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W3F1-2011-0067

October 13, 2011

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555

SUBJECT: License Amendment Request
Proposed Change to Technical Specification 3/4.7.4 Table 3.7-3, "Ultimate Heat Sink Minimum Fan Requirements Per Train"
Waterford Steam Electric Station, Unit 3
Docket No. 50-382
License No. NPF-38

Dear Sir or Madam:

Pursuant to 10 CFR 50.90, Entergy Operations, Inc. (Entergy) hereby requests a license amendment to the Waterford Steam Electric Station, Unit 3 (Waterford 3) Technical Specifications (TS) 3/4.7.4 Table 3.7-3, "Ultimate Heat Sink Minimum Fan Requirements Per Train."

Waterford 3 TS 3/4.7.4 Table 3.7-3 indicates the minimum Dry Cooling Tower (DCT) and Wet Cooling Tower (WCT) fan requirements for given meteorological conditions. This request modifies the WCT fan requirements by placing a limit on the number of inoperable fans per cell. This change is needed because the current TS requirement was found to be non-conservative. To address non-conservatism in the TS, Waterford 3 has implemented administrative controls that limit the number of WCT fans allowed out-of-service per cell in procedure OP-100-014 "Technical Specification and Technical Requirements Compliance."

In concert with the above change, the dry bulb temperature limits for the DCT and wet bulb temperature limits for the WCT will be lowered to accommodate the increased heat load resulting from the Replacement Steam Generators.

The proposed change has been evaluated in accordance with 10 CFR 50.91(a)(1) using criteria in 10 CFR 50.92(c), and it has been determined that the change involves no significant hazards consideration.

The proposed change involves no new commitments.

ADD/MLC

Please contact William Steelman, Licensing Manager, at 504-739-6685 if there are any comments regarding this submittal.

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

Sincerely,

A handwritten signature in black ink, appearing to be "DJ/WJS/RJP", written in a cursive style.

DJ/WJS/RJP

Attachments:

1. Analysis of Proposed Technical Specification Change
2. Proposed Technical Specification Changes (mark-up)
3. Proposed Technical Specification Changes (clean copy)

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Attachment 1 to

W3F1-2011-0067

Analysis of Proposed Technical Specification Change

1.0 DESCRIPTION

Technical Specification (TS) 3/4.7.4 Table 3.7-3 lists the Ultimate Heat Sink (UHS) minimum fan requirements per train. Currently, this TS requires all 8 Wet Cooling Tower (WCT) fans to be operable at wet bulb temperature greater than or equal to 75°F, 7 WCT fans to be operable at a wet bulb temperature less than 75°F but greater than or equal to 70°F, and 4 WCT fans to be operable at a wet bulb temperature of less than 70°F. The TS also requires that 15 Dry Cooling Tower (DCT) fans to be operable at dry bulb temperature greater than or equal to 98°F, 14 DCT fans to be operable at a dry bulb temperature less than 98°F but greater than or equal to 91°F, and 12 DCT fans to be operable at a dry bulb temperature of less than 91°F.

Additionally, there is a note in Technical Specification (TS) 3/4.7.4 Table 3.7-3 stating that “with any WCT fan(s) out-of-service in any cell, covers must be in place on the out-of-service fan(s) or the entire cell (i.e. 4 fans) must be declared out-of-service. If four fans are out of service in the same cell, the covers do not have to be installed.”

The current TS for the WCT fans is non-conservative because a WCT is only operable when both cells are operable. A cell is operable with a minimum number of fans for given meteorological conditions if the out-of-service fans have been covered. To address the non-conservatism in the TS, Waterford 3 has implemented administrative controls that limit the number of WCT fans allowed out-of-service per cell in procedure OP-100-014 “Technical Specification and Technical Requirements Compliance.”

This TS change modifies the fan requirements to indicate the number of fans required to be operable per cell, rather than per train. In addition, the note will be modified to delete the allowance for an entire cell to be out-of-service because it incorrectly indicates that four fans can be out of service in a single cell. The note modification will also remove the implication that covers are not needed to maintain an operable train.

In concert with the above change, the wet and dry bulb temperature limits in Table 3.7-3 will be lowered to account for the increased heat duty for the DCT and WCT resulting from the Replacement Steam Generators. Lowering the limits prior to replacing the Steam Generators adds conservative margin to the existing Technical Specification limits.

2.0 PROPOSED CHANGE

The proposed modification of TS Table 3.7-3 will be to specify the maximum number of out-of-service Wet Cooling Tower fans per cell, rather than per train. Also, the wet bulb temperature limits for the WCT will be reduced, and the dry bulb temperature for the DCT will be reduced. These changes are intended to correct non-conservatism in the TS and account for increased heat duty from the Replacement Steam Generators. The specific TS changes are listed below.

- For the Wet Cooling Tower, lower the ambient wet bulb temperature limits from “75°F” to “73.5°F” and “70°F” to “68.5°F”
- For the Dry Cooling Tower, lower the ambient dry bulb temperature limit from “98°F” to “97°F”

- For the Wet Cooling Tower, change the fan requirements from “7” operable fans to “Minimum 3 fans/ cell” operable
- For the Wet Cooling Tower, change the fan requirements from “4” operable fans to “Minimum 2 fans/cell” operable
- Remove the statement from Note ** “or the entire cell (i.e. 4 fans) must be declared out-of-service. If four fans are out-of-service in the same cell, then covers do not have to be installed.” Revise Note ** to read “With any WCT fan(s) out of service in any cell, covers must be in place on the out-of-service fan(s) or the entire Wet Cooling Tower must be declared out of service.”
- Add a Note (2) to read “With any WCT cell(s) out of service, the entire associated Wet Cooling Tower must be declared out of service.”

3.0 BACKGROUND

The function of the Ultimate Heat Sink (UHS) is to dissipate the heat removed from the reactor and its auxiliaries during normal operation, during refueling, or after a design basis accident. The UHS consists of dry and wet cooling towers, and the water stored in the wet cooling tower basins. Two 100% capacity trains employ one DCT and one WCT each.

The DCTs remove heat from the Component Cooling Water (CCW) system, which is a closed cooling system that serves reactor auxiliaries. The Auxiliary Component Cooling Water (ACCW) system is a separate system that provides cooling water to the CCW heat exchangers and utilizes the wet cooling towers for heat dissipation to the atmosphere. The CCW and ACCW systems are described in the Final Safety Analysis Report (FSAR) Section 9.2.2.

Each DCT is sized to dissipate approximately 60% of heat removed by the CCW System after a Loss of Coolant Accident (LOCA). The heat removal capacity of the DCTs varies significantly depending on the CCW temperature, atmospheric dry bulb temperature, and the heat removal by the ACCW system. Each DCT consists of five separate cells, each cell containing two vertical cooling coils. Cooling for each cell is provided by three fans. DCT fans are started and shut-off automatically to maintain the CCW temperature at a predetermined setpoint. When the water outlet temperature of the CCW Heat Exchanger exceeds a separate predetermined setpoint, the associated ACCW pump automatically starts, which initiates heat removal via the WCTs.

The WCTs are designed to operate whenever the heat rejection capacity of the DCT is exceeded or ambient conditions degrade the ability of the DCT to reject its heat load. The WCTs can also be used to maintain the CCW system temperature below the range maintained by the DCT during normal operation.

Each WCT is sized to dissipate approximately 40% of the heat removed by the CCW system after a LOCA to the atmosphere. The capacity of the WCT varies significantly, depending on the CCW temperature to be maintained and the atmosphere wet bulb temperature. Each WCT consists of two cells separated by a concrete barrier, which prevents air recirculation

between the fans of each cell. The WCT fans are started automatically whenever the water temperature in the WCT basin exceeds a predetermined setpoint.

Recent analyses have determined that the Wet Cooling Tower fan requirements for a given wet bulb temperature were not conservative in that previous analysis did not consider separation of the WCT cells. The previous analysis incorrectly assumed that any reduction in air flow, caused by out-of-service fans in either WCT cell, impacts both cells of the tower equally. Because of the concrete wall that separates cells, having all four fans out-of-service in a cell will reduce the capacity of the tower below design needs. In addition, after the Replacement Steam Generators are installed, the WCT and DCT will have a higher heat duty, which also impacts the wet and dry bulb temperature limits on TS Table 3.7-3.

4.0 TECHNICAL ANALYSIS

The current Technical Specification Table 3.7-3 is not conservative because it allows for an entire Wet Cooling Tower cell to be removed from service by allowing all four fans to be out of service. Based on the construction of the Wet Cooling Tower, removing an entire cell from service significantly reduces the tower's heat removal capability. As shown in Figure 1, the Auxiliary Component Cooling Water is divided between the two WCT cells. If all four fans in one of the cells are inoperable, forced evaporative cooling would not exist in this cell. A concrete barrier prevents air flow communication between the cells. Because the TS Table 3.7-3 specifies the number of out-of-service fans per tower (rather than per cell), the assumption that any reduction in air flow, caused by out-of-service fans in either WCT cell, impacts both cells of the tower equally is invalid.

As discussed above, if an entire cell were inoperable, the Auxiliary Component Cooling Water (ACCW) entering this cell would not be cooled by forced evaporative cooling. Rather, this ACCW flow would be cooled by natural draft cooling which is significantly less effective than forced evaporative cooling. Based on the Zurn Natural Draft Thermal Performance Curves, the natural draft cooling range is ~3°F at design conditions. Whereas, the cooling range for the evaporative cooling is ~23°F at design conditions. Therefore, if one cell was inoperable, the entering ACCW flow would only be cooled about 3°F, which, when mixed in the WCT basin, would unacceptably reduce the capacity to remove heat from the CCW system. Therefore, the analysis has been revised to credit an equal number of fans in each cell, such that the Cooling Tower Institute (CTI) Code ATC-105 methodology is valid for determining the impact on out of service fans.

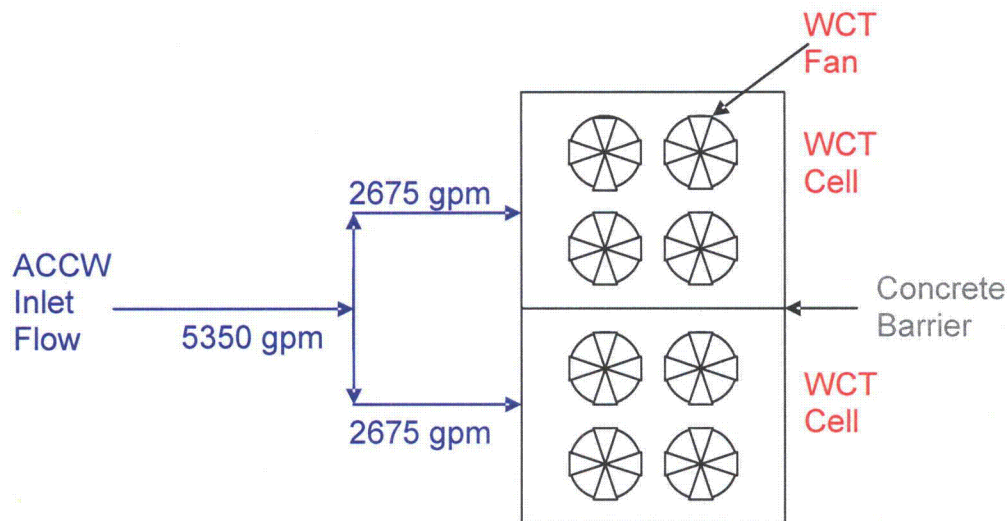


Figure 1: Top View of WCT ACCW Inlet Flow Diagram @ Design Flow Rate

TS Table 3.7-3, which indicates the number of WCT fans operable for a given wet bulb temperature, will be revised. The fan requirements will be specified per cell, rather than per tower. The sentence in Note ** will be revised to read "With any WCT fan(s) out of service in any cell, covers must be in place on the out-of-service fan(s) or the entire Wet Cooling Tower must be declared out of service." Additionally, Note (2) will be added to read "With any WCT cell(s) out of service, the entire associated Wet Cooling Tower must be declared out of service."

To limit the number of fans out of service per cell, TS Table 3.7-3 will be rewritten to specify fan configurations per cell, instead of per tower. An analysis, using the Cooling Tower Institute (CTI) Code and the Zurn WCT Performance Curves, was performed to calculate the wet bulb temperature for a given fan configuration. Per CTI Code ATC-105, the WCT inlet flow is proportional to $[\text{fan break horsepower}]^{1/3}$. Adjusting the WCT inlet flow with fans-out-of-service, the maximum wet bulb temperature with 1 fan out per cell and 2 fans out per cell was calculated by interpolating the Zurn Wet Cooling Tower Performance Curves. This analysis is based on the assumption that an equal number of fans are out-of-service per cell and that they are covered.

In addition to the changes to address the non-conservatism in TS Table 3.7-3, the dry and wet bulb temperature limits will also be lowered to account for the increased heat duty on the DCT and WCT as a result of the Replacement Steam Generators. For the WCT, the temperature ranges were lowered. Specifically, the maximum number of fans that will be allowed out-of-service for wet bulb temperature ranging from 68.5°F to 73.5°F is one fan per cell for the tower to remain operable. This allows two fans per tower to be out-of-service and is a change from the current TS that specifies a temperature limit for one fan per tower to be out-of-service. This change is supported by calculation ECM95-009 that uses the same CTI Code ATC-105 methodology that was originally used. This maintains conservative margin by reflecting comparatively lower wet bulb temperature requirements in TS Table 3.7-3. The

maximum number of fans allowed out-of service for wet bulb temperature less than 68.5°F is two fans per cell for the tower to remain operable. In addition, for the DCT, the temperature was lowered so that all 15 fans are required to be operable with a dry bulb temperature greater than or equal to 97°F. The temperature for 3 DCT fans out-of-service will remain unchanged.

5.0 REGULATORY ANALYSIS

5.1 Applicable Regulatory Requirements/Criteria

Entergy Operations, Inc. (Entergy) proposes to modify Technical Specification (TS) Table 3.7-3, "Ultimate Heat Sink Minimum Fan Requirements Per Train," by specifying the maximum number of out-of-service Wet Cooling Tower fans per cell and lowering the wet bulb limits for the WCT. This change will correct a non-conservative TS and account for increased WCT and DCT heat duty resulting from the Replacement Steam Generators.

This change to TS Table 3.7-3 does not involve any physical changes to the plant or to the CCW/ACCW system design that would affect the intent of the General Design Criteria, national standards, or engineering principles. Consistency with the defense-in-depth philosophy is maintained in that the independence of fission product barriers has not been degraded by the TS change. Sufficient safety margins are maintained in that the proposed change is not in conflict with approved Codes and standards relevant to the CCW/ACCW system, such as GDC 2, GDC 44, ANSI N18.2-1973, ANSI N18.2a-1975, Regulatory Guide 1.29-1973, and Regulatory Guide 1.53-1973. The proposed changes will lower the dry and wet cooling tower temperature limits in Table 3.7-3. These revised temperatures are based on calculations ECM95-008, ECM95-009, and ECI91-029, and an additional allowance to account for minor inaccuracies. The TS Bases 3.4/7.4 indicates that the calculated temperature values associated with the DCT and WCT fan requirements have been rounded in the conservative direction and lowered at least one full degree to account for minor inaccuracies.

In conclusion, Entergy has determined that the proposed changes do not require any exception or relief from regulatory requirements, other than the TS, and do not affect systems, structures, and components described in the Waterford 3 Final Safety Analysis Report (FSAR). Based on FSAR 9.2.5, the function of the ultimate heat sink is to dissipate the heat removed from the reactor and its auxiliaries during normal operation, during refueling or after a design basis accident. The proposed changes to add more restrictive dry and wet bulb temperature limits and WCT fan configurations do not adversely affect the design function, method of controlling a design function, and any method of evaluation that demonstrates intended design function of the UHS as described in the FSAR.

5.2 No Significant Hazards Consideration

Entergy Operations, Inc. has evaluated whether or not a significant hazards consideration is involved with the proposed amendment by focusing on the three standards set forth in 10CFR50.92, "Issuance of amendment," as discussed below:

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

Response: No.

The proposed change modifies TS 3/4.7.4 Table 3.7-3 to be consistent with the revised design basis calculation. This change is necessary to preserve the assumptions and limits of the revised UHS design basis calculation. The calculation determines the maximum number of cooling tower fans allowed out-of-service for a given wet or dry bulb temperature and establishes more restrictive cooling tower fan operating requirements. The proposed change does not directly affect any material condition of the plant that could contribute to an accident or that could contribute to the consequences of an accident. The proposed change ensures that the mitigating effects of the UHS will be consistent with the design basis analysis. Therefore, the proposed change will not involve a significant increase in the probability or consequences of any accident previously evaluated.

2. Does the proposed change create the possibility of a new or different kind of accident from any accident previously evaluated?

Response: No.

The proposed change modifies TS 3/4.7.4 Table 3.7-3 to be consistent with the revised design basis calculation. The revised calculation lowers the dry and wet bulb temperature limits to account for increased heat duty for the Replacement Steam Generators. This change also implements more restrictive WCT minimum fan requirements. The proposed change to Table 3.7-3 does not alter the operation of the plant or the manner in which the plant is operated such that it created credible new failure mechanisms, malfunctions, or accident initiators.

Therefore, the proposed change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Does the proposed change involve a significant reduction in a margin of safety?

Response: No.

The proposed change modifies TS 3/4.7.4 Table 3.7-3 to be consistent with the revised design basis calculation. More restrictive cooling tower fan operability requirements result from placing lower limits on the wet and dry bulb temperatures in the TS and limits on the number of WCT out-of-service fans per cell. These revised temperatures are based on calculations ECM98-009 and ECI91-029, and an additional allowance to account for minor inaccuracies. The TS Bases 3.4/7.4 indicates that the calculated temperature values associated with the DCT and WCT fan requirements have been rounded in the conservative direction and lowered at least one full degree to account for minor inaccuracies. The proposed change preserves the margin of safety by ensuring that the minimum number of operable fans per cell for a given temperature are capable of removing the heat duty for the UHS. The proposed change does not exceed or alter a design basis or safety limit.

Therefore, the proposed change will not involve a significant reduction in a margin of safety.

Based on the above, Entergy concludes that the proposed amendment presents no significant hazards consideration under the standards set forth in 10CFR50.92(c), and, accordingly, a finding of "no significant hazards consideration" is justified.

5.3 Environmental Considerations

The proposed amendment does not involve (i) a significant hazards consideration, (ii) a significant change in the types or significant increase in the amounts of any effluent that may be released offsite, or (iii) a significant increase in individual or cumulative occupational radiation exposure. Accordingly, the proposed amendment meets the eligibility criterion for categorical exclusion set forth in 10CFR51.22(c)(9). Therefore, pursuant to 10CFR51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the proposed amendment.

6.0 PRECEDENCE

There is no precedence identified.

7.0 REFERENCES

- 7.1 Technical Specifications.
- 7.2 Updated Final Safety Analysis Report (UFSAR).

Attachment 2 to

W3F1-2011-0067

Proposed Technical Specification Changes (mark-up)

TABLE 3.7-3

ULTIMATE HEAT SINK MINIMUM FAN REQUIREMENTS PER TRAIN

AMBIENT CONDITION	<u>DRY COOLING TOWER</u>			
	DRY BULB \geq 98°F Revise 97°F	< 98°F	DRY BULB \geq 91°F	
Fan Requirements ⁽¹⁾	15		14*	
			12*	
AMBIENT CONDITION	<u>WET COOLING TOWER</u>			
	WET BULB \geq 75°F Revise 73.5°F	< 75°F	WET BULB \geq 70°F Revise 68.5°F	WET BULB $<$ 70°F
Fan Requirements ⁽¹⁾ (2)	8		7^{^^} Revise Minimum 3 Fans Per Cell Operable ^^	4^{^^} Revise Minimum 2 Fans Per Cell Operable ^^

(1) With any of the above required UHS fan inoperable comply with ACTION d.

Add

(2) With any WCT cell(s) out of service, the entire associated Wet Cooling Tower must be declared out of service.
* With a tornado watch in effect, all 9 DCT fans under the missile protected portion of the DCT shall be OPERABLE.

Delete

** With any WCT fan(s) out-of-service in any cell, covers must be in place on the out-of-service fan(s) ~~or the entire cell~~ Revise
~~fan(s) must be declared out-of-service. If four fans are out of service in the same cell, the covers do not have to be installed~~
 or the entire Wet Cooling Tower must be declared out of service.

Attachment 3 to

W3F1-2011-0067

Proposed Technical Specification Changes (clean copy)

Attachment contains 1 page.

TABLE 3.7-3

ULTIMATE HEAT SINK MINIMUM FAN REQUIREMENTS PER TRAIN

AMBIENT CONDITION	DRY COOLING TOWER		
	DRY BULB \geq 97°F	< 97°F DRY BULB \geq 91°F	< 91°F DRY BULB
Fan Requirements ⁽¹⁾	15	14*	12*

AMBIENT CONDITION	WET COOLING TOWER		
	WET BULB \geq 73.5°F	< 73.5°F WET BULB \geq 68.5°F	WET BULB < 68.5°F
Fan Requirements ⁽¹⁾⁽²⁾	8	Minimum 3 Fans Per Cell Operable **	Minimum 2 Fans Per Cell Operable **

⁽¹⁾ With any of the above required UHS fan inoperable comply with ACTION d.

⁽²⁾ With any WCT cell(s) out of service, the entire associated Wet Cooling Tower must be declared out of service

* With a tornado watch in effect, all 9 DCT fans under the missile protected portion of the DCT shall be OPERABLE.

** With any WCT fan(s) out-of-service in any cell, covers must be in place on the out-of-service fan(s) or the entire Wet Cooling Tower must be declared out of service.