Entergy

Entergy Operations, Inc.
P.O. Box B
Killona, LA 70066-0751
Tel 504 739 6660

Charles M. Dugger
Vice President, Operations
Waterford 3

W3F1-97-0121
A4.05
PR

May 24, 1997

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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Technical Specification Change Request NPF-38-197

Gentlemen:

The attached description and safety analysis support a change to the Waterford 3 Technical Specifications (TS). The proposed change modifies TS 3/4.7.4, Ultimate Heat Sink, Table 3.7-3, by incorporating more restrictive dry cooling tower fan requirements and changes the wet cooling tower water consumption in the TS Bases. The change to the wet cooling tower water consumption value was evaluated in accordance with 10CFR50.59 and determined to not be a Unreviewed Safety Question (USQ). This proposed change seeks to modify the TS to be consistent with revised design basis calculations.

The proposed change has been evaluated in accordance with 10CFR50.91(a)(1) using criteria in 10CFR50.92(c) and it has been determined that this change does not involve a significant hazard. The bases for that determination is included in the attached submittal.

A001/1

Waterford 3 will implement appropriate precautions that will prohibit plant operation consistent with Technical Specifications 3.7.4, Actions a and/or b if more than 3 DCT fans per DCT are inoperable. Waterford 3 will remain in compliance with the current specification, and within the bounds of the new analysis and the change contained in this submittal. An expedited review is requested.

Should you have any questions or comments concerning this request, please contact Paul Caropino at (504)739-6692.

Very truly yours,

Charles. M. Dugger
Vice President, Operations
Waterford 3

CMD/WMW/ssf

Attachments: Affidavit
NPF-38-197
Figure 1

cc: E.W. Merschoff, NRC Region IV
C.P. Patel, NRC-NRR
J. Smith
N.S. Reynolds
NRC Resident Inspectors Office
Administrator Radiation Protection Division
(State of Louisiana)
American Nuclear Insurers

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

In the matter of	)	
	)	
Entergy Operations, Incorporated	)	Docket No. 50-382
Waterford 3 Steam Electric Station	)	

AFFIDAVIT

Charles. M. Dugger, being duly sworn, hereby deposes and says that he is Vice President Operations - Waterford 3 of Entergy Operations, Incorporated; that he is duly authorized to sign and file with the Nuclear Regulatory Commission the attached Technical Specification Change Request NPF-38-197; that he is familiar with the content thereof; and that the matters set forth therein are true and correct to the best of his knowledge, information and belief.

Charles Marshall Dugger

Charles. Marshall Dugger
Vice President Operations - Waterford 3

STATE OF LOUISIANA	)	
	) ss	
PARISH OF ST. CHARLES	)	

Subscribed and sworn to before me, a Notary Public in and for the Parish and State above named this 2nd day of May, 1997.

Notary Public

My Commission expires at death.

DESCRIPTION AND SAFETY ANALYSIS
OF PROPOSED CHANGE NPF-38-197

This proposed amendment request modifies Technical Specification (TS) 3/4.7.4 Ultimate Heat Sink, to be consistent with revised design basis calculations. Specific changes are as follows:

Table 3.7-3 - revised to eliminate allowance for operation with less than 12 dry cooling tower fans per dry cooling tower.

Bases for TS 3/4.7.4 - revised to correct the wet cooling tower water consumption.

Existing Specification

See Attachment A

Proposed Specification

See Attachment B

Description

The function of the ultimate heat sink (UHS) is to dissipate the heat removed from the reactor and its auxiliaries during normal unit operation, during refueling, or after a design basis accident.

The UHS consists of two forced draft Dry Cooling Towers (DCT)s, two mechanical draft Wet Cooling Towers (WCT)s, and water stored in the WCT basins. Each of the two 100 percent capacity loops employs a DCT and WCT.

The DCTs are the primary heat sink for the Component Cooling Water System (CCWS) during normal and post accident operation. The CCWS removes the heat from the design basis essential heat loads as well as non-essential heat loads including the spent fuel pool (SFP) (see FSAR Table 9.2-3 for the essential equipment cooled by CCWS).

The DCTs are forced draft, dry type heat exchangers (Hx) with each tower consisting of five separate cells. Each cell contains two cooling coils. Cooling air for each cell is provided by three fans, for a total of 15 fans per DCT. DCT fans are started and shut-off automatically to maintain the CCWS temperature at a predetermined setpoint. When the water outlet temperature of the CCWS Hx exceeds the predetermined setpoint, the associated ACCWS pump automatically starts.

The cooling coils on three cells of each DCT (i.e. 60%) are protected from tornado missiles by grating located above the coils and capable of withstanding tornado missile impact. DCT fans and motors are located below grade which provides protection from tornado missiles.

Each DCT has been sized to dissipate, to the atmosphere, approximately 60% of the heat removed by the CCWS after a Loss of Coolant Accident (LOCA) assuming the worst case UHS meteorological condition of 102°F dry bulb temperature and 78°F wet bulb temperature.

During normal operation, the heat removal capacity of the DCT varies depending on the CCWS inlet temperature and ambient dry bulb temperature. When CCWS temperatures rise above a predetermined setpoint, the ACCWS removes the excess heat from the CCWS using the CCWS Heat Exchanger (Hx). During accident conditions, the heat removal capacity of the DCT varies significantly depending on the CCWS inlet temperature and ambient dry bulb temperature.

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 CCWS temperature below the range maintained by the DCT during normal operation.

Each WCT has a basin which is capable of storing sufficient water to bring the plant to safe shutdown under design basis accident conditions. Each WCT is sized to dissipate to the atmosphere approximately 40% of heat removed by the CCWS after a LOCA, assuming the worst case UHS meteorological conditions of 102°F dry bulb and 78°F wet bulb. The heat removal capacity of the WCT varies significantly, depending on the CCWS temperature to be maintained and atmospheric wet bulb temperature.

Each WCT consists of two cells. Each WCT cell is serviced by four fans, for a total of eight fans per WCT. A concrete partition between each cell prevents air re-circulation between the fans of each cell. The WCT fans are started automatically whenever the water temperature in the WCT basin exceeds a predetermined setpoint.

WCTs remove heat from the CCWS Hxs and the Essential Chillers (post accident) using the ACCWS. Unlike the DCTs, the forced air actually contacts the ACCWS water during the heat removal process. The ACCWS takes water from the WCT basin, pumps it through the CCWS Hx and Essential Chiller where its temperature increases, and then to the WCT for heat dissipation to the atmosphere. ACCWS enters the WCT and is sprayed downward towards the basin into fill modules which separate the water into droplets. Air is drawn upward through the modules and spray area by the fans located on top of the tower.

See Figure 1 (FSAR Figure 9.2-6), attached, for a simplified flow diagram of the WCTs and DCTs.

Background

In 1996, in response to open items in the Design Basis Document Program, the SFP heat load was added to the UHS. The FSAR and SER specify that the SFP heat load is non-essential. Previously the SFP heat load had not been assumed to be part of the UHS heat load.

In early 1997, to support a containment fan cooler (CFC) TS submittal (NPF-38-194, W3F1-97-0072, April 11, 1997), an analysis using the computer code CONTEMPT was performed to determine the impact on the UHS by assuming inputs that would provide the maximum heat input into the UHS. This analysis determined that the maximum possible UHS heat load can be 199.4×10^6 BTU/Hr which exceeds the UHS peak accident heat load of 178.35×10^6 BTU/Hr given in the FSAR (Table 9.2-3).

Based on meteorological conditions and assumed fouling of the DCT and the CCWS Hx, ACCWS design flow rate through the CCWS Hx may be required to maintain CCWS temperature within design. At ACCWS design flow rate, the CCWS temperature control valve, ACC-126A(B), may throttle to a position where the design flow of 850 gpm to the Essential Chiller is not maintained. Additionally, WCT basin water consumption may increase beyond the capacity of one WCT basin.

The results of the analysis were unacceptable and action was necessary to ensure the design basis, with adequate margin, is preserved. Two options were available. The first option was to remove the SFP heat load from the UHS following an accident and allow the SFP to boil as a heat removal mechanism. The second option was to maintain the SFP heat load on the UHS following the accident and credit the previously reviewed replenishment water sources so that adequate water reserves are available. The first option was determined to be unacceptable and the second option was selected as the proper course of action.

The approach to ensure the design basis, with margin, is preserved was to implement the corrective actions documented in the Corrective Action Plan for the Root Cause Analysis for Condition Report CR 97-0777. They include:

- Revise FSAR Table 9.2-3 with the new UHS peak accident heat loads
- Submit a Technical Specification Change Request to revise TS 3/4.7.4
- Verify by calculation that makeup is available to ensure the continuous capability of the WCT to perform its safety function.
- Demonstrate that makeup can be provided to the WCT Basins via the WCT Basin Cross-Connect and the Circulating Water System.

- Determine a throttled position of ACC-127A(B) to assure design flow is maintained to the Essential Chiller

- Revise Procedure OP-002-001 to maintain ACC-127A(B) in a throttled position to assure design flow is maintained to the Essential Chiller

- Revise Calculation EC-I91-036 to support the 3.0°F CCW temperature uncertainty used in the UHS

Discussion

The Waterford 3 UHS meets the requirements of Standard Review Plan (SRP) Section 9.2.5 and Regulatory Guide (RG) 1.27, Ultimate Heat Sink For Nuclear Power Plants, Revision 2 January 1976. SRP 9.2.5 states that the UHS must have the capability to dissipate the maximum possible heat load, including LOCA under the worst combination of adverse environmental conditions. RG 1.27 requires that the meteorological conditions considered in the design of a heat sink, to be selected with respect to the controlling parameters and critical time periods unique to the heat sink.

RG 1.27 further provides that sufficient conservatism should be provided to ensure that a 30-day cooling (water) supply is available and that design basis temperatures are not exceeded. A cooling capacity of less than 30 days may be acceptable if it can be determined that replenishment or use of an alternate water supply can be effected to assure the continuous capability of the (heat) sink to perform its safety function, taking into account the availability of replenishment equipment and limitations that may be imposed on "freedom of movement" following an accident or the occurrence of severe natural phenomena.

FSAR Table 9.2-3 states the accident maximum heat transferred into the UHS is 178.35×10^6 BTU/Hr which includes 173.25×10^6 BTU/Hr transferred into CCWS and 5.1×10^6 BTU/Hr, the Essential Chiller heat load, dissipated by ACCWS. The accident heat loads given in FSAR Table 9.2-3 were determined in Calculation MN(Q)-9-3 and are based on a 115°F CCWS temperature. The containment heat load used in Calculation MN(Q)-9-3 was determined in Calculation AN-LOU-8 (June 1978) using CONTEMPT. The inputs into the analysis of record were consistent with the current FSAR Chapter 6 LOCA analysis except it was assumed there was no fouling of the SDC Hxs and two CFCs were operating. The UHS peak accident heat load, given in Calculation MN(Q)-9-3 (Rev. 0 January 1979 and Rev. 1 June 1984) was determined to be 178.35×10^6 BTU/Hr.

NRC Information Notice (IN) 96-01, received in January 1996 and responded to on October 10, 1996, identified a potential concern for high post-accident CCWS temperatures which have the potential to disable equipment important to safety. To determine the impact, Engineering reviewed Calculation AN-LOU-8 to determine if conservative assumptions were utilized in the UHS analysis. Engineering determined that the UHS containment heat loads assumed the CFCs were fouled.

Although this is conservative when analyzing containment, no fouling of the CFCs is more conservative for maximum heat input into the UHS. A recommendation was issued to Engineering to evaluate the impact on the UHS assuming clean CFCs. Engineering could not perform the analysis at that time because CONTEMPT, the original A/E's computer code, was not available and GOTHIC had not been approved. After NRC approval, the GOTHIC computer code will be used for Entergy analysis.

A Self Assessment was performed in August 1996 and an E&TS inspection on the UHS was performed in September 1996. The findings of both assessments recommended that the heat removal capability of the UHS should be examined using an uncertainty of ±3°F for the 115°F CCWS outlet temperature. A preliminary analysis assuming a CCWS temperature of 112°F and the accident heat loads given in MN(Q)-9-3 demonstrated margin in the WCT basins.

During Refuel 7, (Fall 1995) degraded CCWS flows to the CFCs were discovered. To support a CFC TS change submittal (NPF-38-194, April 11, 1997), CONTEMPT was utilized in March 1997 to perform the containment analysis. An additional analysis was performed which maximized the heat input into the UHS. The differences in inputs between the original analysis given in AN-LOU-8 and the new CONTEMPT analysis are as follows:

Variable	New	Original
CFC Fouling	0.0000	0.0005
SDC Hx U (BTU/Hr °F ft^2)	450*	300
CCWS Temp (°F)	112	115

* Based on Special Test Procedures, STP 01156079 and STP 01156080

This containment heat load analysis, using the new conservative assumptions determined that the maximum possible UHS heat load, including plant auxiliary heat loads and non-essential heat loads (SFP heat load), can be 199.4 x 10^6 BTU/Hr, which exceeded the UHS peak accident heat load of 178.35 x 10^6 BTU/Hr given in the FSAR. This higher peak accident heat load could, based on meteorological conditions and the condition of the DCT and the CCWS Hx, increase CCWS temperature to essential equipment cooled by CCWS and increase WCT basin water consumption and/or degrade the Essential Chiller space cooling capacity.

The impact of a higher CCWS temperature on the essential equipment that it cools was not considered safety significant (see FSAR Table 9.2-3 for the essential equipment cooled by CCWS). By design, the UHS is self-correcting should it be subjected to the additional heat load. The UHS is designed to dissipate the maximum design basis, post-accident heat load with ACCWS design flow through the CCWS Hx. When adding the conservative assumptions, the maximum possible UHS heat load is increased by approximately 21 x 10^6 BTU/Hr. The UHS will respond by increasing ACCWS flow through the CCWS Hx to maintain CCWS temperature. Should ACCWS flow increase above the ACCWS pump's capability, CCWS temperature will rise, however, the heat input into the UHS will then decrease because of higher CCWS temperatures to the essential equipment. Based on an increased heat load of approximately 21 x 10^6 BTU/Hr into the UHS, CCWS temperature to the essential equipment will not exceed the design temperature of 120°F.

The impact on the Essential Chiller is more significant. By design, ACC-126A(B), the CCWS temperature control valve, will provide adequate head through the parallel Essential Chiller loop to ensure a design flow of at least 850 gpm if ACCWS flow does not exceed design flow through the CCWS Hx. When adding the conservative assumptions, ACC-126A(B) may throttle to a position where the design flow of 850 gpm to the Essential Chiller is not assured, thus reducing the space cooling capacity of the Essential Chiller. If ACCWS flow to the Essential Chiller is reduced to below 510 gpm, the Essential Chiller will trip on low flow.

To preclude the low flow condition to the Essential Chiller, ACC-127A(B), ACCWS to CCWS Hx Outlet Isolation, will be throttled to a position that ensures that design flow is maintained to the Essential Chiller. Operations Procedure OP-002-001 will be changed to ensure the throttle position of ACC-127A(B) is maintained. Testing performed on the ACCWS, STP 01146595, demonstrated that the ACCWS can provide design flow to the CCW Hx while maintaining the design cooling flow of 850 gpm to the Essential Chiller.

WCT basin water consumption is not considered safety significant since makeup to the WCT basin can be provided via the WCT basin cross-connect and gravity draining from the Circulating Water system. These replenishment water sources were previously reviewed by NRC (Waterford 3 SER, NUREG 0787) and they were demonstrated by Special Test Procedure, STP 01156126, "Technical Procedure, Wet Cooling Tower Basin Cross-connect and Circulating Water Make-up to Wet Cooling Tower Basins Flow Verifications (Mode 5 and 6)".

The inventory contained in the redundant WCT Basin and/or the Circulating Water system will provide adequate replenishment water to meet the additional heat load. Replenishment of the WCT basins is only required if non-essential heat loads are maintained on the UHS following a LOCA.

The specific conditions that must be met for replenishment to be needed are; LOCA coincident with a loss of off-site power, a single active failure of one electrical division, worst case ambient conditions, inability to restore power to the redundant electrical division within 3 days, and non-essential heat loads being cooled by the UHS. The probability of this occurrence is extremely low. If the non-essential heat loads are not loaded onto the UHS in this condition, the WCT basin water consumption is maintained within the required minimum WCT basin capacity of 174,000 gallons. The water consumption of the WCT for the design basis post accident heat load is 164,389 gallons. The water consumption of the WCT for the maximum possible post accident heat load, including the non-essential heat loads, is 218,155 gallons.

To ensure that adequate replenishment water reserves are available from the previously review sources, calculation EC-M97-022 was developed. This calculation demonstrates that adequate make-up can be supplied to a WCT basin by gravity draining from the Circulating Water system or the redundant WCT basin. Either replenishment source far exceeds the minimum make-up requirement of approximately 44,000 gallons. Additionally a special test, STP 01156126, was performed that demonstrated that the flow rates from these replenishment sources far exceeds the minimum make-up flow rates.

As previously stated, RG 1.27 provides that a cooling capacity of less than 30 days may be acceptable if it can be determined that replenishment or use of an alternate water supply can be effected to assure the continuous capability of the (heat) sink to perform its safety function, taking into account the availability of replenishment equipment and limitations that may be imposed on "freedom of movement" following an accident or the occurrence of severe natural phenomena.

The calculation and STP have demonstrated the capability to replenish the WCT basin from the redundant WCT using the cross-connect and from the circulating water system using gravity drain paths. Each of these replenishment make-up paths are effected using installed piping and valves. No replenishment equipment other than the installed piping and valves is needed. Additionally, these paths can be effected by manual operation of the installed valves by on-site operations personnel as make-up is needed. No "freedom of movement" issues are identified. The replenishment sources will be available for the duration of the accident. The line-up of the valves is performed in accessible areas and would occur 3 days following an accident.

The above discussions concerning the revised heat load analysis for the UHS which includes throttling of ACC127A(B) to ensure adequate flow is maintained to the Essential Chillers, and the water consumption and replenishment of the WCT basins were evaluated in accordance with 10CFR50.59. This evaluation determined that no USQ exist for these changes. The discussions have been added to this submittal for completeness. The following paragraphs address technical specification changes requested by this submittal.

It has been determined that when the new conservative assumptions are factored into the calculation, the temperature at which more than 3 DCT fans could be inoperable needs to be reduced by 2°F from 77°F to 75°F. In considering the reduction in temperature, it has been determined that there is no need to provide for more than 3 DCT fans per DCT to be inoperable at any one time. If more than 3 fans are inoperable, generic implications may be indicated and the appropriate action is to restore the inoperable DCT fans to operable status within 72 hours or shutdown. Therefore the conservative approach is to remove the capability to have more than 3 fans inoperable for a single DCT at any one time.

Additionally, based on the new conservative assumptions and the need to dissipate the heat of non-essential heat loads, it has been determined that the water consumption of the WCT is different than that currently stated in the Bases of the UHS TS. The Bases are being revised to reflect the correct design basis water consumption. This Bases change is consistent with the values determined in the calculations and the results of the above discussed 10CFR50.59 evaluation.

Safety Analysis

The proposed change described above shall be deemed to involve a significant hazards consideration if there is a positive finding in any of the following areas:

1. Will operation of the facility in accordance with this proposed change involve a significant increase in the probability or consequences of an accident previously evaluated?

   Response: No

   The proposed change modifies the UHS TS by not allowing operation with less than 12 DCT fans per DCT. This change is necessary to adequately preserve the assumptions and limits of the revised UHS design basis calculations. These calculations conclude that the UHS is capable of dissipating the maximum peak heat load resulting from the limiting design bases accident (i.e., large break LOCA). The proposed change does not directly affect any material condition of the plant that could directly contribute to causing 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. Will operation of the facility in accordance with this proposed change create the possibility of a new or different type of accident from any accident previously evaluated?

   Response: No.

   The proposed change modifies the UHS TS to be consistent with revised design basis calculations. The UHS TS is being modified to eliminate operation with less than 12 DCT fans per DCT. The proposed change will not alter the operation of the plant or the manner in which the plant is operated. Therefore, the proposed change will not create the possibility of a new or different kind of accident from any accident previously evaluated.

3. Will operation of the facility in accordance with this proposed change involve a significant reduction in a margin of safety?

   Response: No

   The proposed change modifies the UHS TS by not allowing operation with less than 12 DCT fans per DCT. The proposed change preserves the margin of safety by ensuring that the UHS will be capable of dissipating the maximum design basis accident heat load with adequate margin. Therefore, the proposed change will not involve a significant reduction in a margin of safety.

Safety and Significant Hazards Determination

Based on the above safety analysis, it is concluded that: (1) the proposed change does not constitute a significant hazards consideration as defined by 10 CFR 50.92; and (2) there is a reasonable assurance that the health and safety of the public will not be endangered by the proposed change; and (3) this action will not result in a condition which significantly alters the impact of the station on the environment as described in the NRC final environmental statement.

NPF-38-197

ATTACHMENT A