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Vice President, Operations
Waterford 3

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A4.05
PR

April 11, 1997

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

Subject: Waterford 3 SES
Docket No. 50-382
License No. NPF-38
Technical Specification Change Request NPF-38-194
Containment Cooling System

Gentlemen:

The attached description and safety analysis support a change to the Waterford 3 Technical Specifications. This submittal requests a change to Technical Specification 3.6.2.2 and Surveillance Requirement 4.6.2.2 for the Containment Cooling System. The purpose of this Technical Specification Change Request is to make the Technical Specification 3.6.2.2 and Surveillance Requirement 4.6.2.2 consistent with the containment cooling assumptions in the Waterford 3 containment analysis. Additionally, a Surveillance Requirement has been added to verify valves actuate on a Safety Injection Actuation Signal. A change to the Technical Specification Basis 3/4.3.6.2.2 has been included to support this change.

This proposed change has been evaluated in accordance with 10CFR50.91(a)(1), using the criteria in 10CFR50.92(c), and it has been determined that this request involves no significant hazards consideration.

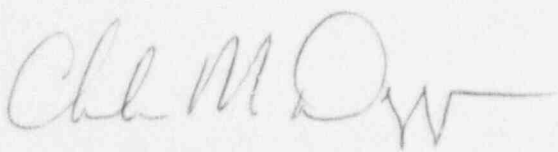
The terminology is modeled after the containment cooling Specification in NUREG 1432, "Standard Technical Specifications - Combustion Engineering Plants." Changes have been made to be consistent with the format of the current Waterford 3 Technical Specifications and the Waterford 3 Containment Cooling design basis.

A001

The circumstances surrounding this change do not meet the NRC's criteria for exigent or emergency review. However, because of the significant impact on plant operation, we respectfully request an expeditious review. Entergy Operations requests the effective date for this change be upon approval.

Should you have any questions or comments concerning this request, please contact Mr. Early Ewing at (504) 739-6242.

Very truly yours,



C.M. Dugger
Vice President, Operations
Waterford 3

CMD/CWT/ssf
Attachment: Affidavit
NPF-38-194

cc: E.W. Merschoff, NRC Region IV
C.P. Patel, NRC-NRR
R.B. McGehee
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 Marshall 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-38-194; 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
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 11th day of April, 1997.

Notary Public

My Commission expires at death.

DESCRIPTION AND SAFETY ANALYSIS
OF PROPOSED CHANGE NPF-38-194

The proposed change requests a change to Technical Specification 3.6.2.2 and Surveillance Requirement 4.6.2.2 for the Containment Cooling System. The purpose of this Technical Specification Change Request is to make the Technical Specification 3.6.2.2 and Surveillance Requirement 4.6.2.2 consistent with the containment cooling assumptions in the Waterford 3 containment analysis. A Surveillance Requirement has been added to verify the cooling water control valves actuate to the open position on a Safety Injection Actuation Signal. The containment analyses are performed using the CONTEMPT computer code, which is an NRC approved code and was used in the original Design Basis containment analysis. Technical Specification Bases 3/4.6.2.2 has also been revised to support this change.

Existing Specification

See Attachment A

Proposed Specification

See Attachment B

Background

The function of the Containment Heat Removal Systems under accident conditions is to remove heat from the containment atmosphere, thus maintaining the containment pressure and temperature at acceptably low levels. The Containment Heat Removal Systems also serve to limit offsite radiation levels by reducing the pressure differential between the containment atmosphere and the external environment, thereby decreasing the driving force for fission product leakage across the containment. The two Containment Heat Removal Systems are the Containment Cooling System (CCS), and the Containment Spray System (CSS).

The CCS consists of four containment fan coolers and a ducted air distribution system with associated instrumentation and controls. The CCS fan coolers are designed to operate during both normal plant operations and under accident conditions. Each CCS loop consists of two fan coolers both of which discharge into a common duct. The ducts from each loop then are interconnected into a common ring header and ductwork system which distributes the discharge of the fan coolers to different areas of the containment. Component Cooling Water (CCW) flows through each fan cooler to remove heat from the containment air forced over the cooling coils by the fans. The fans are two speed, fast for normal operation and slow speed for accident mitigation. During normal operation fan coolers are manually started from the main control room and operate at the higher speed to maintain containment temperature at 90-120°F.

Each one of the four fan coolers receive a safety injection actuation signal (SIAS). Upon receipt of an SIAS, the fan coolers are automatically energized and placed in operation. The fans of all units operate at low speed and dampers on the ducts automatically open. The fan coolers will remain operational in the emergency mode until the effects of the accident have mitigated to the extent that the operator determines that the fan coolers are no longer required.

Emergency operation of the containment fan coolers (CFC) can not be manually initiated from the main control room with a control switch during normal operation of the plant. However, it can be put into emergency (low speed) operation manually with an SIAS signal present.

The Containment Spray System removes heat from the containment by passing spray flow from the safety injection sump in containment through the shutdown cooling heat exchanger and into the spray header nozzles at the top of containment. The cooled spray flow falls through the containment condensing the steam and cooling the air. CCW flows through the tube side of the shutdown cooling heat exchanger to remove heat from the sump water.

The ultimate heat sink (UHS) serves to dissipate heat removed from the reactor and its auxiliaries during normal plant operation, during refueling, or after a design basis accident. The UHS consists of dry and wet cooling towers and water stored in the wet cooling tower basins. Each of the two 100% capacity loops employs a dry and wet cooling tower. Each dry cooling tower consists of five separate cells, each of which has cooling air provided by three fans. CCW to be cooled is supplied to each dry cooling tower coil. Each wet cooling tower consists of two cells, each of which is serviced by four induced draft fans. Wet cooling towers remove heat from the CCW system by a separate auxiliary component cooling water (ACCW) system. The ACCW system takes water from the wet cooling tower basin, pumps it through the CCW heat exchanger, where heat is removed from the CCW system and then to the wet cooling tower for dissipation of the heat to atmosphere. The ACCW system can also be used to maintain the CCW system temperature below the range maintained by the dry cooling towers during normal operation, if desired. Each wet cooling tower basin contains sufficient water for UHS operation without makeup following a Loss of Coolant Accident (LOCA).

The original Waterford 3 Technical Specification (TS) 3.6.2.2 for the Containment Cooling System required that two independent groups of containment cooling fans be operable with two fan systems to each group. On May 28, 1988, plant personnel discovered that the "C" Containment Cooling Fan was inoperable due to the failure of the fan motor windings. At the time of the discovery Waterford 3 was in the process of entering Mode 2 to begin physics testing after a refueling outage. Waterford 3 contacted vendors and utilities throughout the country, as well as Canada, for a fan motor that would meet the design requirements of this particular application. As the effort proved futile, Waterford 3 requested enforcement discretion for physics testing by

letter W3P88-1211, dated May 30, 1988 based on an assessment of the impact of only one fan cooler per train being necessary to perform the accident mitigation function at zero power.

A review of the limiting analysis for main steam line break (MSLB) at hot zero power conditions, performed in 1988 to support the request for enforcement discretion, indicated that peak containment pressure would reach less than 41.7 psig. This is well below the design pressure of 44 psig.

Upon receiving enforcement discretion, Waterford 3 entered Mode 2 on May 29, 1988 to begin low power physics testing. Throughout May 29 and 30, Entergy (then LP&L) continued to search for alternative motors. In addition, LP&L and Ebasco engineers continued work on the reanalysis. On May 31, 1988, the reanalysis results showed that acceptable containment peak pressures and temperatures could be achieved at full power with only one CFC per train operable at the start of the accident.

Waterford 3 requested a temporary waiver of compliance by letter W3P88-1213, dated May 31, 1988 until a TS Change could be processed. Waterford 3 requested a change to the TS by letter W3P88-1212, dated May 31, 1988. This change would require two independent groups of containment cooling fans to be operable with one fan system to each group. This was based on a reanalysis, which assumed only one containment cooling fan per train was operable. The reanalysis showed that for the limiting 75% MSLB with the worst single failure, the peak containment pressure increased from approximately 43.7 psig to 43.8 psig.

To assess the effect of fewer operable cooling fans on the long term post accident containment pressure, the limiting loss of coolant accident was reanalyzed. This analysis verified that the containment peak pressure can be reduced by a factor of 2 within 24 hours after the accident.

Based on the above analysis, the Staff granted the Technical Specification Change Request by letter dated June 2, 1988 as Amendment 39 to the Facility Operating License. This TS has been in place for Waterford 3 since that time.

On September 7, 1995, as part of the corrective action for Condition Report 95-0622, Waterford 3 initiated action to perform flow balance testing on the Component Cooling Water (CCW) System to determine if there was adequate flow to safety equipment in the accident configuration. This testing, which was performed in October 1995 during Refueling Outage 7, identified the CCW flows less than that used in the safety analysis through the Shutdown Cooling Heat Exchangers and the Containment Fan Coolers. A Condition Report was initiated due to the low flow condition and an engineering evaluation was performed which determined that the containment cooling system remained operable with the identified low flows. Differential pressure data was collected across major system components in an effort to determine why the low flow

conditions existed. Differential pressures were identified to be higher than design across the Dry Cooling Towers (DCT), which are upstream of the Containment Coolers and Shutdown Cooling Heat Exchangers. One bundle of DCT 'A' was inspected, found to have fouling, and cleaned. As a result, it was believed that the low flow conditions which were discovered during flow testing were due to DCT fouling. The remaining DCT bundles were cleaned in January through March 1996.

Another CCW flow test was performed in August, 1996 and provided the following flows to the containment coolers: Cooler 'A' - 1340 gpm, Cooler 'B' - 1250 gpm, Cooler 'C' - 1310 gpm, Cooler 'D' - 1370 gpm. As Coolers 'A' and 'C' are in one train and Coolers 'B' and 'D' are in the other train, each train currently has at least one cooler with a flow rate above the current Technical Specification limit of 1325 gpm. The Licensing basis containment analyses at the time were performed based on one fan cooler operable per train with a CCW flow rate of 1350 gpm to each cooler.

Description

Entergy Operations proposes to change the Waterford 3 Technical Specification 3.6.2.2, Surveillance Requirement 4.6.2.2, and the Basis 3/4.6.2.2 to revise the requirements for the Containment Cooling System. Specifically, this change replaces the requirement of one fan cooler in the specification with two fan coolers. The ACTION for this specification is also changed to require that ACTIONs be performed if one or both fan coolers in a group are inoperable. SR 4.6.2.2.b.2 is being revised to change the required flow rate to each cooler from 1325 gpm to 1200 gpm. SR 4.6.2.2.b.3 has been added to verify that each cooling water control valve goes to the open position on a Safety Injection Actuation Signal.

Additionally, this change replaces the nomenclature of "group of containment cooling fans" with "train of containment cooling" in the Specification and Surveillance. Also this changes the Surveillance terminology of "fan group" with "operational fan" and "each cooler" to "at least one cooler." The terminology is modeled after the containment cooling Specification in NUREG 1432, "Standard Technical Specifications - Combustion Engineering Plants." Changes have been made to be consistent with the format of the current Waterford 3 Technical Specifications and the Waterford 3 Containment Cooling design basis.

The Waterford 3 limiting peak pressure and temperature containment analyses have been reanalyzed using the current licensing basis, NRC approved CONTEMPT computer code. The revised analyses are based on the same set of assumptions as the current analyses of record documented in the FSAR, except for the CCW flow to CFCs and shutdown cooling heat exchanger, air flow rate for each CFC, and number of CFCs operable per train.

The new analysis assumes two fan coolers per train operable with a CCW flow rate of 1100 gpm to each cooler. The revised CFC performance data based on a CCW flow rate of 1100 gpm and an air flow rate of 33,250 ACFM (design air flow rate reduced by 5%) was obtained from the fan cooler vendor (American Air Filter). The revised CFC heat transfer performance is input to the CONTEMPT code. The 1100 gpm used in the analysis is below the 1200 gpm proposed for this Surveillance Requirement to allow for measurement uncertainty and potential flow degradation. Similarly, the assumed air flow rate is conservatively well below the design air flow rate of the CFC.

The CCW flow rate to the shutdown cooling heat exchanger was also reduced from 3000 gpm to 2550 gpm in the revised analysis. This assumed flow to the shutdown cooling heat exchanger bounds the test results and accounts for measurement uncertainty. The overall heat transfer coefficient of the heat exchanger was reduced as a result of the lower flow.

The effect of the lower CCW flow to the CFCs and shutdown cooling heat exchanger is an increase in containment peak pressure because of the lower individual heat removal rate. However, this is offset by the requirement that both CFCs per train be operable. With twice the number of CFCs removing heat from containment, the net effect is an increase in heat removal from containment during an accident. Thus, the peak pressure in the revised analysis is equal to or lower than in the current analysis. The following table provides a comparison of the current and revised analyses results for the limiting LOCA and Main Steam Line Break (MSLB) events:

	LOCA		MSLB	
	Revised	Present	Revised	Present
Peak P (psig)	42.41	42.8	43.57	43.57
P @ 24 hour (psig)	13.75	21.0	N/A	N/A

This table shows that the revised analysis results in equal to or lower peak pressures than the previous analysis and that the calculated pressures are less than the containment design pressure of 44 psig. There is a bigger impact on the LOCA results because the time of peak pressure is later so there is more time for the changes in heat removal capability to have an impact. The greater heat removal of two fan coolers with a lower CCW flow versus one at the higher CCW flow is clearly shown in the long term 24 hour pressure. The revised analysis pressure at 24 hours is well below one half of the peak as described in the Technical Specification bases.

There is no change in the peak pressure for the MSLB because the peak occurs only a short time (56 seconds) after the start of the accident. Thus, there is little time for these changes to have an impact.

The peak containment temperature was also considered for these analyses. The limiting event for the containment peak temperature is the MSLB from 102% power with the failure of one containment spray train as the worst single active failure. Therefore, the MSLB from 102% power was analyzed assuming four CFCs and one containment spray train running. This event resulted in a containment peak temperature of 413.4 °F which is below the below the 413.5 °F provided in Technical Specification 3.6.2.1 and 3.6.2.2 Bases. The peak temperature for the case of a single train failure (two CFCs and one spray running) was 411.6 °F, which is less than the limiting case. This is because the fans condense steam that would have otherwise absorbed heat. With fewer fans more steam is present to absorb more heat, resulting in a lower temperature.

Additional parametric analyses assess the impact of uncertainty in the temperature of CCW flow to the CFCs and shutdown cooling heat exchanger. Analyses at a maximum CCW temperature of 120°F showed a negligible increase in peak pressure (0.03 psi for LOCA) and temperature from the design basis analyses.

An analysis has been performed to determine the impact on environmentally qualified equipment based on the lower flows to the CFCs and shutdown cooling heat exchanger. The current temperature profile and containment peak pressure used to determine post accident operability on environmentally qualified equipment bound this analysis.

An UHS analysis has been performed of the effect of the lower CCW flows to the CFC and shutdown cooling heat exchanger used in this TSCR. The analysis has shown that the peak accident heat load and wet cooling tower basin water consumption is bounded by the existing UHS analysis.

The Bases for the Specification is being revised to provide a more explicit explanation of what comprises a train, e.g. two fans (powered from the same safety bus) and their associated coolers (supplied from the same Component Cooling Water loop). Additionally, a discussion of the Surveillance Requirements has been added providing information on testing requirements and requiring that the 18 month flow measurement be performed in a configuration consistent with the accident lineup.

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 results of the reanalysis show that the consequences of an accident are not increased by this change to the required number of operable fan coolers and CCW flow to each fan cooler. Specifically, the acceptance criteria for peak containment pressure during an accident and pressure reduction at 24 hours after the accident are met. The calculated peak pressure for the limiting MSLB is less than the containment design pressure of 44 psig. The pressure at 24 hours after the start of the limiting LOCA is less than one half of the peak pressure.

Therefore, revising the containment fan cooler Technical Specification to require two fan coolers per train operable with a lower CCW flow rate of 1200 gpm to each will not adversely impact the consequences of accidents previously evaluated. The flow rate of 1200 gpm is conservatively greater than the assumed flow rate in the analysis (1100 gpm). Furthermore, since the fan coolers are not an initiator of any event, the proposed change will not impact the probability of occurrence of an accident previously evaluated.

An UHS analysis has been performed of the effect of the lower CCW flows to the CFC and shutdown cooling heat exchanger used in this TSCR. The analysis has shown that the peak accident heat load and wet cooling tower basin water consumption is bounded by the existing UHS analysis.

An analysis has been performed to determine the impact on environmentally qualified equipment based on the lower flows to the CFCs and shutdown cooling heat exchanger. The current temperature profile and containment peak pressure used to determine post accident operability on environmentally qualified equipment bounds this 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 does not alter the operation of the fan coolers in a manner that would create a new or different accident. Although both CFCs per train are now required to be operable with a lower CCW flow to each CFC, the manner in which the CFCs perform their safety function is not changed. There are no new system interactions that could lead to a different kind of accident. This change serves to clarify the specification with respect to the Waterford 3 safety analysis

and provide further information in the Bases. The configuration required by the proposed specification is permitted by the existing specification.

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 revises Technical Specification 3.6.2.2 and Surveillance Requirement 4.6.2.2 for the Containment Cooling System. This change revises the required number of fan coolers from one fan cooler per train to two fan coolers per train. This change also revises the surveillance flow requirement from 1325 gpm to a value consistent with containment cooling assumptions in Waterford 3 containment analyses. This flow rate will be tested with the CCW system in the accident lineup to be consistent with the analysis assumptions.

The containment cooling system is designed, as described in the containment depressurization and cooling system Technical Specification Bases, to maintain the post accident containment peak pressure below its design value of 44 psig. The system is also designed to reduce the containment pressure by a factor of 2 from its post-accident peak within 24 hours.

The revised analyses done to support this Technical Specification change has shown that the peak containment pressure remains below 44 psig and the 24 hour pressure is less than half the peak. Therefore, the proposed change does not adversely impact margin of safety.

The revised analysis has also shown that the containment peak temperature remains below the temperature provided in the Technical Specification 3.6.2.1 and 3.6.2.2 Bases.

An UHS analysis has been performed of the effect of the lower CCW flows to the CFC and shutdown cooling heat exchanger used in this TSCR. The analysis has shown that the peak accident heat load and wet cooling tower basin water consumption is bounded by the existing UHS analysis.

An analysis has been performed to determine the impact on environmentally qualified equipment based on the lower flows to the CFCs and shutdown cooling heat exchanger. The current temperature profile and containment peak pressure used to determine post accident operability on environmentally qualified equipment bounds this analysis.

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 10CFR50.92; 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.