Entergy

Entergy Operations, Inc.
17265 River Road
Killona, LA 70066
Tel 504 739 6660
Fax 504 739 6678

Charles M. Dugger
Vice President, Operations
Waterford 3

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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-38-217
Addition of Main Feedwater Isolation Valves to Technical Specifications
And Request for NRC Staff Review of an Unreviewed Safety Question

Gentlemen:

In accordance with 10CFR50.90, Entergy is hereby proposing to amend Operating License NPF-38 for Waterford 3 by requesting the attached changes to the Technical Specifications. The attached description and safety analysis support the proposed changes to the Waterford 3 Technical Specifications (TS). The proposed change creates a new TS for the feedwater isolation valves. These TS and Bases changes are modeled after the guidelines of TS 3.7.3, Main Feedwater Isolation Valves (MFIVs), in NUREG 1432, "Standard Technical Specifications - Combustion Engineering Plants." With this TS change, TS 3.6.3, Containment Isolation Valves, will no longer be applicable to the MFIVs.

Additionally, this letter provides for NRC Staff review of an unreviewed s. fety question regarding the crediting of the Reactor Trip Override feature and Auxiliary Feedwater Pump high discharge pressure trip as assisting the operation of the MFIVs during their required safety function, to close on a Main Steam Isolation Signal (MSIS). The current operability analysis for the MFIVs shows very little margin between the required thrust for valve closure and the available thrust for valve closure. The MFIVs' friction coefficient used in the current operability evaluation is

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not consistent with the larger, more conservative, value recommended in Electric Power Research Institute (EPRI) guidelines and by the NRC Staff. Due to these circumstances, Entergy proposes to take credit for Reactor Trip Override (RTO) and the Auxiliary Feedwater (AFW) Pump high discharge pressure trip for increased MFIV margin. During review of the proposed resolution under 10 CFR 50.59, an unreviewed safety question regarding the crediting of a non-safety-related feature for a safety related component to perform its safety function was encountered. Further, during a Feedwater Line Break (FWLB) with AFW in operation (the most limiting scenario), a 30 second valve closure will be allowed. This is acceptable because the valve will continue to meet the 60 second requirement for containment isolation based on ANS N271-1976. In order to have the Reactor Trip Override available during manual operation, Entergy will perform a modification to the plant. Due to the high degree of reliability of the secondary system components Entergy believes the safety impact of the proposed changes is minimal. Entergy requests NRC Staff review of this approach as an unreviewed safety question.

Further, contrary to the FSAR, both MFIV hydraulic accumulators must be credited to ensure a rapid valve closure. Technical Requirements Manual changes will be made for crediting backup valves and circuitry. A revision to the FSAR will be made to address the changes associated with this TS Change Request and resolution of the unreviewed safety question. Testing of non-safety-related components credited for MFIV closure (RTO and AFW pump high discharge pressure trip) will be developed and consistent with that for safety-related equipment. All of the commitments contained in this submittal are identified on the attached Commitment Identification/Voluntary Enhancement Form.

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 circumstances surrounding this change do not meet the NRC's criteria for exigent or emergency review. Entergy requests the effective date for this TS change be within 60 days of issuance of the Amendment.

Should you have any questions or comments concerning this request, please contact Everett Perkins at (504) 739-6379 or Curt Taylor at (504) 739-6725.

Very truly yours,

C.M. Dugger
Vice President, Operations
Waterford 3

CMD/CWT/rtk
Attachments: Affidavit
NPF-38-217

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

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

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

AFFIDAVIT

Charles 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-38-217; 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 25th day of June, 1999.

Notary Public

My Commission expires at death.

DESCRIPTION AND NO SIGNIFICANT HAZARDS CONSIDERATION
DETERMINATION OF PROPOSED CHANGE NPF-38-217
AND REQUEST FOR NRC STAFF REVIEW OF UNREVIEWED SAFETY QUESTION

Proposed Change

The proposed change creates a new Technical Specification (TS) Limiting Condition for Operation for the Main Feedwater Isolation Valves (MFIVs). This adds TS Section 3/4.7.1.6, Bases 3/4.7.1.6, and adds this section to the index. This TS and Bases change are modeled after the guidelines of TS 3.7.3, Main Feedwater Isolation Valves (MFIVs), in NUREG 1432, "Standard Technical Specifications - Combustion Engineering Plants."

This change also involves an unreviewed safety question for crediting the Reactor Trip Override (RTO) during Steam Generator Feed Pump (SGFP) operation and the Auxiliary Feedwater (AFW) Pump high discharge pressure trip during shutdown and low power operation with the AFW pump. The RTO and AFW pump trip are non-safety related, but will be credited to allow quick closure of the safety class 2 MFIVs. The aspect of this change requiring NRC Staff review is the fact that MFIV closure, within its required closure time, will be dependent on non-safety RTO circuitry for the SGFPs and the non-safety AFW pump high discharge pressure trip. The crediting of a non-safety-related feature is not normally performed for a safety related function. If the credited RTO or AFW pump trip circuitry were to malfunction and a failure in the back-up valves (Main Feedwater Regulating Valves and Startup Feedwater Regulating Valves) occurred, the MFIVs may take longer to close than the required 5 seconds.

For a Feedwater Line Break during lower mode operation with the AFW pump aligned (the most limiting scenario), a 30 second valve closure will be allowed. This is acceptable because the valve will continue to meet its 60 second General Design Criteria requirement for containment isolation, and preliminary analysis shows that potential consequences will remain conservatively bounded by the Main Steam Line Break and Loss of Coolant Accident in Mode 1 and 2.

As a result of the analysis, a revision to the FSAR will be made to address the crediting of both actuator accumulators for rapid valve closure. Further, an evaluation has been performed for the 30 second closure of the MFIV during AFW operation, and FSAR and Technical Requirements Manual clarifications will be made for crediting backup valves and circuitry. Also, a modification will be implemented to the current RTO circuitry to allow run-back of the SGFPs when the Feedwater Control System (FWCS) is in manual. Currently, the RTO function only works when the control system is in automatic.

Existing Specification

See Attachment A

Proposed Marked-up Specification

See Attachment B

Proposed Specification

See Attachment C

Main Feedwater System Drawing and Reactor Trip Override Logic Diagram

See Attachment D

Commitment Identification/Voluntary Enhancement Form

See Attachment E

Background

System Operation:
The Condensate and Feedwater Systems (CFWS) are designed to supply full load feedwater flow plus steam generator blowdown (maximum of two percent of the rated flow) at full power steam pressures to the steam generators. The CFWS is a closed system with deaeration accomplished in the main condenser. Condensate from the condenser "A" hotwell is pumped by three motor-driven condensate pumps through two stages of low pressure and three stages of intermediate pressure feedwater heaters to the suction of two turbine-driven steam generator feed pumps. The feedwater is then pumped through one stage high pressure feedwater heaters to the steam generators. The CFWS design includes provisions for automatic isolation of the system from the steam generators on a Main Steam Isolation Signal (MSIS). The Main Feedwater Isolation Valves (MFIVs), Main Feedwater Regulating Valves (MFRVs), and Startup Feedwater Regulating Valves (SFRVs) are designed to close within five seconds upon receipt of a MSIS.

The Emergency Feedwater System (EFWS) piping joins the main feedwater piping outside containment. These connections are located between the hydraulically/pneumatically operated MFIVs and the containment penetrations for main feedwater piping. The EFWS may be used to achieve safe plant shutdown by removal of heat from the steam generators in the event of a design basis event.

An Auxiliary Feedwater System (AFWS) is provided to permit plant startup, heatup, cooldown, and steam generator filling. The AFWS is only used during startup, shutdown and low power (1%) operation. During hot standby operations, the AFWS can be used to replace water losses such as from the blowdown system, the atmospheric dump valves, etc. This is accomplished by delivering water from the condensate storage tank to the steam generators via the Auxiliary Feedwater (AFW) Pump. The AFW pump takes suction directly from the condensate storage tank and enters the main feedwater system at a point upstream of the Main Feedwater Regulating Valves. Flow is controlled manually by the operators by positioning of the SFRVs and AFW controls.

The AFWS is a non-seismic system whose electrical components are powered from non-IE sources. It is not intended that this system be used during emergency operations. However, the design of the system is such that sufficient flow to meet Final Safety Analysis Report (FSAR) Chapter 15 requirements can be delivered to the steam generators at maximum steam generator pressure if power is available to the pump's motor.

The MFIV operators are furnished with redundant solenoid valves, powered by diverse power, which operate the hydraulic shuttle valves in the actuator, to insure that no single electrical failure will prevent isolation valve closure. Valve closure is accomplished through two hydraulic accumulators with pressurized nitrogen blankets, which act as "pneumatic springs". The hydraulic accumulators are furnished with integral piston stop tubes on the nitrogen side to ensure that the nitrogen pressure can be effectively monitored. The MFIVs are energized to close in a maximum of five seconds.

The MFRVs & SFRVs are used as a back up to their related MFIVs and are furnished with emergency closure circuits so that the closure of these valves can be actuated through override of their normal control signals to allow closure within 5 seconds. These AOVs also have redundant solenoid vent valves powered from diverse sources to ensure no single electrical failure will prevent valve closure. The Feedwater Regulating Valve Bypass Valves are closed and deactivated during plant operation.

The emergency closure circuits for the MFIVs, MFRVs and SFRVs are actuated by MSIS from redundant channels as shown in FSAR Table 7.3-9. The maximum time

allowed for closure of the valves from a fully open position is 5 seconds for the MFIVs, the Main Feedwater Regulating Valves, and Startup Feedwater Regulating Valves.

The purpose of the Reactor Trip Override (RTO) is to prevent overcooling of the reactor coolant system after a reactor trip. This is accomplished by limiting the feedwater flow to a minimum rate which will slowly refill the Steam Generators (SGs) and make up for decay heat.

The RTO condition is initiated by a reactor trip through four undervoltage relay status signals received from the Control Element Drive Mechanism Control System (CEDMCS). Two of the undervoltage signals are direct inputs to FWCS 1 and the second two undervoltage signals are direct inputs to FWCS 2. (See attached logic drawing.) The RTO actuation requires at least one undervoltage signal directly from CEDMCS combined with one undervoltage signal from the other FWCS. If one or both pairs of undervoltage signals are present, an output is generated to the three time delay networks that will hold the signal output for 10 seconds. This assures that the FWCS will maintain the reactor trip status long enough to allow the RTO to actuate. An output from two of the three time delay networks generate the RTO logic. If a MSIS occurs, a reactor trip will also occur.

At least one UV signal directly from CEDMCS for a particular FWCS coupled with one UV signal from the other FWCS are required to initiate RTO. This increases system reliability by requiring both FWCSs to recognize a reactor trip before starting control action.

If one or both pairs of UV signals are present, a bistable output is generated to the three time delay (seal-in) networks. The time delay networks will hold an output for 10 seconds after receiving an input signal. The 10 second delay is to ensure that RTO is initiated, even with a signal present for only a short period of time. This assures that the FWCS will maintain the reactor trip status long enough to switch to RTO. An output from two of three time delay networks generates the RTO logic. Once the relays perform their function, RTO is locked in until flow demand is less than the RTO flow signal to the respective startup valves or the Operator takes manual control.

When the RTO logic signal exists, the following limitations are placed on the valves and the pump speed program:

- Flow demand to the SGFP is limited to <3.5 percent, holding it at minimum speed (3900 rpm).
- Flow demand to the SFRV is limited to <3.5 percent, holding it at a partially open position.
- Flow demand to the MFRV is limited to 0 percent, holding it closed.

When the reactor trips, a large level decrease in the SGs will occur due to shrink. This large level deviation will result in the FWCS generating a large flow demand signal. With the RTO present, the FWCS should only supply enough feedwater to make up for decay heat removal and to slowly return the SG downcomer water level to normal. This is accomplished as follows:

- There are three comparators that are constantly comparing the actual flow demand signal with minimum flow signal (<3.5 percent of rated flow).
- If the flow demand signal is greater than the <3.5 percent signal, these three comparators seal in the RTO logic signal.
- When the SG levels are returned to a level that results in the flow demand signal being less than ≤3.5 percent, the RTO condition is reset and the FWCS functions as normal in auto.

When a MSIS occurs and the MFIVs, MFRVs and SFRVs close after 5 seconds, feedwater is isolated such that the above actions of the RTO circuitry have no effect on feedwater flow to the SG.

Note that the RTO programs are currently only activated if their respective FWCS Manual/Auto Stations are in the auto mode of operation. Pending approval of crediting RTO for MFIV closure, a modification to the RTO system will be implemented to ensure the SGFPs will run back to minimum speed on a reactor trip when the FWCS is in manual.

The RTO system at Waterford 3 has proven to be an exceptionally reliable system. The FW Controls System Engineer and Instrumentation and Controls Supervisor could recall no failures of the RTO system to reduce SGFP speed when required during the history of plant operation. A search of the Waterford 3 Condition Report System also showed no failures of the RTO to reduce SGFP speed. Further, the RTO circuitry is tested every outage to ensure it is working properly. Multiple inputs are simulated, and the outputs, such as valve positioning and pump speed, are verified.

The FWCS is included in the Maintenance Rule as a system whose functions encompass satisfactory automatic operation during load rejection, reactor trip (RTO), and high SG level.

Issue History:
During the Engineering and Tech Support Inspection at the end of 1997, the friction coefficient used for the sizing of the MFIVs was questioned. It was discovered that the manufacturer, Anchor Darling Valve Company, used a 0.2 friction coefficient for valve design. However, based on test information from industry motor operated valve

programs, a friction coefficient of 0.4 is recommended as a bounding value for the MFIV. Also, the MFIVs were designed for a differential pressure equal to the design pressure of the associated piping, 1400 psig. However, during the system level review for the valve, it was discovered that the actual differential pressure could be much higher under Design Basis Accident (DBA) conditions if crediting only safety related equipment and assuming the worse case non-safety system responses. Due to these findings, the MFIVs are currently considered to be marginal in their ability to close rapidly under DBA conditions.

To address this issue, Entergy proposes to credit the Reactor Trip Override feature of the Feedwater Control System, since the Main Steam Line Break (MSLB) and Feedwater Line Break (FWLB) initiating conditions cause both a Reactor Trip and MSIS. As discussed above, the RTO rapidly runs the SGFP to minimum speed, thus reducing the differential pressure across the MFIVs, allowing rapid closure under the MSLB or FWLB scenario. The RTO is non-safety related, but will be credited to allow quick closure of the safety class 2 MFIVs. It should be noted that the MFIVs will close without the RTO function, but the closure time may be longer than the currently assumed 5 seconds in the safety analysis. Additionally, crediting the current non-safety AFW pump discharge pressure trip during AFW pump operation is required.

The FSAR currently states that the MFIV actuators each have two closure channels that are electrically and mechanically redundant, such that no single failure can prevent valve closure, and each is capable of valve closure. During system/valve capability reviews, these statements were found to be inaccurate. Both channels must be credited for valve closure during SGFP and AFW pump operations due to the large differential pressure developed during an accident. A revision to the FSAR will be developed to state this fact upon NRC Staff acceptance of this resolution. This is also included in the Bases to the proposed TS change.

These changes will increase valve margin, allowing the use of a 0.4 recommended friction coefficient, and will reduce the assumed maximum differential pressure across the valve.

Testing of non-safety-related components credited for MFIV closure (RTO and AFW pump high discharge pressure trip) will be developed and consistent with that for safety-related equipment.

Other options were considered to increase MFIV margin before this resolution was accepted. One option that was considered by Entergy was a modification to the MFIV actuator. If a modification were to be developed, the quickest, most affordable, least impact idea was to add a supplementary nitrogen volume to the existing accumulators. The nitrogen expansion is the motive force that is used to close the valve. With a larger

volume of nitrogen available, the expansion ratio is decreased, and a greater force is available to close the valve at the end of the stroke.

However, this greater force, although it will allow the valve to meet its safety function under the worst postulated expected differential pressure, would potentially compromise piping/valve load and stress analyses for non-worst case operations. The additional nitrogen would add almost 26,000 pounds of thrust at the end of the valve stroke as it contacts the seat, based on a beginning nitrogen pressure at the low alarm setpoint. If the nitrogen were at its normally maintained pressure of 5000 psig, the additional force is over 30,000 pounds. This could challenge the integrity of the valve components. Because there are negligible resistance forces in a static stroke, all of this force would only be stopped by the disk/seat contact. Further, because there are low resistance forces, the stroke time would be much less than 5 seconds. Any change that lowers the MFIVs closure time increases the potential for water hammer events. Waterhammer in high energy secondary plant systems is a significant concern. Due to the greater forces and potential stroke time issues, the increased nitrogen volume modification was eliminated.

Because of water hammer concerns, the minimum allowable closing time is limited to 1.5 seconds. The maximum is limited by the accident stroke time of 5 seconds assumed in safety analyses for Feedwater and Main Steam Line Breaks. Therefore, the actual stroke time must fall between 1.5 and 5 seconds. This range dictated the types of actuator options available. A motor operator would not be fast enough to close the valve within the required 5 seconds. A spring to close actuator may be too fast, since the speed of the spring force cannot be regulated and the outlet air force may be difficult to regulate. Therefore, another hydraulic system would be the optimal choice if an entire actuator replacement was chosen.

In gate valves with hydraulic actuators, the actual valve closure time is affected by system pressure. The MFIV actuators' hydraulic system can be adjusted to control valve closure speed. This adjustment cannot totally account for the effects of different differential pressures. The higher the differential pressure across the valve, the slower the stroke; and the lower the differential pressure, the faster the stroke. A normal or spurious closure in which differential pressure would be much lower due to high pressure in the steam generator or proper operation of the Reactor Trip Override system, would cause the stroke time to be much faster. According to simple calculations performed using the existing MFIV actuators as a model, the actual closure could be lower than the 1.5 second limit if actuator force was increased, thus compromising piping integrity. The MFIV integrity may also be compromised by such a fast closure due to the upstream check valve existing in the line. Based on these factors, the increased nitrogen volume and the new hydraulic actuator options were eliminated.

A third option involved a plant modification consisting of the addition of circuitry to trip the Steam Generator Feed Pumps (SGFPs) on a MSIS actuation. The new trip circuitry would be non-safety related, but credited to allow quick closure of the MFIVs. The Loss of Feedwater Event can be initiated by the loss of a SGFP. Therefore, any modification that could increase the probability of a pump trip could increase the probability of this event. A modification like this would be intended to minimize the increase in the event probability through the design. The trip circuitry added would be of the same quality classifications and construction as that currently existing, and send the trip signal to the same trip valves that currently trip the pump for other occurrences (i.e.-low oil pressure). Further, the trip circuitry would be designed such that no single failure in the circuitry or from the MSIS signals would cause a SGFP trip. The signals used for the SGFP trip would be the same, safety related MSIS signals that are currently sent to the MFIVs. Therefore, if the signal was sent to the valves, it would also be sent to the pumps.

Because the proposed modification would cause some increase in the probability of a Loss of Feedwater Event, it is not the preferred resolution to this issue. This modification would incur high cost with a trade-off in mitigation of one accident with the increase in the probability of another. Furthermore, the current Reactor Trip Override system is considered to be as reliable as a modification to add a SGFP trip, with significantly less risk involved and minimal plant modification necessary. Tripping the SGFP versus taking credit for the RTO feature has only one advantage, which is that only one accumulator would be necessary to rapidly close the MFIV. However, that redundancy which adds operational flexibility is offset by the increase in the probability of a loss of feedwater event.

The final option considered to solve the marginal MFIV issue was to replace the entire valve/actuator assembly in both Feedwater Lines with an assembly that was capable of isolating Feedwater at pressures potentially greater than 1900 psig, assuming worst case of every design feature. Some other plants have taken this route and were contacted to estimate the approximate cost of a similar effort. It was estimated that the replacement of both assemblies would be in excess of $1 million. This is a very large cost in comparison with the other options considered, and does not address the disadvantages, including piping overpressurization. The Feedwater piping design pressure is 1400 psig. However, during valve closure, if only safety related systems are credited, absolute worst case scenarios estimate the pressure upstream of the closed MFIV could approach approximately 1900 psig, thus potentially compromising piping integrity.

Therefore, because of the potential of disrupting the current piping, valve supports and loadings, and the potential for creating a waterhammer event, the submittal of the

proposed resolution to credit Reactor Trip Override and trip of AFW pump to the NRC Staff is the most viable option. The Reactor Trip Override and Auxiliary Feedwater pump high discharge pressure trip are two reliable features. RTO has been shown to be functional in every reactor trip at Waterford 3. Crediting these features for the design basis of the Main Feedwater Isolation Valve closure is the safest, most economical resolution of this issue.

Description and Safety Considerations

Technical Specification Change Request:

The proposed change to the TS adds the MFIVs as Section 3/4.7.1.6, Bases 3/4.7.1.6, and the addition of this section to the index. This TS and Bases change is modeled after the guidelines of TS 3.7.3 Main Feedwater Isolation Valves (MFIVs) in NUREG 1432, "Standard Technical Specifications - Combustion Engineering Plants." The allowed outage time of 72 hours is used for the MFIVs as the Waterford 3 design contains as a backup to these valves, the Main Feedwater Regulating Valves and Startup Feedwater Regulating Valves, which also receive a MSIS signal. The MFRVs and SFRVs are designed to close against full pump differential pressure.

The APPLICABILITY of the proposed Waterford 3 TS (MODES 1 – 4) is more conservative than that in NUREG 1432 (MODES 1 – 3) consistent with the Waterford 3 safety analysis.

The ACTIONs for an inoperable MFIV are modeled after those in NUREG 1432. Both NUREG 1432 and the proposed change require closure and deactivation of an inoperable valve or isolation of an inoperable valve within 72 hours. The time requirement of 72 hours provides adequate time for repair of an inoperable valve. This allowed outage time (AOT) is appropriate due to the backup capability afforded by the MFRVs and SFRVs, which also receive a MSIS signal. TS 3.6.3, Containment Isolation Valves, will no longer be applicable to the MFIVs. This is consistent with the application of this TS in NUREG 1432. RTO provides an additional degree of mitigation in the reduction of feedwater flow due to SGFP speed reduction. RTO and MSIS are both activated by diverse means and multiple channels providing increased reliability. Thus the common mode failure discussed in NUREG 1432 for an 8 hour AOT (bracketed value) is inappropriate for Waterford 3. The MFRVs, SFRVs, RTO and AFW pump high discharge pressure trip features will be added to the Technical Requirements Manual (TRM), with allowed outage times appropriate to their safety significance. The TRM is considered to be part of the Final Safety Analysis Report at Waterford 3.

If an inoperable valve is closed and deactivated or isolated, the status is verified every 7 days. This time is reasonable, in view of valve status indications available in the control room, and other administrative controls to ensure that these valves are closed or isolated.

If an inoperable valve is not closed and deactivated or isolated, the time required to place the plant in a MODE in which the valve is no longer required to be OPERABLE is appropriate and consistent with the requirements of other Waterford 3 TS.

The MFRVs and SFRVs are used as a back up to their related MFIV. The MFIV does not require the MFRVs and SFRVs for OPERABILITY, however since these valves are relied upon for back up capability, a TRM ACTION will be entered for inoperability of these valves. These valves are furnished with emergency closure circuits so that the closure of these valves is actuated through override of their normal control signals.

The capability of the Reactor Trip Override to reduce SGFP speed to minimum is required during SGFP operation for OPERABILITY of the MFIVs as is the OPERABILITY of both sets of accumulators. A TRM ACTION will also be added for RTO.

During AFW pump operation, OPERABILITY of the Auxiliary Feedwater (AFW) pump discharge pressure trip and both sets of MFIV hydraulic accumulators are required for MFIV OPERABILITY due to the high discharge pressure of the AFW pump. A TRM ACTION will be added for AFW pump discharge pressure trip.

The TS is annotated with a 3.0.4 exemption, allowing entry into the applicable MODEs to be made with a MFIV closed or isolated as required by the ACTIONs. This is allowed as 3.0.4 states that entry into an OPERATIONAL MODE or specified condition may be made in accordance with ACTION requirements when conformance to them permits continued operation of the facility for an unlimited period of time. Thus, if a MFIV is closed and isolated (as required by the ACTIONs), entry into the applicable MODEs may be made for testing.

The ACTIONS in NUREG 1432 are annotated with a note allowing separate condition entry for each valve. This precludes immediate entry into TS 3.0.3 if both MFIVs are declared inoperable, i.e. the 72 hour AOT would apply. This philosophy is included in this TSCR by using this note and "With one or more MFIV.." consistent with the format of the Waterford 3 TS.

The Surveillance Requirement to verify isolation in less than or equal to 5 seconds is based on the time assumed in the accident analyses. The static test will show that the

valve is capable of a 5 second closure time under design basis conditions. The MFIVs should not be tested at power since even a partial stroke exercise increases the risk of a valve closure, and subsequent Loss of Feedwater, with the plant generating power and would create added cyclic stresses.

The MFIVs are tested on a cold shutdown frequency to verify closure time in accordance with TS 4.0.5 due to the operational impact of testing valves quarterly at power, which would interrupt main feedwater flow to the steam generators. The frequency is acceptable from a reliability standpoint and is in accordance with the Inservice Testing Program.

The Surveillance to verify each MFIV can close on an actual or simulated actuation signal is normally performed when the plant is returning to operation following a refueling outage. Verification of valve closure on an actuation signal is not required until entry into Mode 3 consistent with TS 3.3.2. The 18 month frequency is based on the refueling cycle.

Testing of MFRVs & SFRVs is also performed in accordance with the Inservice Testing Program. Testing of RTO and the AFW pump trip credited for MFIV closure will be similar to that conducted for safety-related circuits, tested on an 18 month frequency. This provides assurance of the reliability of the non-safety related functions credited either as backup to or to support safety related functions. These testing requirements will be added to the TRM.

The Surveillance is modeled after the guidelines of NUREG 1432, as modified by Technical Specification Task Force Traveler 289, which has been approved by the NRC Staff.

Proposed Resolution to Main Feed Water Isolation Valve Margin Issue:

The accidents/events that may be affected by the proposed resolution are the events that actuate a MSIS or credit Operator action to close the MFIVs. The limiting events with respect to design or regulatory consequences are the Main Steam Line Break and the Feedwater Line Break. This is because these accidents create the largest differential pressure across the MFIV (creating the biggest challenge to rapid closure) and the MFIV is automatically actuated during these events.

Feedwater and Main Steam Line Breaks (FWLB & MSLB):

The crediting of the Reactor Trip Override (RTO) circuitry for the SGFPs and the Auxiliary Feedwater (AFW) high discharge pressure trip will not affect the

probability of occurrence of a MSLB or FWLB. Neither the AFW pump nor the SGFPs are initiators of either line break. The crediting of the RTO circuitry for the SGFPs and the crediting of the AFW pump trip will also not affect the consequences of a MSLB or FWLB. The configuration for the SGFP RTO feature and AFW pump trip currently exists. No modification is necessary to add these features, only to modify RTO to function during manual FWCS operations. The SGFP RTO feature allows more reliable MFIV closure by reducing the differential pressure against which the MFIVs must close. Therefore, the consequences of the line break will not be increased.

The aspect of this change requiring NRC Staff review is the fact that MFIV closure, within its required closure time, will be dependent on non-safety RTO circuitry and trip circuitry of the AFW pump. The crediting of a non-safety function is not normally performed for a safety related function. If the SGFP RTO circuitry were to malfunction, the MFIV would close, but may take longer than the required 5 seconds. However, given a single failure of the RTO circuitry, main feedwater isolation is accomplished by closure of the MFRV and SFRV, which are designed to close against full pump developed head. Thus, the isolation function is met assuming a single failure.

As stated in NUREG-0138, Staff Discussion of Fifteen Technical Issues Listed in Attachment to November 3,1976, Memorandum from Director NRR to NRR Staff, "Treatment of Non-Safety Grade Equipment in Evaluations of Postulated Steam Line Break Accidents", the NRC Staff concluded that it was acceptable to rely on non-safety grade components in the main steam (MS) and feedwater (FW) systems as a backup to safety grade components because their design and performance were compatible with the accident conditions under which they were required to function. It was the NRC Staff's position that utilization of these components as a backup to a single failure in the safety grade components adequately protected the health and safety of the public. Reliance on non-safety grade components as a backup was permitted based on reliability of the components. This verbiage indicates that secondary rupture events were deemed less significant and exceptions could be made. This is reiterated in NUREG-0800, "Standard Review Plan," Section 15.1.5.II.i, which allows crediting non-safety grade components to mitigate the consequences of breaks of seismic piping downstream of the MFIVs. Currently, the MFRVs and SFRVs are credited in the Waterford 3 licensing basis as a backup to the MFIVs. However, this request expands that philosophy to credit the nonsafety RTO features of the SGFPs and trip of the AFW pump for MFIV closure as well.

Other Events:

The Loss of Feedwater Event can be initiated by the loss of a SGFP. The currently analyzed Loss of Feedwater Event evaluates the loss of both SGFPs, which bounds a potential loss of one SGFP. Therefore, any modification that could increase the probability of a pump trip could increase the probability of this event. Since the proposed solution of crediting RTO features of the SGFPs and the trip of the AFW pump for the MFIV margin issue uses existing functions, no new features/trips will be added, and there is no increase in the probability or consequences of a Loss of Feedwater Event. The only plant modification being made is to enhance RTO such that it will run the SGFPs back to a minimum speed on a reactor trip, even when the FWCS is in manual. Although this slows the pump down, feedwater and the SGFPs remain available and the Loss of Feedwater Event probability is not significantly increased. The modification to make RTO function when the FWCS is in manual is not significant since the FWCS is in manual for such a short period of time during plant operation.

The other events that actuate MSIS or credit Operator action to close the MFIVs (for instance during Loss of Coolant Accident and Steam Generator Tube Rupture) are bounded by the events discussed. This is due to the low differential pressure across the MFIV in these events. No credit for AFW pump trips or RTO features would be required.

MFIV Risk Significance:

A simple and conservative risk assessment was performed to determine the significance of a failure to close the Main Feedwater Isolation Valves (MFIV) due to a failure of RTO to run the pump back to a minimum speed. No significant impact on core damage frequency resulted since the MFIV will eventually close after a Main Steam Isolation Signal isolates steam to the feedwater pump turbine. However, it is assumed that EFW operation could be affected through overfilling the steam generators prior to MFIV closing, causing water slugs/flow to the EFW pump turbine. The only line break in which this could occur is a break between the MSIVs and the EFW steam line, which is less than 50' of piping on each train. Any other break would cause the feedwater to flow out of the main steam and feedwater lines prior to reaching the EFW steam line. The increase in core damage frequency has been conservatively calculated for this scenario:

- Steam line break occurs in the section of line between the MSIV and EFW steam discharge on either side: P_1 = 2 sections x 8760 hrs * 8.9×10^{-10} per section-hour = 1.56×10^{-5}. This initiating event creates a demand for closure of the MFIV in response to the accident. 8.9×10^{-10} per section-hour is the recommended initiating

event frequency per EPRI Report TR-102266, Pipe Failure Study Update, for PWR Main Steam Lines > 6".

- Main and start-up regulating valves fail to close on a Main Steam Isolation signal: $P_2 = (2.2 \times 10^{-3}) * 2 = 4.4 \times 10^{-3}$. The regulating valves are capable of closing against maximum postulated differential pressure.
- Main feedwater pump fails to run back to minimum speed on a reactor trip: $P_3 = 1/61 = 1.6 \times 10^{-2}$. No failure has occurred in 60 documented trips. For conservatism in calculating the probability of failure, the next trip is assumed a failure. However, this is considered to be a very conservative calculation. Further, if the controls fail to decrease the feedwater pump speed, the MFIV will close slower than the required 5 seconds, but will eventually close, preventing SG overfill and EFW failure. It is conservatively assumed, however, that failure of the MFIV to close in 5 seconds would cause total failure of the EFW pump turbine.

Multiplying these individual probabilities produces 1.1×10^{-9} as the probability for failure to isolate the feedwater line during the postulated scenario. This scenario bounds the time during which the auxiliary feedwater pump is aligned to the steam generator. The AFW case adds a comparably negligible contribution due to the small exposure time.

In actuality, the pressure downstream of the MFIV in the steam generators during a MSLB should be high enough to allow rapid MFIV closure within the required 5 seconds with a failure of RTO to spin the SGFP back to minimum speed. However, it is conservatively assumed that isolation of feedwater, due to the above failures, would not occur during this steam line break. It is assumed that subsequent overfill of a steam generator would occur causing the EFW turbine driven pump to fail. The result is an increase in core damage frequency of 1.8×10^{-13}. This small result is also considered to be conservatively high, based on the assumptions made in the analysis. Thus, the concern for failure to close the MFIV is not risk significant in this MSLB event, which bounds the FWLB scenario for impact on core damage. In both cases, because the CDF increase is very small, the change in Large Early Release Fraction (LERF) is negligible.

No Significant Hazards Consideration Determination

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:

The proposed change to add the Main Feedwater Isolation Valves (MFIVs) to the Technical Specifications (TS) and provide an allowed outage time of 72 hours with appropriate required ACTIONs does not affect the operation of any structures, systems, or components or the assumptions of any accident analyses. The MFIVs are primarily designed to mitigate the consequences of a Main Steam Line Break (MSLB), and the Feedwater Line Break (FWLB). This TS change ensures the 5 second closure time currently assumed in the Waterford 3 analysis, thus it preserves the current analysis. Hence, the consequences of accidents previously evaluated do not change. Therefore, this change does not involve an increase in the consequences of any accident previously evaluated. Adding the MFIVs to the TS will not initiate an accident. Providing a TS and allowed outage time makes no changes to the plant and, thus, no increase in the probability of any accident previously evaluated.

The accidents/events that may be affected by the proposed resolution are the Reactor Trip Override (RTO) circuitry for the Steam Generator Feed Pumps (SGFPs) during SGFP operation and the crediting of the Auxiliary Feedwater (AFW) pump high discharge pressure trip during AFW pump operation are the MSLB and the FWLB.

The crediting of the RTO circuitry for the SGFPs and the crediting of the AFW pump trip will not affect the probability of occurrence of a MSLB or FWLB. Neither the SGFPs nor the AFW pump are initiators of either line break.

The crediting of the RTO circuitry for the SGFPs and the crediting of the AFW pump trip will not adversely affect the consequences of a MSLB or FWLB. Ultimately, the RTO feature allows more reliable MFIV closure by reducing the differential pressure against which the MFIVs must close while not introducing a new failure mechanism such as a Loss of Feedwater or water hammer event.

The RTO feature (which has always been a part of the Waterford 3 plant design) mitigates the consequences of the MSLB and MFLB by reducing flow to the affected steam generator and containment.

The Loss of Feedwater Event can be initiated by the loss of a SGFP. The currently analyzed Loss of Feedwater Event evaluates the loss of both SGFPs, which bounds a potential loss of one SGFP. Therefore, any modification that could increase the probability of a pump trip could increase the probability of this event. Since the proposed solution of crediting RTO features of the SGFPs and the trip of the AFW pump for the MFIV margin issue uses existing functions, no

new features/trips will be added, and there is no increase in the probability or consequences of a Loss of Feedwater Event. The only plant modification being made is to enhance RTO such that it will run the SGFPs back to a minimum speed on a reactor trip, even when the FWCS is in manual. Although this slows the pump down, feedwater and the SGFPs remain available and the Loss of Feedwater Event probability is not significantly increased. The modification to make RTO function when the FWCS is in manual is not significant since the FWCS is in manual such a short period of time during plant operation.

The AFW system is not credited in any accident analysis. The Emergency Feedwater (EFW) system is relied upon in the safety analyses to replenish SG inventory. Therefore, crediting the AFW pump discharge pressure trip will not involve an increase in the probability or consequences of any accident.

In conclusion, the proposed TS change and resolution to the MFIV margin issue 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:

The proposed TS change in itself does not change the design or configuration of the plant. No new or different equipment is being installed by the TS. No new or different accidents result from the addition of the MFIVs to the TS. Previously performed accident analyses remain valid. The proposed allowed outage time and required actions of the proposed TS do not change the procedural operation of the plant, but specify the requirements for treatment of the MFIVs under the plant TS. Therefore, no new or different type of accident from any accident previously evaluated is created.

No new system interaction is created by crediting the existing RTO and AFW pump trip. Failure to isolate feedwater would require two failures, failure of the RTO or AFW circuitry, in addition to the failure of the Main Feedwater Regulating Valves (MFRVs) and Startup Feedwater Regulating Valves (SFRVs) to close, and is beyond single failure criteria. If the RTO and AFW features were the single failure, then closure of the regulating valves would be credited for MSIS isolation since the regulating valves were designed to close against SGFP shutoff head.

RTO and AFW pump trips would not be considered initiators of a MSLB or FWLB, but could be considered initiators of a Loss of Feedwater Event. However, this event is bounded by the analyzed Waterford 3 Loss of Feedwater Events. No new event is created. The only hardware change being made is the use of RTO for pump run back when the FWCS is in manual. The existing signal will be used and routed through the same methods as are currently installed, ensuring it will run the pump back appropriately. Therefore, no new system interactions or events are created.

The new method of potential failure that has not previously been evaluated is in the fact that Waterford 3 would now be crediting a non-safety related circuit for closure of the safety related MFIVs. Non-safety features are not normally credited for the proper operation of a safety related component. However, in this case, for the valve to close in the 5 seconds assumed in safety analyses, the RTO and AFW pump trip will be credited. Because this is new, different and not a previously approved allowance, this resolution must be submitted for NRC Staff approval. Entergy believes this resolution is acceptable based on the high degree of reliability of these components.

The system design, as discussed above, does not increase the potential for a Loss of Feedwater Event and current analyses bound all potential accident scenarios. Therefore, the proposed TS change and resolution to the MFIV margin issue 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:

The MFIVs have no effect on a margin of safety as defined by Section 2 of the TS. Their only effect is response to the accidents described above, which will be enhanced by specifying an allowed outage time, action requirements and surveillance requirements in the TS. Therefore, no reduction in the margin of safety is involved with the addition of these valves to the TS.

No new system interaction is created by the crediting of the RTO feature or the AFW pump trip, or the addition of RTO operation in manual.

The proposed resolution does affect a part of a protective boundary, the MFIV, which serves to isolate the Main Feedwater system from portions of the system

inside containment. However, it does not affect operation or function of the valve itself since no changes to the valve are being made. The proposal allows increased margin for valve closure; therefore, margins of safety are not affected. The valve will close within the time limits required by safety analyses and general design criteria.

Therefore, the proposed TS change and resolution to the MFIV margin issue will not involve a significant reduction in a margin of safety.

Safety and Significant Hazards Determination

Based on the above No Significant Hazards Evaluation, 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.