February 7, 2000

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Mr. Charles M. Dugger
Vice President Operations
Entergy Operations, Inc.
P. O. Box B
Killona, LA 70066

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 - ISSUANCE OF AMENDMENT RE: EXTENSION OF ALLOWED OUTAGE TIME OF SAFETY INJECTION TANK (TAC NO. MA4667)

Dear Mr. Dugger:

The Commission has issued the enclosed Amendment No. 155 to Facility Operating License No. NPF-38 for the Waterford Steam Electric Station, Unit 3. The amendment consists of changes to the Technical Specifications (TS) in response to your application dated January 25, 1999, as supplemented by letter dated December 9, 1999.

The amendment consists of a modification to TS 3/4.5.1 to allow up to 72 hours to restore safety injection tank (SIT) operability if one SIT is inoperable due to boron concentration not within the limits or the inability to verify level or pressure. The proposed change also allows up to 24 hours to restore SIT operability if one SIT is inoperable due to other reasons when reactor coolant system pressure is greater than or equal to 1750 pounds per square inch, absolute.

A copy of our related Safety Evaluation is also enclosed. The Notice of Issuance will be included in the Commission's next biweekly *Federal Register* notice.

Sincerely,

/RA/
N. Kalyanam, Project Manager, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-382

Enclosures: 1. Amendment No. 155 to NPF-38
2. Safety Evaluation

cc w/encls: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

ENTERGY OPERATIONS, INC.

DOCKET NO. 50-382

WATERFORD STEAM ELECTRIC STATION, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 155
License No. NPF-38

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Entergy Operations, Inc. (the licensee) dated January 25, 1999, as supplemented by letter dated December 9, 1999, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C(2) of Facility Operating License No. NPF-38 is hereby amended to read as follows:

   (2) Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A, as revised through Amendment No. , and the Environmental Protection Plan contained in Appendix B, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of its date of issuance and shall be implemented within 60 days from the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

Robert A Gramm

Robert A. Gramm, Chief, Section 1
Project Directorate IV & Decommissioning
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: February 7, 2000

ATTACHMENT TO LICENSE AMENDMENT NO. 155

TO FACILITY OPERATING LICENSE NO. NPF-38

DOCKET NO. 50-382

Replace the following pages of the Appendix A Technical Specifications with the attached revised pages. The revised pages are identified by amendment number and contain marginal lines indicating the areas of change.

Remove	Insert
3/4 5-1	3/4 5-1
3/4 5-2	3/4 5-2
	3/4 5-2a
B 3/4 5-1	B 3/4 5-1
	B 3/4 5-1a
	B 3/4 5-1b

3/4.5 EMERGENCY CORE COOLING SYSTEMS (ECCS)

3/4.5.1 SAFETY INJECTION TANKS

LIMITING CONDITION FOR OPERATION

3.5.1 Each Reactor Coolant System safety injection tank shall be OPERABLE with:

a. The isolation valve open,

b. A contained borated water volume of between 926 (40%) and 1807 (83.8%) cubic feet,

c. Between 2050 and 2900 ppm of boron, and

d. A nitrogen cover-pressure of between 600 and 670 psig.

APPLICABILITY: MODES 1, 2, 3*, and 4*.

ACTION: MODES 1, 2, 3 and 4 with pressurizer pressure greater than or equal to 1750 psia.

a. With one of the required safety injection tanks inoperable due to boron concentration not within limits, restore the boron concentration to within limits within 72 hours or be in at least HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than 1750 psia within the following 6 hours.

b. With one of the required safety injection tanks inoperable due to inability to verify level or pressure, restore the tank to OPERABLE status within 72 hours, or be in at least HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than 1750 psia within the following 6 hours.

c. With one of the required safety injection tanks inoperable for reasons other than ACTION a or b, restore the tank to OPERABLE status within 24 hours, or be in HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than 1750 psia within the following 6 hours.

* With pressurizer pressure greater than or equal to 1750 psia. When pressurizer pressure is less than 1750 psia, at least three safety injection tanks must be OPERABLE, each with a minimum pressure of 235 psig and a maximum pressure of 670 psig, and a contained borated water volume of between 1332 (61%) and 1807 (83.8%) cubic feet. With all four safety injection tanks OPERABLE, each tank shall have a minimum pressure of 235 psig and a maximum pressure of 670 psig, a boron concentration of between 2050 and 2900 ppm boron, and a contained borated water volume of between 888 (39%) and 1807 (83.8%) cubic feet. In MODE 4 with pressurizer pressure less than 392 psia (700 psia for remote shutdown from LCP-43), the safety injection tanks may be isolated.

ACTION: (Continued)

MODES 1, 2, 3 and 4 with pressurizer pressure greater than or equal to 1750 psia (continued).

d. With two of the required safety injection tanks inoperable, restore one of the tanks to OPERABLE status within 1 hour, or be in HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than 1750 psia within the following 6 hours.

MODES 3 and 4 with pressurizer pressure less than 1750 psia

e. With one of the required safety injection tanks inoperable due to boron concentration not within limits, restore the boron concentration to within limits within 72 hours, or be in at least COLD SHUTDOWN within the following 24 hours.

f. With one of the required safety injection tanks inoperable due to inability to verify level or pressure, restore the tank to OPERABLE status within 72 hours, or be in at least COLD SHUTDOWN within the following 24 hours.

g. With one of the required safety injection tanks inoperable for reasons other than ACTION a or b, restore the inoperable tank to OPERABLE status within 1 hour, or be in at least COLD SHUTDOWN within the following 24 hours.

h. With two of the required safety injection tanks inoperable, restore one of the tanks to OPERABLE status within 1 hour, or be in at least COLD SHUTDOWN within the following 24 hours.

SURVEILLANCE REQUIREMENTS

4.5.1 Each safety injection tank shall be demonstrated OPERABLE:

a. At least once per 12 hours by:

1. Verifying the contained borated water volume and nitrogen cover-pressure in the tanks, and

2. Verifying that each safety injection tank isolation valve is open.

b. At least once per 31 days by verifying the boron concentration of the safety injection tank solution.

c. Within 6 hours after each solution volume increase of greater than or equal to 1% of tank volume by verifying the boron concentration of the safety injection tank solution. This surveillance is not required when the volume increase makeup source is the RWSP.

SURVEILLANCE REQUIREMENTS (Continued)

d. At least once per 31 days when the RCS pressure is above 1750 psia, by verifying that the isolation valve operator breakers are padlocked in the open position.

e. At least once per 18 months by verifying that each safety injection tank isolation valve opens automatically under each of the following conditions:

1. When an actual or simulated RCS pressure signal exceeds 535 psia, and

2. Upon receipt of a safety injection test signal.

BASES

3/4.5.1 SAFETY INJECTION TANKS

The OPERABILITY of each of the Reactor Coolant System (RCS) safety injection tanks ensures that a sufficient volume of borated water will be immediately forced into the reactor core through each of the cold legs in the event the RCS pressure falls below the pressure of the safety injection tanks. This initial surge of water into the core provides the initial cooling mechanism during large RCS pipe ruptures.

If the boron concentration of one SIT is not within limits, it must be returned to within the limits within 72 hours. In this condition, ability to maintain subcriticality or minimum boron precipitation time may be reduced, but the reduced concentration effects on core subcriticality during reflood are minor. Boiling of the ECCS water in the core during reflood concentrates the boron in the saturated liquid that remains in the core. In addition, the volume of the SIT is still available for injection. Since the boron requirements are based on the average boron concentration of the total volume of three SITs, the consequences are less severe than they would be if an SIT were not available for injection. Thus, 72 hours is allowed to return the boron concentration to within limits.

If one SIT is inoperable due to inability to verify level or pressure, ability to verify level or pressure should be restored within 72 hours. NUREG-1366, "Improvements to Technical Specifications Surveillance Requirements," Section 7.4 and Generic Letter 93-05 "Line Item Technical Specifications Improvements to Reduce Surveillance Requirements for Testing During Power Operation" discuss surveillance requirements for the instrumentation channels used in the measurement of water level and pressure in SITs. It is the recommendation of the NUREG and Generic Letter that when one SIT is inoperable due only to the inability to verify water level and pressure, 72 hours be allowed to restore the SIT to an OPERABLE status.

The limits on safety injection tank volume, boron concentration, and pressure ensure the assumptions used for SIT injection in the safety analysis are met. If one SIT is inoperable, for a reason other than boron concentration or the inability to verify level or pressure, the SIT must be returned to OPERABLE status within 24 hours. This condition would encompass a closed isolation valve, or actual level or pressure not within limits. In this condition, the total contents of the three remaining SITs cannot be assumed to reach the core during a LOCA, contrary to the assumptions of 10 CFR 50, Appendix K.

CEOG "Joint Applications Report for Safety Injection Tank AOT/STI Extension," CE NPSD-994, provides a series of deterministic and probabilistic findings that support 24 hours as being either "risk beneficial" or "risk neutral" in comparison to shorter periods for restoring the SIT to OPERABLE status.

3/4.5.1 SAFETY INJECTION TANKS (Continued)

The TS allow operation below 1750 psia with three SITs at reduced pressure and increased volume or four SITs at reduced SIT pressure and volume. CE NPSD-994 does not address operation with less than 3 SITs. Therefore, since CE NPSD-994 is not applicable at less than 1750 psia, a separate 1 hour ACTION consistent with the Waterford 3 licensing basis is provided. The limits for operation with a safety injection tank inoperable for any reason except boron concentration or inability to verify water level and pressure minimizes the time exposure of the plant to a LOCA event occurring concurrent with failure of an additional safety injection tank which may result in unacceptable peak cladding temperatures. If one of the required SITs cannot be restored within one hour, the full capability of one safety injection tank is not available and prompt action is required to place the reactor in a mode where this capability is not required. If more than two SITs are inoperable, then entry into 3.0.3 is required.

Thirty-one days is reasonable for verification to determine that each SIT's boron concentration is within the required limits, because the static design of the SITs limits the ways in which the concentration can be changed. The 31 day frequency is adequate to identify changes that could occur from mechanisms such as stratification or inleakage. Sampling the affected SIT within 6 hours after a 1% volume increase will identify whether inleakage has caused a reduction in boron concentration to below the required limit. It is not necessary to verify boron concentration if the added water is from the Refueling Water Storage Pool (RWSP), as long as the water contained in the RWSP is within the SIT boron concentration requirements. This is consistent with the recommendations of NUREG-1366. Likewise, movement of water between SITs is within the confines of the tank system (not from an external makeup source) and is within the SIT boron concentration requirements for tank OPERABILITY, thus sampling is not required for these level changes.

The safety injection tank power operated isolation valves are considered to be "operating bypasses" in the context of IEEE Std. 279-1971, which requires that bypasses of a protective function be removed automatically whenever permissive conditions are not met. In addition, as these safety injection tank isolation valves fail to meet single failure criteria, removal of power to the valves is required.

3/4.5.2 and 3/4.5.3 ECCS SUBSYSTEMS

The OPERABILITY of two separate and independent ECCS subsystems ensures that sufficient emergency core cooling capability will be available in the event of a LOCA assuming the loss of one subsystem through any single failure consideration. Either subsystem operating in conjunction with the safety injection tanks is capable of supplying sufficient core cooling to limit the peak cladding temperatures within acceptable limits for all postulated break sizes ranging from the double-ended break of the largest RCS cold leg pipe downward. In addition, each ECCS subsystem provides long-term core cooling capability in the recirculation mode during the accident recovery period.

When in mode 3 and with RCS temperature above 500°F two OPERABLE ECCS subsystems are required to ensure sufficient emergency core cooling capability is available to prevent the core from becoming critical during an uncontrolled cooldown (i.e., a steam line break) from greater than 500°F.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 155 TO

FACILITY OPERATING LICENSE NO. NPF-38

ENTERGY OPERATIONS, INC.

WATERFORD STEAM ELECTRIC STATION, UNIT 3

DOCKET NO. 50-382

1.0 INTRODUCTION

By application dated January 25, 1999, as supplemented by letter dated December 9, 1999, Entergy Operations, Inc. (the licensee), submitted a request for changes to the Waterford Steam Electric Station, Unit 3 (Waterford 3), Technical Specifications (TS).

The proposed changes would modify TS 3/4.5.1 to extend up to 24 hours the allowed outage times (AOT) to restore a single inoperable safety injection tank (SIT) (for reasons other than those described below) to OPERABLE status. In addition, for a single SIT inoperable specifically due to boron concentration not within the prescribed limits, or due to an inability to verify the required SIT water volume or nitrogen cover pressure, the AOT to restore the SIT to OPERABLE status will be extended from 1 hour to 72 hours. For 2 SITs that are inoperable, the provisions of LIMITING CONDITIONS FOR OPERATION (LCO) 3.0.3 (which would normally apply to this situation in the existing TS) are provided directly in the ACTION statement for this specification. In addition, parts of the footnote for this section that provide details concerning applicability pertaining to pressurizer pressure have also been incorporated into the ACTION statement for this section. Several related editorial changes to Surveillance Requirements (SR) in TS 3/4.5.1 and TS Bases 3/4.5.1 were also proposed by the licensee.

The December 9, 1999, supplement revised the proposed Bases changes and did not expand the scope of the amendment request as initially noticed or change the proposed no significant hazards consideration determination.

2.0 BACKGROUND

Since the mid-1980s, the Nuclear Regulatory Commission (NRC) has been reviewing and granting improvements to TS that are based, at least in part, on probabilistic risk assessment (PRA) insights. In its final policy statement on TS improvements dated July 22, 1993, the NRC stated that it:

> "...expects that licensees, in preparing their Technical Specification related submittals, will utilize any plant-specific PSA [probabilistic safety assessment][1] or risk survey and any available literature on risk insights and PSAs....Similarly, the NRC staff will also employ risk insights and PSAs in evaluating Technical Specifications related submittals. Further, as a part of the Commission's ongoing program of improving Technical Specifications, it will continue to consider methods to make better use of risk and reliability information for defining future generic Technical Specification requirements."

The NRC reiterated this point when it issued the revision to 10 CFR 50.36, "Technical Specifications," in July 1995 (60 FR 36953). In August 1995, the NRC adopted a final policy statement on the use of PRA methods in nuclear regulatory activities that encouraged greater use of PRA to improve safety decision making and regulatory efficiency (60 FR 42622). The PRA policy statement included the following points:

1. The use of PRA technology should be increased in all regulatory matters to the extent supported by the state of the art in PRA methods and data and in a manner that complements the NRC's deterministic approach and supports the NRC's traditional defense-in-depth philosophy.

2. PRA and associated analyses (e.g., sensitivity studies, uncertainty analyses, and importance measures) should be used in regulatory matters, where practical within the bounds of the state of the art, to reduce unnecessary conservatism associated with current regulatory requirements.

3. PRA evaluations in support of regulatory decisions should be as realistic as practicable and appropriate supporting data should be publicly available for review.

In August 1995, the Combustion Engineering Owners Group (CEOG) submitted several Joint Application Reports for the staff's review. One of the CEOG Joint Application Reports provided justifications for extension of the TS AOT for SITs.[2] The justification for this extension is based on a balance of probabilistic considerations, traditional engineering considerations, including defense-in-depth, and operating experience. Risk assessments for all of the Combustion Engineering (CE) plants are contained in the report. The staff first reviewed the Joint Application Report and then reviewed the licensee's plant-specific amendment request which incorporated the Joint Application Report by reference.

Arkansas Nuclear One, Unit 2 (ANO-2) had been the lead CE plant for the SIT TS changes. The staff performed an in-depth review of the ANO-2 PRA methodology relating to these changes, as the lead plant for all of the CEOG. Therefore, a portion of the review of the Waterford 3 amendment request was based on a comparison of the Waterford 3 PRA results with those from ANO-2.

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[1]PSA and PRA are used interchangeably herein.

[2]CE NPSD-994, "Joint Application Report for Safety Injection Tank AOT/STI Extension," May 1995.

In addition, some of the proposed changes would revise TS 3/4.5.1, "Safety Injection Tanks (SITs)" to incorporate recommendations and suggestions from Generic Letter (GL) 93-05, "Line-Item Technical Specifications Improvements to Reduce Surveillance Requirements for Testing During Power Operation," while other changes would revise TS 3/4.5.1 to be consistent with NUREG-1432, "Standard Technical Specifications - Combustion Engineering Plants," Revision 1.

3.0 PROPOSED CHANGES

The licensee proposed the following changes to TS 3/4.5.1:

The change in ACTION paragraphs 3/4.5.1.a, 3/4.5.1.b, 3/4.5.1.c, and 3/4.5.1.d below pertain to the APPLICABILTY for MODES 1, 2, 3 and 4 with pressurizer pressure greater than or equal to 1750 pounds per square inch, absolute (psia).

a. When a single SIT is inoperable due to boron concentration not within prescribed limits or due to the inability to verify SIT water level or nitrogen cover-pressure, the AOT to restore the SIT to OPERABLE status would be extended from 1 hour to 72 hours.

b. When a single SIT is inoperable for reasons other than stated in "a." above, the AOT to restore the SIT to OPERABLE status would be extended to 24 hours. The current AOT is "immediately" if the inoperability is due to a closed isolation valve and 1 hour if the inoperability is due to any other reason.

c. If an inoperable SIT is not restored to OPERABLE status within the AOT, the proposed TS would require transition to HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than 1750 psia within the following six hours. This is consistent with ACTION a. for the current TS but is a change in the times to reach HOT STANDBY and HOT SHUTDOWN from ACTION b. These new times as stated above are consistent with the CEOG Standard Technical Specifications (STS) (NUREG-1432 Revision 1).

d. When two SITs are found inoperable and one of the inoperable SITs is not restored to OPERABLE status within 1 hour, the proposed TS would require transition to HOT STANDBY within the next 6 hours and reduce pressurizer pressure to less than 1750 psia within the following 6 hours. The current TS would require entry into LCO 3.0.3. This change is consistent with the provisions as stated in LCO 3.0.3 and have been provided directly in the ACTION statement for this specification.

The change in ACTION paragraphs 3/4.5.1.e., 3/4.5.1.f., and 3/4.5.1.g. below pertain to the APPLICABILTY for MODES 3 and 4 with pressurizer pressure less than 1750 psia.

e. When a single SIT is inoperable due to boron concentration not within prescribed limits or due to the inability to verify SIT water level or nitrogen cover-pressure, the AOT to restore the SIT to OPERABLE status would be extended from 1 hour to 72 hours. In addition, the TS would require the unit be placed in COLD SHUTDOWN within the next 24 hours.

f. When a single SIT is inoperable for reasons other than stated in "e." above, the AOT to restore the SIT to OPERABLE status would be extended to 1 hour. The current AOT is "immediately" if the inoperability is due to a closed isolation valve and 1 hour if the inoperability is due to any other reason. In addition, the TS would require the unit be placed in COLD SHUTDOWN within the next 24 hours.

g. When two SITs are found inoperable and one of the inoperable SITs is not restored to OPERABLE status within 1 hour, the proposed TS would require transition to COLD SHUTDOWN within the next 24 hours

Minor administrative changes were made to SR 4.5.1.b, SR 4.5.1.c, and SR 4.5.1.d to clarify the intent of the required surveillances.

An additional requirement to verify boron concentration as SR 4.5.1.c has been added which states "Within 6 hours after each volume increase of greater than or equal to 1% of tank volume by verifying the boron concentration of the safety injection tank solution. This surveillance is not required when the volume increase makeup source is the RWSP (Refueling Water Storage Pool)."

A revision to the Safety Injection Tank BASES has been proposed.

4.0 EVALUATION

The staff evaluated the licensee's proposed amendment to the TS using a combination of evaluation tools, including traditional engineering considerations, PRA methods, and a review of operating experience. The staff used insights derived from both traditional engineering considerations and the use of PRA methods to determine the safety impact of extending the AOTs for one inoperable SIT.

4.1 Justification for Proposed Changes

4.1.a Justification for Proposed Change to SIT AOT from 1 to 72 Hours when SIT is Inoperable Due to Boron Concentration Being Outside Limits

An extension of the AOT from 1 hour to 72 hours to restore boron concentration to within limits is consistent with NUREG-1432, "Standard Technical Specifications - Combustion Engineering Plants," Revision 1. The basis for this AOT includes recognition that, although ability to maintain subcriticality or minimum boron precipitation time may be reduced in this condition, the reduced concentration effects on core subcriticality during reflood are minor. In addition, the volume of the SIT is still available for injection. Since the boron requirements are based on the average boron concentration of the total volume of three SITs, the consequences are less severe than they would be if a SIT were not available for injection. Therefore, 72 hours is a reasonable AOT for returning the boron concentration to within limits.

4.1.b Justification for Proposed Change to SIT AOT from 1 Hour to 72 Hours when SIT is Inoperable Due to Inability to Verify Water Volume or Nitrogen Cover-Pressure

The NRC issued GL 93-05 on September 27, 1993, and recommended that licensees add a condition to the SIT TS for the case where one SIT is inoperable due to the inoperability of water level and pressure channels in which the AOT to restore the SIT to OPERABLE status would be 72 hours. GL 93-05 stated that the NRC staff and industry efforts to develop new STS recognized that SIT instrumentation operability was not directly related to the capability of the SITs to perform their safety function. At the time of the development of the STS, the staff did not include a separate condition in the SIT TS for a SIT inoperable due to the inability to verify level or pressure, as was recommended in GL 93-05. However, the staff believes this is appropriate based on the analysis done during the development of NUREG-1366, "Improvements to Technical Specifications Surveillance Requirements," which formed the basis for the issuance of GL 93-05.

The current Waterford 3 TSs do not differentiate between a SIT that is inoperable due to tank inventory or nitrogen gas pressure discrepancies and a SIT whose inventory or gas pressure cannot be verified due solely to malfunctioning water level instrumentation or pressure instrumentation. Because these instruments provide no safety actuation, it is reasonable to extend the AOT to 72 hours under these conditions since the SIT is available to perform its safety function during this time, consistent with the staff's recommendations in GL 93-05.

4.1.c Justification for Proposed Change to SIT AOT from 1 Hour to 24 Hours when SIT is Inoperable for Other Reasons

Industry operating experience has demonstrated that many of the causes of SIT inoperability have been diagnosed and corrected within a relatively short period. However, the diagnosis of the cause and restoration to an operable status of the SIT, in general, takes longer than the existing AOT of 1 hour. In several cases, the diagnosis of an inoperable SIT has resulted in plant shutdowns.

If a single SIT were to be diagnosed as inoperable for reasons other than a closed isolation valve, TS 3/4.5.1, ACTION a., would require restoration in 1 hour. If the ACTION were not completed, the plant would have to be shut down. The extension of the existing SIT AOT to 24 hours should provide the licensee with sufficient time in which to diagnose and possibly repair minor SIT system malfunctions at power, thereby averting an unplanned plant shutdown. Since risk analyses demonstrate that the increased risk of operating with a single SIT out of service is negligible, increasing the AOT can be beneficial by possibly avoiding unplanned shutdowns associated with an inoperable SIT. Unnecessary plant shutdowns associated with the outage of non-risk-significant equipment are undesirable because MODE changes have the potential to increase the risk above that of steady state operation. The proposed times to reach HOT STANDBY and HOT SHUTDOWN when the SIT cannot be restored within the AOT are consistent with the licensee's current TS 3.0.3 and with NUREG-1432.

4.1.d Justification for Proposed Change in the Case of Two SITs Inoperable for any Reason

If two SITs are determined inoperable, the proposed TS would require one of the two tanks be restored to OPERABLE within 1 hour or be in HOT STANDBY within the next 6 hours. The proposed times to reach HOT STANDBY, HOT SHUTDOWN, and COLD SHUTDOWN when one of the two SITs cannot be restored within the AOT are consistent with the licensee's current TS 3.0.3 and with the intent of NUREG-1432.

4.1.e Justification for Proposed Changes to SR 4.5.1.b, SR 4.5.1.c, and 4.5.1.1.c

The proposed change to SR 4.5.1.c and SR 4.5.1.d is administrative and editorial in nature. The proposed change to SR 4.5.1.b, which requires sampling within 6 hours after a 1% increase in tank volume, is being modified to not require sampling if the makeup source is the RWSP. Since the RWSP is required by TS 3/4.5.4 to be within the same boric acid concentration limit as the SITs, the concentration of borated water in the SITs will remain within the TS limits. This change is consistent with the SRs of NUREG-1432 for SIT sampling.

4.1.f Justification for Proposed Change to TS BASES 3/4.5.1 SAFETY INJECTION TANKS

The proposed changes to the TS BASES include references for acceptability of the revised ACTION times and an explanation of the conditions and ACTIONs. Additionally, an explanation is included on the sampling SRs. If the source of the makeup to a SIT is from the RWSP, sampling is not required as the RWSP is required by TS 3/4.5.4 to be maintained within the same concentration limits as the SITs. Any transfer of borated water between the SITs is contained within the confines of the SIT system and maintained within the same boron concentration limits. This BASES change is consistent with the guidelines of NUREG-1432, "Standard Technical Specifications - Combustion Engineering Plants," Revision 1.

4.2 SIT Evaluation

The SITs are passive pressure vessels partially filled with borated water and pressurized with a cover gas (nitrogen) to facilitate injection into the reactor vessel during the blowdown phase of a large break loss-of-coolant accident (LOCA). This action provides inventory to assist in accomplishing the refill stage following blowdown.

Each SIT is piped into an associated RCS cold leg via an emergency core cooling system line also utilized by high-pressure safety injection and low-pressure safety injection (LPSI). Each SIT is isolated from the RCS during full pressure operations by two series check valves. Each SIT also has a normally deenergized open motor-operated isolation valve utilized to isolate the SIT from the RCS during normal cooldown and depressurization evolutions. Each of these valves receive a safety injection actuation signal to open. The SIT gas pressure and volume, water volume, and outlet pipe size are designed to allow three of the four SITs to inject the inventory necessary to keep clad melt and zirconium-water reaction within design assumptions following a design basis LOCA. The design assumes the loss of inventory from one SIT through the LOCA break.

LCO 3/4.5.1 requires that all SITs be OPERABLE whenever the plant is in MODES 1, 2, 3, or 4, with pressurizer pressure greater than or equal to 1750 psia, and MODES 3 or 4 with pressurizer pressure less than 1750 psia. The LCO is based on the assumption that when the plant is in any of these MODES of operation, the SITs must have the same functionality that would be required for a LOCA at full rated thermal power. When the plant is in any of the applicable MODES, a SIT is considered OPERABLE when the following conditions exist:

- The associated isolation valve is fully open.
- Electric power has been interrupted to the motor for the associated isolation valve.
- Water inventory in the tank is within the assumed band.
- The boric acid concentration of the water inventory of the tank is within the assumed band.
- The nitrogen cover pressure within the tank is within the assumed band.

In the past, a justification for the short AOT for one inoperable SIT has been that the perceived severity of the consequences of not having all SITs available to provide passive injection during a design basis LOCA warranted the severity of the requirement to return the SIT to OPERABLE status within 1 hour or shut down the unit. However, the current SIT AOT was based solely on engineering judgment and did not take into consideration a quantitative assessment of risk.

The SIT operational parameters are set by the design basis licensing large break LOCA analysis. Since the SIT is a passive device and provides a limited function, operability has been restricted to mean that the equipment's initial conditions are within a band supported by 10 CFR Part 50, Appendix K, design basis analysis. Analytical models of Appendix K to 10 CFR Part 50 are devised so as to overestimate the amount of liquid lost from the break and to underestimate the residual inventory in the reactor vessel lower plenum. Consequently, inventory discharge requirements are conservatively set at a high level. Extending the AOT from 1 hour to 24 hours for one SIT that is inoperable for reasons other than boron concentration being outside of limits or the inability to verify level or pressure, will allow time for the licensee to correct minor problems with a SIT. Considering the short time frame that a SIT is allowed to be out of service, the low likelihood of a large break LOCA during this short time frame, and the potential risk associated with plant shutdowns, extending the SIT AOT will allow defense in depth to be maintained while not significantly affecting overall safety margins assumed in the design basis analysis.

4.3 Evaluation of the PRA Used to Support the Proposed TS Change to SIT AOT to 24 Hours

The staff used a three-tiered approach to evaluate the risk associated with the proposed TS changes. The first tier evaluated the PRA model and the impact of the AOT extensions for the SITs on plant operational risk. The second tier addressed the need to preclude potentially high risk configurations by identifying the need for any additional constraints or compensatory actions that, if implemented, would avoid or reduce the probability of a risk-significant configuration

during the time when one SIT is out of service. The third tier evaluates the licensee's Configuration Risk Management Program to ensure that the equipment removed from service prior to entering or during the proposed AOT will be appropriately assessed from a risk perspective. Because the SIT sequence modeling is relatively independent of that for other systems, the staff concludes that application of the third tier to the proposed SIT AOT is not necessary. Each tier and the associated findings are discussed below.

4.3.a Cross Comparison Approach

After completing a detailed evaluation for the tentative approval of SIT TS AOT extension for ANO-2, the original CEOG lead plant for the risk-informed TS pilot project, the staff used a cross comparison approach to consider the viability of similar AOT relaxations for other participating CEOG plants, including Waterford 3. The pilot technical evaluation report[3] used in support of the staff's draft safety evaluation for ANO-2[4] focused on:

- the process adopted by the CEOG to assess single AOT risk,
- the identification of ANO-2 accident sequences in which credit was taken for SITs and LPSI,
- independent verification of the single AOT risk [essentially equivalent to incremental conditional core damage probability (ICCDP)[5]], and
- determination of the significance of single AOT risk relative to an acceptance guideline value.

The objective of this cross comparison evaluation is to use insights derived from the ANO-2 technical evaluation to examine the validity of the conclusions drawn in the joint submittals. Because a common methodology was employed by the CEOG to quantify AOT risk and because CE plants generally have similar design characteristics, the staff believes that the findings of the lead pilot plant evaluation will be generally applicable to other CE plants. The staff confirmed that differences in the underlying PRA models are chiefly attributed to:

- minor design differences,
- operational differences,
- success criteria assumptions, and
- common cause failure β-factor assumptions.

The cross comparison draws on information contained in the CEOG Joint Application Reports, the licensees' responses to the staff's requests for additional information, the licensees'

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[3]SCIE-NRC-318-97, "Technical Evaluation of Combustion Engineering Owners Group (CEOG) Joint Application for Safety Injection Tanks and Low Pressure Safety Injection System Allowed Outage Time (AOT) Extension," July 21, 1997.

[4]SECY-97-095, "Probabilistic Risk Assessment Implementation Plan Pilot Application for Risk-Informed Technical Specifications," April 30, 1997.

[5]ICCDP = [(conditional CDF with the subject equipment out of service) - (baseline CDF with nominal expected equipment unavailabilities)] X (duration of single AOT under consideration).

individual plant examinations (IPE) performed in response to Generic Letter 88-20, "Individual Plant Examination for Severe Accident Vulnerabilities," and the corresponding IPE evaluations performed by the staff.

4.3.b Impact of SITs on Tier 1, 2, and 3 Requirements (Risk Measures)

The following factors are chiefly responsible for the differences in SIT AOT risks among the CE plants:

- modeling for success criteria for SITs,
- initiating event (IE) frequency assumed for the initiators challenging the SITs, and
- credit for SITs in mitigating medium LOCAs.

The SIT single AOT risks (or essentially equivalently, ICCDP) for Waterford 3 is 1.37E-07 and is lower than the acceptance guideline value of 5.0E-07 published in Regulatory Guide (RG) 1.177, "An Approach for Plant-Specific Risk-Informed Decisionmaking: Technical Specifications," (63 FR 48771, September 11, 1998), due largely to the use of conservative 3-out-of-4 success criteria (ANO-2 used 2-out-of-4). In addition, the changes in the Waterford 3 updated baseline core damage frequencies (CDF) (as reported in the CEOG Joint Application Report) due to the SIT AOT change is about 0.4%, i.e., from 1.7E-05 to very slightly more than 1.7E-05 per year. The changes in CDFs of 6.3E-08 is within the acceptance guidelines published in RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" (63 FR 44659, August 20, 1998).

In the context of integrated decision making, the acceptance guidelines should not be interpreted as being overly prescriptive. They are intended to provide an indication, in numerical terms, of what is considered acceptable. As such, the numerical acceptance guideline is an approximate value that provides an indication of the changes that are generally acceptable. Furthermore, the state of knowledge, or epistemic, uncertainties associated with PRA calculations preclude a definitive decision with respect to the acceptance of the proposed change based purely on the numerical results. The intent in making the comparison of the PRA results with the acceptance guidelines is to demonstrate with reasonable assurance that the increase in risk is small and consistent with the intent of the Commission's Safety Goal Policy Statement. Given the licensee's use of conservative 3-out-of-4 success criteria, the staff believes that the proposed changes to the Waterford 3 SIT TS meet this principle.

The Tier 2 evaluation did not identify the need for any additional constraints or compensatory actions that, if implemented, would avoid or reduce the probability of a risk-significant configuration. Because the SIT sequence modeling is relatively independent of that for other systems, the staff concludes that application of Tier 3 to the proposed SIT AOT is not necessary.

4.4 Implementation and Monitoring

In addition, the licensee has stated through endorsement of the CEOG Joint Application Reports that the maintenance rule (10 CFR 50.65) will be the vehicle that controls the actual equipment maintenance cycle by defining unavailability performance criteria for the SITs. The AOT extensions will allow efficient scheduling of maintenance within the boundaries established by

implementing the maintenance rule. The effect of the AOT extensions should be considered if any adverse trends in meeting established performance criteria are identified for the SITs. The maintenance rule will thereby be the vehicle that monitors the effectiveness of the AOT extensions. Application of these implementation and monitoring strategies will help to ensure that extension of TS AOTs for SITs does not degrade operational safety over time and that the risk incurred when a SIT is taken out of service is minimized.

5.0 STAFF CONCLUSION

The staff has evaluated the licensee's proposed changes for compliance with regulatory requirements as documented in this evaluation and has determined that they are acceptable. This determination is based on the following:

1. The need to maintain reliable safety systems.

2. Consideration of the design basis requirements for the SITs.

3. Staff recommendations contained in GL 93-05 and NUREG-1432, Revision 1, regarding SIT TS requirements.

4. Insights gained from the quantitative evaluation of the risk associated with having one SIT out of service.

5. Interface considerations that ensure the risk incurred when a SIT is taken out of service is minimized.

6. Performance monitoring through the maintenance rule to ensure that extension of TS AOTs for SITs does not degrade operational safety over time.

The staff therefore finds that the AOT for one SIT that is inoperable for the inability to verify level or pressure or for boron concentration outside limits may be extended to 72 hours, the AOT for one SIT that is inoperable for other reasons may be extended to 24 hours, with a negligible impact on risk. The staff also finds that the proposed related changes to SRs and BASES for TS 3/4.5.1 are acceptable.

6.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Louisiana State official was notified of the proposed issuance of the amendment. The State official had no comments.

7.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The

Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration, and there has been no public comment on such finding (64 FR 9190 February 24, 1999). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

8.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

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