Entergy Operations

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February 5, 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-38-189

Gentlemen:

The attached description and safety analysis support a change to the Waterford 3 Technical Specifications 3.1.2.7, 3.1.2.8, 3.5.1, 3.5.4, 3.9.1, and Bases 3/4.1.2. The change described herein increases the minimum boron concentration in the Safety Injection Tanks and the Refueling Water Storage Pool to 2050 ppm.

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 the change involves no significant hazards consideration. The bases for these determinations are described in the attached submittal.

The proposed change will ensure the minimum boron concentration prescribed by the TS is consistent with the safety analysis for fuel Cycle 9. The Waterford 3 refueling outage is currently scheduled to begin April 11, 1997. Because the proposed minimum boron concentration limit is within the band for boron concentration currently prescribed by the TS, a start up restraint will not be imposed. However, if the proposed change is not approved prior to start up, Waterford 3 will ensure that an administrative limit for the more restrictive minimum boron concentration is in place prior to start up following Refueling Outage 08. Entergy Operations requests the effective date for this change be within 60 days of 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/ELL/ssf
Attachment: Affidavit
NPF-38-189

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

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-38-189; 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 5TH day of FEBRUART, 1997.

Sten E. Fa

Notary Public

My Commission expires WITH LIFE.

DESCRIPTION AND SAFETY ANALYSIS
OF PROPOSED CHANGE NPF-38-189

Existing Specification

See Attachment A

Proposed Specification

See Attachment B

Background

The safety injection tanks (SIT's) are a passive injection system containing borated water under a pressurized nitrogen cover. No outside operator action or electrical signal is required for operation. Each tank is connected to its associated Reactor Coolant System (RCS) cold leg by a line containing two check valves that isolate the tank from the RCS during normal operation. When RCS pressure falls below tank pressure, the check valves open, discharging the contents of the tanks into the RCS.

The tanks are specifically designed to rapidly reflood and cool the reactor core during the time between the occurrence of a large break (LBLOCA) and the time it takes for flow from the Safety Injection pumps to reach the core. In the case of a LOCA concurrent with loss of off-site power (LOOP), this delay may be as great as 60 seconds. Adequate borated water is supplied in the four tanks to flood and recover the core assuming the contents of one tank are lost through the break.

The Refueling Water Storage Pool (RWSP) is located in the north side of the Reactor Auxiliary Building (RAB) at elevation (-4) feet mean sea level. The RWSP is a 600,000 gallon stainless steel lined concrete compartment in the Reactor Auxiliary Building (RAB). The pool is vented to the RAB normal exhaust filter train inlet and has vacuum breakers to prevent pool collapse during discharge. The RWSP is used to store borated water for use in both the Safety Injection and Containment Spray Systems. The RWSP provides full flow to all Engineered Safeguard Feature (ESF) pumps prior to reaching a low-level switchover to the Safety Injection Sump for recirculation. The minimum boron concentration of the RWSP guarantees the reactor will remain subcritical in the cold condition following a mixing of the RWSP and RCS water volumes with all control rods inserted except for the most reactive control assembly which is in the fully withdrawn position. The maximum boron concentration requirement (2300 ppm) is based upon boric acid precipitation rates in the reactor core in post-LOCA conditions.

because the operating band has been reduced from 580 ppm to 250 ppm. However this impact is offset by the relative lack of frequency of changes required to adjust both SIT and RWSP concentrations.

For the SITs, once the boron concentration is established at the desired level, there should be very little change in concentration. The primary reason for making an addition would be backleakage from the RCS during power escalation which would dilute the SIT boron concentration. Once normal operating pressure (2250 psia) is reached however, the check valves seat, limiting leakage from the RCS. In the event there is a need to make an addition to the SITs, the makeup source is the RWSP. Since the concentration levels are the same for the SITs and the RWSP, there should be no problem maintaining the desired concentration level in the SITs.

Once RWSP concentration is established, it also requires few additions. If makeup to the RWSP is required, operators will be working within the narrower band (250 ppm vs. 580 ppm). The biggest impact is that operators may have to use smaller quantities of water when making additions. However, due to the large volume of the RWSP (600,000 gallons), an operator would have to make a significant addition of acid in order to measurably affect the concentration level.

The change to the Action statement of TS 3.9.1 is being made to assure that the more restrictive limiting conditions of the Core Operating Limit Report (COLR) in regards to Mode 6 Refueling operations are adhered to. COLR section 3.9.1 requires that the more restrictive reactivity condition of a K_{eff} of 0.95 or less or a boron concentration of 2050 ppm is met. In addition, this change is consistent with the Standard Technical Specifications.

Description

The proposed change raises the minimum boron concentration in the SIT's and the RWSP from the current 1720 ppm to 2050 ppm. This increase is due to an increase in fuel enrichment, longer operating cycles, and reduced rod shimming.

As a result of a postulated LBLOCA, the RCS depressurizes to the point where the SIT discharges into the RCS. During the initial stages of reflood, borated water from the SIT provides core cooling and reactivity control. At this point, the RCS is assumed to be completely filled with water from the SIT. Therefore, the core boron concentration at the point when the void reactivity is no longer credited, is assumed to be equal to SIT boron concentration. Upon emptying the SIT, the Safety Injection pumps take suction from the RWSP and inject borated water into the RCS for reactivity control. The combined boron concentrations from the SIT and the RWSP provide adequate shutdown margin. Therefore, the minimum boron concentration to ensure adequate shutdown margin during a LOCA can be applied to both the SIT and the RWSP.

The calculation for SIT boron concentration is performed at the conditions corresponding to the largest Critical Boron Concentration (CBC) which is the beginning of cycle (BOC) at the short end point of the end of the previous cycle. The highest CBC will result in higher requirements on the SIT boron concentration. The assumed core conditions for the SIT calculation exist during hot zero power (HZP), all rods out (ARO), with Hot Full Power (HFP), Equilibrium Xenon (Eq. Xe). In reactivity space, these conditions bound those used in the LBLOCA analysis, which results in the highest peak centerline temperature and closest approach to system design limits.

The limiting LBLOCA analysis occurs at the condition of BOC, HFP, Equilibrium Xenon. Immediately following the RCS depressurization, the presence of large voids in the core region produces significantly subcritical conditions which results in a shutdown of the core fission power to HZP conditions. Subcriticality is maintained during the reflood by virtue of the soluble boron contained in the SIT inventory. HZP rather than SIT ambient water temperature is used since the high soluble boron levels following SIT injection imply a positive moderator temperature coefficient which means high moderator temperatures result in higher boron requirements. Thus, HZP conditions are appropriate for determining the SIT boron concentration.

The LBLOCA analysis does not assume rapid shutdown from a scram since it is possible that the blowdown forces following a LBLOCA may result in a delayed trip. For this reason, the conservative assumption of ARO is used for the SIT boron determination. HFP, Equilibrium Xenon is assumed since it is consistent with the limiting LBLOCA analysis. For the LBLOCA analysis, the peak clad temperature is produced by the energy resulting from the decay fission products. The highest concentration of fission products results from operation for an extended period of time at HFP. At these conditions, Xenon, also a fission product, would be at HFP equilibrium concentration. Other core operation scenarios which produce smaller Xenon concentrations would also produce lower decay heat values and thus less conservative values for the peak clad temperature.

The determination of required RWSP boron concentration is based on considerations of post-LOCA shutdown and also of the refueling boron concentrations. The calculation of RWSP boron requirements for post-LOCA is performed at HZP, no Xenon, all rods in (ARI) - worst rod stuck out (WRSO). The assumption of ARI-WRSO is consistent with the TS Design Bases (3.5.4) for the RWSP. Blowdown forces no longer exist to prevent CEA insertion, therefore ARI condition is assumed. WRSO is considered for events with ARI, to allow for the possibility of the highest soluble boron requirements. The no Xenon condition is assumed since the eventual decay of Xenon will result in higher boron requirements.

No change is being made to the boron concentration upper limit of 2300 ppm. This continues to ensure that there will not be an unacceptably high concentration of boric acid in the core resulting in precipitation during the Long Term Cooling phase following a LOCA.

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 Safety Injection System (SIS) is designed to provide core cooling in the unlikely event of a loss of coolant accident (LOCA). The cooling must be sufficient to prevent significant alteration of core geometry, preclude fuel melting, limit the cladding metal-water reaction, and remove the energy generated in the core for an extended period of time following a LOCA. The SIS fluid must contain the necessary boron concentration to maintain the core subcritical for the duration of a LOCA.

   The proposed change increases the minimum boron concentration in the SITs and RWSP from 1720 ppm to 2050 ppm. Thus, the SIT/RWSP will at all times contain sufficient borated water to provide adequate shutdown margin. Sampling of the system and RWSP required by the Technical Specifications assures that the required dissolved boron concentration is present. In addition to its emergency core cooling function, the SIS functions to inject borated water into the RCS to increase shutdown margin following a rapid cooldown of the RCS as a result of a steam line rupture.

   Operation of the safety injection system is credited in the steam line break analysis for causing a decrease in core reactivity. The current minimum RWSP/SIT concentration to be injected is 1720 ppm. Thus an increase to 2050 ppm will have no adverse affect on this analysis.

   The Mode 5 boron dilution event identifies that with an initial boron concentration of 1240 ppm, a K_{eff} of 0.98, RCS partially drained, and one charging pump operational, the minimum possible time to criticality is greater than 90 minutes. For all other combinations of K_{eff}, RCS conditions, and number of charging pumps, the time to loss of shutdown margin is greater than 55 minutes. Thus, the proposed increase in boron concentration will not affect the results of the Mode 5 boron dilution event.

The change to the action statement of TS 3.9.1 assures that the more limiting reactivity condition of a K_{eff} less than 0.95 or a boron concentration of 2050 ppm specified in the COLR will be adhered to during refueling operations.

The upper limit on boron concentration has not changed; therefore, there will be no affect on boric acid precipitation post-LOCA.

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 physically alter the configuration of the plant and, therefore, does not create the possibility of a new or different kind of accident from any previously evaluated accident.

   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 maintains the minimum of 55 minutes to criticality for the refueling mode boron dilution event analysis. The proposed change continues to ensure that borated water of sufficient concentration is injected from both the SITs and the RWSP in the event of a LOCA or MSLB and that boric acid does not precipitate in the core during long term cooling following a LOCA.

   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.