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A4.05
PR

August 11, 1995

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-38-171

Gentlemen:

The attached description and safety analysis supports a change to the Waterford 3 Technical Specifications. The proposed change reduces the minimum reactor coolant cold leg temperature of Technical Specification 3.2.6 by three degrees.

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 involves no significant hazards considerations. The bases for these determinations are included in the attached submittal.

Waterford 3 requests that the implementation date for this change be within 30 days of NRC issuance of the amendment to allow for distribution and procedural revisions necessary to implement this change. Although this request is neither exigent nor emergency, your prompt review is requested. As described herein the proposed change is being pursued in support of fuel Cycle 8 that will begin mid November 1995.

A001

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

Very truly yours,

R.P. Barkhurst

R.P. Barkhurst
Vice President, Operations
Waterford 3

RPB/PLC/ssf
Attachment: Affidavit
NPF-38-171

cc: L.J. Callan, 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

R.P. Barkhurst, 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-38-171; 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.

R.P. Barkhurst
R.P. Barkhurst
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 AUGUST, 1995.

Steve B. Fe[illegible]
Notary Public

My Commission expires WITH LIFE.

DESCRIPTION AND SAFETY ANALYSIS
OF PROPOSED CHANGE NPF-38-171

The proposed change modifies Technical Specification 3.2.6 by replacing the current minimum reactor coolant cold leg temperature of 544°F with 541°F.

Existing Specification

See Attachment A

Proposed Specification

See Attachment B

Background

Technical Specification (TS) 3.2.6 requires the reactor coolant cold leg temperature to be maintained between 544°F and 558°F for power levels above 30% of rated thermal power. As a result of reducing the reactor coolant hot leg temperature in an effort to improve steam generator integrity, Waterford 3 operates very close to the lower end of this temperature range. This places an additional burden on plant operators and quick action is sometimes required to avoid violating this Technical Specification. A 3°F reduction on the minimum cold leg temperature has been evaluated and proposed in order to increase the operating margin and minimize the possibility of violating the limit.

This specification is provided to ensure that the actual value of reactor coolant cold leg temperature is maintained within the range of values used in the safety analyses. The specified value includes an adjustment of 2°F for instrument measurement uncertainty. Thus, the proposed TS minimum value of 541°F was determined acceptable by using a value of 539°F, in the safety analyses as the minimum core inlet temperature.

The reduction in cold leg temperature has an impact on the structural response to the large break LOCA blowdown loads, as well as, the thermal hydraulic response to accident analyses in Chapter 15 of the FSAR. The evaluation results of these impacts are described below.

Description

The reduction in cold leg temperature causes a slight increase (less than 1%) in the average density of the RCS water. This higher density results in a small change in the calculated LOCA blowdown loads that are applied to the major NSSS components, their supports, and the reactor vessel internals. A qualitative assessment of the impact of cold leg temperature reduction on these components was performed in support of the proposed change. This assessment consisted of an evaluation of the design margins on the major components and a determination of the impact this lower temperature would have on those margins.

The maximum blowdown loads for Waterford 3 are currently based on mechanistic size (break opening area is limited by pipe whip restraints) guillotine breaks in the RCS piping. Using these loads, the minimum design margin available is approximately 17% at the core support barrel snubbers and at the reactor vessel outlet nozzle. By applying the criteria of Leak Before Break of Primary Coolant Loop Piping (approved for Waterford 3 in Safety Evaluation Report for Combustion Engineering Topical Report CEN-367 dated October 30, 1990), the current limiting guillotine breaks can be eliminated so that only tributary line breaks need be considered. It is expected that the loads calculated for these tributary lines will decrease or in some cases remain about the same, resulting in no worse design margins than currently exists. For example, the load on the upper guide structure lower flange at a similar plant experienced a decrease in load in one direction from 3 million pounds to around 850,000 pounds. This large decrease in load is more than enough to offset the slight increase that is due to a small decrease in cold leg temperature of 3°F.

The reduction in temperature and the faster break opening time for the tributary line breaks also tends to increase the calculated subcompartment pressurization. This affects the structural analyses of the components, supports, and reactor vessel internals. However, because of the relatively open containment design at Waterford 3, it is expected that the increase will be small and within the available design margins. In analyzing the effects of subcompartment pressurization, a number of physical occurrences are considered. One of the more influential is the rebounding of the pressure wave off of the subcompartment walls and the effect this has on the major components in the subcompartment. The subcompartment construction at Waterford 3 is open at the bottom from the Reactor Coolant Pump columns to the Steam Generator sliding base pedestal and is completely open at the top. This construction allows a large portion of the wave to dissipate as opposed to

rebounding onto the components. This reduces the impact of subcompartment pressurization at Waterford 3 relative to other more closed subcompartment designs. For example, increased loads analyzed for a similar, but more closed design plant with a 10°F decrease in cold leg temperature were within the margins available for Waterford 3. Since this request is for only a 3°F cold leg temperature decrease, the impact is expected to be well within the current design margins.

An additional impact evaluated was the effect that a change in blowdown time history has on tributary line motions during the new postulated tributary line break. These motions have a direct impact on tributary line supports such as snubbers and pipe whip restraints. Again, analyses done for a similar plant and a greater decrease in temperature resulted in almost all nozzle response spectra being enveloped by, or easily reconciled with the existing design margin. Those few that were not enveloped showed very small amplitude changes on the order of several mils. A change of several mils is negligible because the support system on the tributary lines consists of snubbers and whip restraints. The whip restraints are sized and gapped to limit pipe motion after a primary pipe break or tributary pipe guillotine while still allowing free thermal expansion. It is expected that the smaller temperature change requested for Waterford 3 will yield in even more favorable results.

The impact of the core inlet temperature reduction on the accident analyses documented in the FSAR and the set of transients used to provide limits and setpoints in the Core Operating Limit Supervisory System (COLSS) and Core Protection Calculator System (CPCS) were investigated. Some events are insensitive to the change or have already been analyzed at a cold leg temperature less than that proposed by this change. One event (loss of condenser vacuum) has been reanalyzed with the 3°F lower cold leg temperature. Those events that provide input to the COLSS and CPC setpoints are analyzed just prior to startup of the next cycle.

Of the Non-LOCA events, many are insensitive to the change in cold leg temperature or the maximum cold leg temperature has been conservatively used. Examples of the former include reactivity events at subcritical and low power conditions, increase in RCS inventory events, and radioactive waste systems releases. Changes in temperature have a negligible impact on the results of these events. Examples of the latter include increase in heat removal and loss of feedwater events. A higher initial cold leg temperature results in a greater cooldown and a higher calculated offsite dose.

The impact on the LOCA analyses has already been considered by analyzing these events for a cold leg temperature as low as 520°F. The initial cold leg temperature affects the calculated blowdown hydraulics and peak cladding temperature. The allowable peak linear heat generation rate is required to be reduced as cold leg temperature decreases as shown in Technical Specification 3/4.2.1, Linear Heat Rate.

The loss of forced RCS flow and reactor coolant pump seizure/sheared shaft events have already been analyzed at a cold leg temperature of 535°F. The minimum temperature is used for these events to minimize the negative reactivity feedback due to coolant heatup during the event. These events remain acceptable since they have been analyzed at a temperature below the proposed minimum temperature.

The event most affected by the 3°F lower cold leg temperature is the Loss of Condenser Vacuum (LOCV). A LOCV causes both the turbine and the main feedwater pumps to trip, and disables the turbine steam bypass valves. Closure of the turbine stop valves and coastdown of the main feedwater pumps cause the primary and secondary temperatures and pressure to increase rapidly. A reactor trip occurs on high pressurizer pressure. The peak RCS pressure is limited by reactor trip and opening of the pressurizer and main steam safety valves (MSSVs). The acceptance criteria for this event requires that the RCS pressure remain below 2750 psia, i.e., 110% of design pressure.

The LOCV event has been reanalyzed for Cycle 8 to quantify the impact on peak RCS pressure of a 3°F reduction in cold leg temperature. The lower temperature reduces the initial steam generator pressure which delays the opening of the main steam safety valves and increases the peak RCS pressure. The new analysis shows that the peak pressure increased by 9 psia due to the lower temperature and remains less than the acceptance criteria of 2750 psia.

Some Control Element Assembly (CEA) withdrawal, drop, and ejection events are affected by the decrease in cold leg temperature. These events cause a slow increase in reactor core power rather than a reactor trip because of the low worth of the CEA. The power increases slowly due to the reactivity insertion from both the CEA and the moderator feedback with a positive MTC. The power increase is limited by the opening of the main steam safety valves to balance the higher core power with secondary heat removal. The minimum cold leg temperature is used to minimize the initial steam generator pressure. This delays the opening of the safety valve and allows core power to rise higher before a new steady state is reached. These transients are analyzed and

accounted for by appropriate setpoints used in COLSS and CPC just prior to startup of the next cycle. This is done to ensure the most accurate information on core burnup during the previous cycle so that uncertainties are minimized. The COLSS and CPC setpoint analyses for Cycle 8 will explicitly account for a 3°F lower cold leg temperature when they are performed.

Conclusions

The impact of a 3°F minimum cold leg temperature reduction has been evaluated. The affect on the structural response of the major NSSS components, supports, and reactor vessel internals is small and expected to be within existing design margins and conservatisms. The impact on the accident analyses documented in the FSAR is negligible except for the LOCV event which has been reanalyzed. The results indicate that the peak RCS pressure remains less than 110% of the design pressure. Analyses in support of the COLSS and CPC setpoints will address the effects of the 3°F reduction on the minimum cold leg temperature including the margin and setpoint requirements resulting from transient analyses. These analyses will be performed just prior to startup of Cycle 8 as is the normal practice for Waterford 3 reloads.

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 involves a 3°F reduction in the minimum core inlet temperature. This change will not have any impact on the probability of occurrence of any accident documented in the FSAR.

   The impact of this change on the consequences of events documented in the FSAR has been evaluated. The evaluation demonstrated that most events are insensitive to the core inlet temperature. The events that are impacted by lower core inlet temperature are:

- Loss of condenser vacuum (LOCV),
- Part length CEA drop,
- Single CEA withdrawal within deadband, and
- CEA ejection.

The LOCV event has been reanalyzed for the upcoming Cycle (Cycle 8) and the results indicate that the peak RCS pressure remains below the acceptable limit (110% of the design pressure, i.e., 2750 psia). The reactivity anomaly events (remaining events) will be reanalyzed as part of COLSS/CPC setpoint calculations. These calculations will be performed prior to Cycle 8 startup and will address the impact of the 3°F reduction on the minimum core inlet temperature. The CPC/COLSS databases and/or addressable constants will be modified, as needed due to proposed change, prior to cycle startup.

A qualitative assessment of the impact of the proposed change on the calculated LOCA blowdown loads that are applied to the major NSSS components, their supports and the reactor vessel internals was also performed. This assessment consisted of an evaluation of the design margins on the major components and a determination of the impact this lower temperature would have on those margins. The evaluation concluded that the impact of a 3°F cold leg temperature reduction will be well within the current design margins. 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 to the minimum core inlet temperature does not involve any change to any equipment or the manner in which the plant will be operated. Since no hardware modifications or changes in operation procedures will be made, the proposed change would not create the possibility of a new or different kind of accident from any accident previously evaluated. 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 impact of the proposed change on the Waterford 3 FSAR analyses have been evaluated. The evaluation showed that the events that were impacted were important with respect to RCS pressure and fuel thermal limits. One of the events that was impacted by the proposed change was the LOCV event. This event was analyzed and the results showed that the peak RCS pressure remained below the acceptable limit. The impact of this change on other events (reactivity anomaly events) will be evaluated as part of the COLSS/CPC setpoint calculations and the COLSS/CPC databases and/or addressable constants will modified as needed to account for any adverse impact on the results of these events due to the proposed change.

The impact of this change on the Linear Heat Generation Rate limits which varies as a function of the cold leg temperature, is accounted for by Technical Specification 3.2.1, "Linear Heat Rate". The impact of this change on LOCA blowdown loads were evaluated to be insignificant compared to the current design margins. Therefore, the proposed change will not involve a significant reduction in a margin of safety, specifically fuel thermal limits and RCS pressure limit.

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.

NPF-38-171

ATTACHMENT A