REQUEST FOR ADDITIONAL INFORMATION

WATERFORD STEAM ELECTRIC STATION, UNIT 3

LICENSE AMENDMENT REQUEST TO REVISE TECHNICAL SPECIFICATION 3/4.7.4

TABLE 3.7-3, "ULTIMATE HEAT SINK MINIMUM FAN REQUIREMENTS PER TRAIN,"

DOCKET NO. 50-382

The licensee has used the following relationship from the Cooling Tower Institute (CTI) Code ATC-105 (February 2000) in their calculation ECM95-009, "Ultimate Heat Sink Fan Requirements Under Various Ambient Conditions," to determine revised lower ambient wet bulb temperatures for the Limited Condition of Operation (LCO) in Technical Specification 3/4.7.4, "Ultimate Heat Sink," when less than 4 fans per cell are operable.

$$Adj\ flow = Des\ Flow * \left(\frac{Des\ FanHP}{Adj\ FanHP}\right)^{\left(\frac{1}{3}\right)} * \left(\frac{Adj\ \rho}{Des\ \rho}\right)^{\left(\frac{1}{3}\right)}$$

Where: Adj Flow is Adjusted Auxiliary Component Cooling Water Flow
Des Flow is Design Auxiliary Component Cooling Water Flow
Des FanHP is Design WCT Fan Horse Power
Adj FanHP is Adjusted WCT Fan Horse Power
Des ρ is Design ambient air density
Adj ρ is Adjusted ambient air density

The Nuclear Regulatory Commission (NRC) staff, questions the validity of the licensee's use of this equation to describe the actual conditions in the cooling tower (CT) as described below:

According to ATC 105 (February 2000), this relationship described in the above equation is used to evaluate the performance of a mechanical draft CT from test data using performance curves. The examples shown in ATC 105 describe test conditions that are close to design conditions to compare the tower to design performance. Differences are in the range of 3-5 %. Therefore, the staff questions the validity of the licensee's use of this equation to accurately predict tower performance in the case where air flow is reduced by 25% (1 of 4 fans/cell inoperable) and then by 50% (2 of 4 fans/cell inoperable). Not only is air flow reduced by significant quantity, but also reduced locally in sections of the cell, possibly resulting in less effectiveness per unit surface area of tower fill and resulting in sections of tower fill exposed to water flow but not receiving much air flow.

Furthermore, the licensee, in using the above equation, seems to have not used the air conditions for an induced draft cooling tower. ATC 105 states, "For the induced draft tower, the fan air conditions are the tower discharge conditions. The code requires that both the design and test discharge air properties be determined by a heat balance calculation." But, the licensee apparently used ambient conditions in the above equation.

Additionally the licensee in their calculation referenced above, specified assumption 5.4, which states that "WCT inlet air density based on 80% relative humidity(φ)."

ENCLOSURE

Yet the Ultimate Heat Sink (UHS) design basis in input criteria 4.1 of the same calculation states that dry bulb temperature is 102°F and wet bulb temperature is 78°F.

1. Please explain the validity of your use of the above equation to accurately predict Waterford's wet CT performance (and thus affect the LCO) when air flow through each cell is reduced by a) 25% and b) 50%. This question is asked because as described above, possible adverse effects could include reduction in tower fill effectiveness due to diminished and uneven air flow in proportion to water flow.

2. Please explain your use of ambient conditions for "Des ρ" and "Adj ρ" where these values are to be fan inlet conditions, which are the tower discharge conditions for an induced draft tower. Also, please explain assumption 5.4 of calculation ECM95-009.