 5 and 6 which specifies that both control room air conditioning units shall be operable. The action statement for one inoperable air conditioning unit in operational modes 5 and 6 specifies restoring the inoperable system to operable status within seven days, or placing the remaining operable unit in operation. This action statement ensures that the remaining train is operable, the failures preventing automatic actuation will have no effect, and any active failure will be readily detected. Proposed action statement 3.7.6.4b requires suspension of operations involving core alterations or positive reactivity changes when both control room air conditioning units are inoperable. The staff finds the proposed limiting condition for operation for operational modes 5 and 6 consistent with the existing TS for Waterford 3 and with the staff's current position in NUREG-1432. Thus, it is acceptable.

Proposed surveillance requirement 4.7.6.4 invokes the surveillance requirements of proposed TS 3/4.7.6.3 for the AH-12 air handling units. Therefore, this proposed surveillance requirement is acceptable.

Proposed TS 3/4.7.6.5 adds a limiting condition for operation that specifies that the control room envelope isolation and pressurization boundaries shall be operable. Proposed action statements 3.7.6.5.a, 3.7.6.5.b, and 3.7.6.5.c specify actions for inoperable conditions affecting the ability to isolate the

normal outside air flow paths, isolate the emergency air intake paths, and maintain at least one flow path for each emergency intake operable for control room pressurization, respectively. Each of these action statements permits an allowed outage time of seven days when the functional capability is maintained but redundancy is lost. Because the valves in each flow path affect only the ability to isolate or pressurize the control room envelope and not to recirculate air within the control room, valve operability is independent of the operability of the S-8 emergency filtration units and the AH-12 air handling units. The 7-day allowed outage time and the actions specified when the allowed outage time is not satisfied are consistent with the corresponding specifications for the emergency filtration units and control room air conditioning units for a loss of functional capability of the redundant component when the functional capability of the remaining operable component is maintained. Therefore, proposed action statements 3.7.6.5.a, 3.7.6.5.b, and 3.7.6.5.c are acceptable.

Proposed action statement 3.7.6.5.d addresses control room envelope inoperability resulting from causes other than those addressed by proposed action statements 3.7.6.5.a, 3.7.6.5.b, and 3.7.6.5.c. Therefore, this proposed action statement applies to breaches in the control room envelope other than the design intake and exhaust locations in the CRACS. The licensee has proposed additional action statement that permits breaches in the control room envelope for a period not to exceed seven days on an intermittent basis under administrative control provided that the breach origin is known and the characteristics of the breach allow operators to readily seal the breach in an effective manner. The purpose of this action statement is to provide a maintenance and modification provision during normal operation that would permit minor changes to the control room envelope boundary while the unit is operating at power. Proposed action statement 3.7.6.5.d.1 specifies periodic verification that the emergency breathing air bank pressure is adequate when the control room envelope is degraded. Proposed action statement 3.7.6.5.d.2 applies in operational modes 1, 2, 3, and 4, and proposed action statement 3.7.6.5.d.3 applies in operational modes 5 and 6. These two action statements include provisions to take immediate actions to restore control room envelope integrity and place the plant in a safe condition should a toxic chemical release occur. Proposed action statement 3.7.6.5.d.2.b includes an additional provision permitting continued operation for 48 hours to identify the cause of a control room envelope failure. If the cause is identified to be within the limits specified in action statement 3.7.6.5.d.2.a, operation may continue for up to seven days after initially declaring the control room envelope inoperable.

The licensee justified this proposed change on the basis of the conservative nature of control room habitability analyses, the capability to readily mitigate the impact on operators of a degraded control room envelope boundary, and the very low probability of an event requiring control room isolation during the short period a known breach is allowed to exist with the reactor operating at power. The control room habitability analyses assume that the control room is surrounded by a cloud of toxic or radioactive material and that the post-isolation in-leakage would occur directly from that cloud. Actually, the control room is bounded on three sides by the reactor auxiliaries building (RAB), and on a fourth side by the turbine building. The

two remaining sides, neither of which has doors or other penetrations, are exposed to the outside atmosphere. Because the wall shared with the turbine building has only an air-lock door and the walls shared with the RAB contain many more penetrations, the licensee concluded that most in-leakage to the control room would be from the RAB. The licensee determined by analysis that toxic chemical concentrations in the control room are almost entirely from in-leakage after isolation. By considering the effect of the RAB on control room toxic chemical concentrations, the licensee determined that the rate of buildup in toxic chemical concentration would be slower than the rate determined assuming direct in-leakage from the outside atmosphere. Based on this information, the licensee concluded that operators would have adequate time to don protective breathing apparatus before being exposed to elevated levels of toxic chemicals for any credible breach of the control room envelope.

The staff determined that the open doors and small breaches in the walls forming the control room envelope, which would probably communicate with the RAB, would not have a significant effect on performance of the control room envelope because the differential pressure and the associated air flow between surrounding areas and the control room would be small when the CRACS is operated in the isolation mode. Additionally, an emergency air supply system for the control room at Waterford is designed to provide a six hour supply of breathable air at a rate of six scfm for each of 17 control room and security personnel. This provision complies with the guidance of Regulatory Guide 1.78 (RG 1.78), "Assumptions for Evaluating the Habitability of a Nuclear Power Plant Control Room During a Postulated Hazardous Chemical Release," where possible hazardous chemical accidents may be of long duration and may cause the applicable toxicity limits to be exceeded. Finally, monitoring of the installed gas detection systems and notification of industrial emergencies through the St. Charles Parish Emergency Preparedness/Industrial Hotline System provides the control room operators with enhanced identification capability for toxic chemical emergencies and a greater probability that adequate time will be available to take protective actions. The licensee stated that administrative procedures place special controls on work that will breach the control room envelope. The special controls include provision of an emergency closure kit containing materials necessary to restore control room envelope breeches to an air-tight condition. With the exception of notification of off-site events, the above considerations also apply to events involving a radiological release.

The staff finds proposed action statement 3.7.6.5.d to be acceptable based on the following considerations:

1) the low probability of a challenge to the control room envelope during the period where an identified breach in the control room envelope may exist while the plant is in operational modes 1, 2, 3, or 4;

2) the conservative nature of the design basis toxic chemical and radiological event analyses;

3) the features available at Waterford that provide enhanced identification capability for toxic chemical events;

4) the characteristics of permitted breaches in the control room envelope are such that actions to restore control room envelope integrity would have a high probability of success; and

5) the permanently installed emergency breathing air banks and the periodic verification of air bank pressure.

Proposed surveillance requirements 4.7.6.5.a, 4.7.6.5.b, and 4.7.6.5.c retain the portions of the existing surveillance requirements applicable to the isolation and pressurization functions of the CRACS. Proposed surveillance requirement 4.7.6.5.a modifies the existing surveillance requirement by specifying that the control room pressurization function be demonstrated with a make-up air flow rate of less than or equal to 200 cfm. This specific flow rate is consistent with the radiological analyses. Therefore, these proposed surveillance requirements are acceptable.

Based on the above discussion the staff has found that the proposed revision to TS 3.7.6 is acceptable. The division of the original TS into separate specifications based on function is acceptable because the individual specifications apply to functionally independent components and retain substantially all of the original limiting conditions for operation, action statements, and surveillance requirements. The most significant change was the creation of an allowed outage time for the control room envelope, which the staff found to be acceptable based on the low probability of an event requiring control room isolation during the period the control room envelope is degraded, and the reasonable assurance that the operators would be adequately protected if an event requiring control room isolation occurred with a degraded control room envelope.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Louisiana State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20 and changes surveillance requirements. 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 and there has been no public comment on such finding (56 FR 43808 and 60 FR 29875).

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) 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.

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