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W3F1-2012-0053

July 17, 2012

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

Subject: Response to a Request for Additional Information Regarding License Amendment Request to revise Technical Specification 3/4.7.4 Table 3.7-3, "Ultimate Heat Sink Minimum Fan Requirements per Train" [TAC No. ME7342]
Waterford Steam Electric Station, Unit 3
Docket No. 50-382
License No. NPF-38

Dear Sir or Madam:

In Email request from N. Kalyanam to M. Mason (ADAMS Accession Number ML121710592), Waterford 3 received a request for additional information regarding its License Amendment Request to revise Technical Specification 3/4.7.4 Table 3.7-3, "Ultimate Heat Sink Minimum Fan Requirements per Train." Please find attached, the additional information requested.

There are no commitments associated with this submittal. Should you have any questions or comments concerning this submittal, please contact Michael E. Mason at (504) 739-6673.

I declare under penalty of perjury that the foregoing is true and correct. Executed on July 17, 2012.

Sincerely,

DJ/RJP

Attachment: Response to NRC Request for Additional Information

A001
NRR

cc:	Mr. Elmo E. Collins, Jr. Regional Administrator U. S. Nuclear Regulatory Commission Region IV 1600 E. Lamar Blvd. Arlington, TX 76011-4511	RidsRgn4MailCenter@nrc.gov
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Attachment 1 to

W3F1-2012-0053

Response to NRC Request for Additional Information

Request for Additional Information and the Responses

RAI-1

Background

The licensee has performed Calculation ECM95-008,"Ultimate Heat Sink Design Basis," to determine the Ultimate Heat Sink (UHS) design basis under LOCA conditions using the worst combination meteorological design parameters and to account for the impact of the replacement steam generators. When describing the heat transfer associated with the wet cooling towers, Q_{WCT}, the licensee used the relationship: $Q_{WCT} = mC_P(\Delta T)$, where m is the mass flow rate of water, C_P is the specific heat and, and ΔT is the cooling range.

Issue

This equation does not account for the evaporative cooling effect of a wet cooling tower (WCT) which is normally expressed in terms of a change in enthalpy. Thus the calculated temperature of the water out of the cooling tower basin is affected, which affects the UHS WCT cooling range, the component cooling water (CCW) heat exchanger fouling factor and the graph shown in attachment 7.3 of the base calculation, among possible other effects.

Request
Please explain your use of the above described equation for the WCTs in calculation ECM95-008. What changes, if any, are necessary to calculation ECM95-008 and TS 3/4.7.4?

Response

Calculation ECM95-008 determines the wet bulb and dry bulb temperature combinations needed to produce the 115°F CCW water supply temperature based on cooling tower manufacturer performance curves. The heat that needs to be transferred by the Auxiliary Component Cooling Water (ACCW) system, Q_{ACCW} is the heat transferred by the CCW Heat Exchanger, Q_{CCWHX}, plus the heat rejected by the Essential Chiller, $Q_{Chiller}$.
$Q_{ACCW} = Q_{CCWHX} + Q_{Chiller}$

Q_{ACCW}, is also determined by subtracting the Dry Cooling Tower (DCT) capacity, Q_{DCT}, from the total plant heat load, Q_{TOTAL}.
$Q_{ACCW} = Q_{TOTAL} - Q_{DCT}$

The temperature increase in Auxiliary Component Cooling Water (ACCW) between the basin and the return nozzles results from the heat transfer from the CCW heat exchanger and the Essential Chiller and can be calculated from the equation:

$\Delta T_{ACCW} = (Q_{CCWHX} + Q_{Chiller}) / m_{ACCW}C_P$.

Where

m_{ACCW} is the mass flow rate of ACCW,
C_P is the specific heat and,
ΔT_{ACCW} is the difference between the ACCW supply temperature and ACCW return temperature.

This ΔT_{ACCW} is also the temperature difference that would be seen across the WCT at equilibrium conditions. Therefore, ΔT_{ACCW} is the WCT cooling range, which is the difference between the equilibrium basin temperature and the hot water entering the tower.

The WCT guaranteed performance curves, which have been demonstrated by testing to be conservative, are used to determine the wet bulb temperature required to produce the required cooling range. Therefore, for the purpose of demonstrating the ability to transfer peak heat load under worst case meteorological conditions, it is not necessary to perform calculations that compute the evaporate cooling based on change in enthalpy. This has already been factored into the WCT performance curves. Therefore, it is appropriate to determine the WCT range using the equation:

$Q_{WCT} = mC_P(\Delta T)$

The calculations that determine water consumption and inventory margin appropriately consider the evaporative cooling based on change in enthalpy.

Therefore, no changes are necessary to calculation ECM95-008 and TS 3/4.7.4.

RAI-2

Background

In establishing the UHS design basis in Calculation ECM95-008,"Ultimate Heat Sink Design Basis," the licensee has assumed 100% tube capacity on the Dry Cooling Tower (DCT) and 95% tube capacity on the Component Cooling Water (CCW) heat exchanger and has used the manufacturer's performance curves for the DCT and Wet Cooling Tower (WCT). The calculation's intent is to show that the DCT with 15 fans and the WCT with 8 fans meets the LOCA heat removal requirements using the worst combination meteorological design parameters.

Issue

Tube fouling and wet cooling tower fill fouling can adversely affect the heat transfer capabilities of the DCT, WCT and CCW heat exchanger and thus adversely affect the assumptions and performance curves described above.

Request

Identify and describe the testing and maintenance that is performed on the DCT, WCT and CCW heat exchanger that verifies that these components are functioning as described in the design basis calculation ECM95-008.

Response

The CCW system temperature is controlled by the dry cooling tower fans and by modulating the flow through the CCW heat exchanger. The CCW water does not directly interact with the atmosphere, and is thus not subject to contamination. The CCW system chemistry is controlled per procedure CE-002-007 to assure heat transfer surfaces are not subject to contamination or biofouling.
The Auxiliary Component Cooling Water (ACCW) system also uses chemically treated water and does not intake from or discharge to any body of water. The system chemistry is controlled per procedure CE-002-003 to assure heat transfer surfaces are not subject to contamination or biofouling. Makeup water is demineralized potable water from the Condensate Makeup (CMU) system. A filtration system circulates, filters, and chemically treats the water stored in the wet cooling tower basins. However, the Wet Cooling Tower water inventory does directly interact with the atmosphere, thus the ACCW system is conservatively considered an open loop design.

The following information describes the testing and maintenance that is performed on the DCT, WCT and CCW Heat Exchanger that verifies these components are functioning as described in the design basis calculation ECM95-008.

Dry Cooling Tower (DCT) Heat Exchanger

CE-002-007, Maintaining Component Cooling Water Chemistry – This procedure provides steps for controlling the chemistry of CCW, which is the process medium cooled by the DCT. The Chemistry department samples the CCW system every 7 days. Maintaining CCW chemistry within acceptable parameters ensures DCT performance is maintained.

The Dry Cooling Tower “A” & “B” Heat Exchangers have several tasks under Preventative Maintenance Task (PM) #14508 and PM #14509 that are performed. The tasks include the following:

- Pressure Wash DCT "A" and “B” Coils as determined by Engineering. Preventative Maintenance Tasks direct the Engineering Department to perform a cleanliness inspection of the Dry Cooling Tower coils every 2 years. Additionally, the System Engineer inspects the Dry Cooling Tower for any excessive dirt, soot and/or debris during his monthly walkdown. Also, it is an expectation that the DCT equipment is monitored for proper operation daily by the plant Operations staff. If any of the inspections/tours identifies potential degradation of coil cleanliness, the Engineering department determines if pressure washing is necessary. Pressure washing is effective in removing any dirt or soot on the Dry Cooling Tower coils. The Engineering Department also evaluates the effectiveness of the pressure washing performed. Pressure washing the DCT coils has historically been proven to be very effective in removing dirt and soot from the DCT coils in the past.

- Inspect and paint all piping in area every two years.

- Cleanliness inspection every two years (look for any debris or staged equipment that might impact the designed function of the DCTs and resolve any issues).

The System Engineer monitors Meteorological conditions and ensures design margins are met and performs walkdowns in accordance with EN-DC-178, System Walkdowns, on the CCW system, including the inspection of the DCT and DCT Fans.

Wet Cooling Tower (WCT) Heat Exchanger

CE-002-003, Maintaining Auxiliary Component Cooling Water (ACCW) Chemistry – This procedure provides instructions for maintaining corrosion and biological control in the ACCW system, which is the process medium cooled by the WCT. The Chemistry department samples the ACCW system every 7 days. Maintaining ACCW chemistry within acceptable parameters ensures WCT performance is maintained.

WCT "A" & "B" Heat Exchangers have several tasks under PM # 5814 and PM # 5815 that are performed. The tasks include the following:

- Perform a Thermal Performance test on the WCT per procedure PE-004-033. The Thermal Performance Analysis was last performed on 3/30/09 & 12/10/08 respectively. The test is currently scheduled to be nominally performed every 4 years.
- Inspect the WCT in accordance with Tech Manual every two years.
- The WCT Basin & submerged components are inspected for silt, corrosion and degradation that could affect component function every three years.
- Inspect WCT Fans every two years for degradation of equipment and paint (as necessary) all piping in area.

The System Engineer performs walkdowns per EN-DC-178, System Walkdowns, on the ACCW system, including the WCT.

Component Cooling Water (CCW) Heat Exchanger

CE-002-007, Maintaining Component Cooling Water Chemistry and CE-002-003, Maintaining Auxiliary Component Cooling Water (ACCW) Chemistry – These procedures provide steps for controlling the chemistry of CCW and ACCW, which are the process mediums that transfer heat in the CCW Heat Exchanger. The Chemistry department samples the CCW and ACCW systems every 7 days. Maintaining CCW and ACCW chemistry within acceptable parameters ensures the CCW Heat Exchanger performance is maintained.

Eddy Current testing is performed on CCW Heat Exchangers "A" & "B" tubes under PM # 7404 (last performed 11/18/09) and PM # 5440 (last performed 11/04/09). The Eddy Current test is currently scheduled to be nominally performed every 6 years on each train.

CCW Thermal Performance Analysis testing is performed per procedure PE-004-021 under PM # 5814 (last performed on 3/30/09) and PM # 5815 (last performed on 12/10/08). The test is currently scheduled to be nominally performed every 4 years on each train.

The System Engineer monitors Meteorological conditions and ensures design margins are met and performs walkdowns per EN-DC-178, System Walkdowns, on the CCW system, including the inspection of the DCT and DCT Fans.