October 5, 2000

MEMORANDUM TO: File

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

SUBJECT: WATERFORD STEAM ELECTRIC STATION, UNIT 3 RE: RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION (TAC No. MA6173)

The purpose of this memorandum is to place into ADAMS, the attached e-mail received from representatives of Entergy Operations Inc. (the licensee) dated May 31 and June 22, 2000, providing their response to the staff's questions related to Technical Specification (TS) change request NPF-38-217 regarding the addition of main feedwater isolation valves to TS. The two e-mails were in response to the staff's questions during telephone calls to the licensee on May 23 and June 19, 2000.

Attachments: As stated

Docket No.: 50-382

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From: "BURFORD, FRANCIS G" <FBURFOR@entergy.com>
To: "'kdd@nrc.gov'" <kdd@nrc.gov>
Date: Wed, May 31, 2000 10:43 AM
Subject: Supplemental Info - FWIV Submittal

Kulin -

Attached is a file that provides additional info to support your review. The table on the second page quantifies the available and required thrust values for each scenario. We would like to discuss any questions you may still have. I am at the site today and can be reached at (504) 739-6692. I will try to contact you after lunch.

Jerry Burford

<<FWIV info for NRC.doc>>

CC: "'nxk@nrc.gov'" <nxk@nrc.gov>, "COOK, KIMBERLY S" ...

FWIV Risk–Informed Licensing Basis Change

Per conversations on 5/23/00, the following discussion attempts to provide a simplified list of items to consider in peak containment pressure for the deterministic review of the FWIV closure scenarios:

100% Power MSLB – The valve will close in this scenario without credit for RTO, due to the lower differential pressure across the valve from the residual pressure existing in the ruptured steam generator at valve closure. Therefore, this scenario is not a change.

AFW Scenarios –

* Cold water (less than 100 degrees) is fed at a low flow rate. This is comparable to a containment spray function, and should actually help to condense the steam. Therefore, containment pressure is not an issue.
* For inside containment flooding concerns, at a 500 gpm flow rate for 30 minutes approximately 15,000 extra gallons would be added to the blow-down from the steam generators. This amount of water is bounded by the LOCA event, where the entire RCS, SITs, BAM Tanks and RWSP are assumed to flow into the containment sumps. The SITs and BAM Tanks alone have more volume than the 15,000 gallons from AFW, and these tanks are not emptied in the secondary line break scenarios. Therefore, flooding is not a concern for this scenario.

100% Power FWLB –

* The current Licensing Basis does not include a peak containment pressure calculation for feedwater line breaks because it is bounded by steam line breaks. Peak pressure for feedwater line breaks is expected to be several psi below a steam line break.
* It will take longer to reach peak pressure during a FWLB as compared to a MSLB due to the lower flow rate caused by the tortuous path out of the steam generators through the J-tubes and feed ring. The slower build up in pressure allows more time for containment cooling mechanisms, spray & fan coolers, to have a greater impact.
* There is significant margin in the design pressure for the Waterford containment. IPE studies show that for containment designs similar to W3, the failure pressure is typically 2 – 3 times greater than the design pressure. Therefore, if the design pressure was slightly exceeded, the safety function of containment would still be met.

The MSLB analysis assumes all water in the steam generator is flashed to steam, which conservatively maximizes the calculated containment pressure. In a FWLB, two-phase flow will be coming out of the feed line (about 450 degrees) and out of the steam generator, again being pushed through the tortuous path. Therefore, even with potentially up to a minute to full valve closure, less energy will be released to containment for the FWLB.

* Upon event initiation, the valve will go towards the fully closed position. It will hesitate at the point where the differential pressure resistance is equivalent to the available actuator thrust. This will decrease the flow rate, such that a fraction of full

SGFP flow will get to the break. The valve will continue to close as the steam power is isolated from the pump (after 4 seconds) and the nitrogen expansion moves towards isothermal, until the valve is fully closed.

* There is conservatism in the valve thrust calculation itself: a bounding 0.4 friction coefficient was used, the low alarms setpoint for beginning nitrogen pressure less tolerance and inaccuracy was used, and the shut-off head of the SGFPs and heater drain pumps was used.
* The defense in depth argument is based on two single failures: the currently credited regulating valve and RTO.

As a concluding statement, EOI would like to add that the purpose of a risk-informed licensing basis change is to blend the defense in depth review with a review of the risks involved. The risk involved with a closing FWIV is very negligible, even with a non-safety system credited. This is why the time, effort and money that could have been spent on new analyses of a FWLB with a slower FWIV closure times have been deemed not cost beneficial and unnecessary; and why a purely qualitative analysis was performed.

We would also like to make it clear that, with RTO credited, the FWIV will meet its 5 second closure time in all scenarios but one, the FWLB with AFW in operation. This latter event would have a 30 second closure time. All other closure time discussions in the defense in depth review are to explain the sequence of events that would occur after a failure of both a regulating valve and RTO (or high discharge pressure trip). These are beyond the proposed credited scenario.

Valve Thrust Discussion:

Each of the four scenarios laid out in the submittal has a different required thrust calculation associated with it. This is due to the varying differential pressures expected across the valve disk for each scenario. The resulting available and required thrust values for each scenario is depicted in the following table:

Scenario – Fast Mode	Required Thrust (lbs)	Available Thrust (lbs) 2 accumulators	RTO/AFW Pump Trip Credit?	Closure Time
Close - FWLB (SGFP)	98,478	100,086	Yes	5 seconds
Close - MSLB (SGFP)*	100,398	100,086	No	5 seconds

Close - FWLB (AFW)	106,804	108,526	Yes	30 seconds
Close - MSLB (AFW)	80,945	100,086	Yes	5 seconds

*Although the required thrust is slightly greater than the available thrust for the MSLB during SGFP operation, it is considered acceptable. These values reflect the required and actual thrusts for this scenario when RTO is not credited. RTO will be credited for FWIV closure in all scenarios and the resulting required thrust is much less than that available. Also, due to the use of conservatively bounding friction coefficients, calculational methods, nitrogen starting pressures, Feedwater temperatures, and packing assumptions, the thrusts shown above are considered to be conservative.

From: "WILLIAMS, RONALD L" <RWILL15@entergy.com>
To: "'N. Kalyanam'" <nxk@nrc.gov>, "'Kulin Desai'" <kd...
Date: Thu, Jun 22, 2000 4:16 PM
Subject: TSCR NPF-38-217/MFIV

Per a 10:30 AM telecon on June 19, 2000 with Kulin Desai, NRC Staff Technical Reviewer for FWIV TS change request, a response to the following questions was requested.

(1) What type of environment (harsh or mild) is the Reactor Trip Override (RTO) and the Auxiliary Feedwater (AFW) pump high discharge pressure trip circuitry (instrumentation) physically located in?

Response
RTO - The RTO program circuitry is located in the Control Room FWCS cabinets in Panels CP11A and B. This is a mild environment.

AFW Pump discharge pressure transmitter is located in the Turbine Building. The Turbine Building is a mild environment.

(2) Is the function of the RTO and the AFW pump high discharge pressure an automatic function or operator-initiated?

Response
Function of RTO - See W3F1-2000-0017, dated March 29, 2000, Attachment, page 8 of 19, second paragraph. The RTO program is currently activated when the Feedwater Control System (FWCS) M/A Stations are in the AUTO mode of operation. A modification is proposed to activate the RTO program even when the FWCS stations are in manual. The result of this modification will ensure SGFPs will automatically runback to minimum speed, provide flow demands to the Startup Reg. Valve and Main Reg. Valves limited to less than or equal to 3.5% open and 0% (closed), respectively, on a reactor trip when the FWCS Stations are in either manual or auto mode, creating an automatic RTO function. When a MSIS occurs, the RTO f low demands to the SFRVs are overridden to close the valves. See page 7 of 19, fourth through sixth paragraph.

Function of AFW pump high discharge pressure trip - See W3F1-2000-0017, dated March 29, 2000, Attachment, page 8 of 19, next to last paragraph. The AFW pump high discharge pressure trip is set for 1350 +/-25 psig. It is actuated by a single pressure switch in the AFW pump discharge header. This is an automatic function.

(3) Do the Main Feedwater Reg. Valves (MFRV) and Startup Feedwater Reg. Valves (SFRV) have the same closure time as the FWIVs (5 sec.)? Do the MFRVs and SFRVs get the same or similar closure signal (MSIS) as the FWIVs?

Response
The MSIVs, FWIVs, MFRVs and SFRVs all receive a MSIS closure signal and close within 5 seconds. See W3F1-2000-0017, dated March 29, 2000, Attachment, page 7 of 19, last paragraph and page 11 of 19, third paragraph.

(4) How does the Control Room operator know that the FWIVs have failed

to close in order to take additional action, such as closing the MFRVs?

Response

The MSLB and FWLB events evaluated in our proposed TS change involve a line break inside containment, followed by a failure of the FW regulating valve to close, followed by a failure of RTO to decrease SGFP speed if operating at 100% power or failure of the AFW pump high discharge pressure to trip to stop the AFW pump. The analyzed MSLB and FWLB events will cause a MSIS actuation, thus signaling the FWIV and the FW Regulating Valves to close to stop feedwater flowing to the broken SG and isolate containment.

Based on our earlier discussion, a detailed description of the sequence of actions to be taken by the operator via the Emergency Operating Procedures (EOP) should not be necessary. The operator will follow the specified EOP actions to ensure that the plant is placed in a stable and safe condition following a reactor trip in Modes 1 and 2 (SGFP operating) via the standard post trip actions EOP and diagnose the event prior to entering the excess steam demand (ESD) recovery procedure. In Mode 3 (AFW operating), The operator will diagnose the event prior to entering the ESD recovery procedure.

The EOP will have the operator verify that a MSIS has initiated. The operator would verify an MSIS annunciated. He would, at a minimum, verify FWIVs and the MSIVs are closed via valve position indication. If a FWIV was indicated open, he would confirm the OPEN position by checking feedwater flow rate to the broken SG and changing steam generator level and pressure. Additional actions would be made to determine the reason for FWIVs not being closed.

In the four accident scenarios evaluated, operator action was deemed necessary to allow full closure of the FWIV in the MSLB and FWLB where the AFW pump did not trip on high discharge pressure. Operator action to secure the pump and allow the FWIV to fully close should occur within 30 minutes. Unassisted operator action closure time for the FWIV in the events where the SGFP was operating was (1) MSLB - 5 seconds and in (2) FWLB - less that one minute.

(5) Question asked at 2:15 PM on June 22, 2000 - What type of periodic testing is performed on the Startup Reg. Valve and Main Reg. Valves to perform their credited backup function?

Response

The MSIS ESFAS surveillance requirements are specified in the following TS.

* TS 4.3.2.1, Table 4.3-2 : (1) item 4a - Manual (Trip Button) Channel Functional test is performed every 18 months on components actuated by MSIS. Main Steam Isol Valves, Main Feedwater Isol Valves, Main Feedwater Reg. Valves, and Startup Feedwater Reg. Valves. (2) item 4d - ESFAS subgroup relay functional tests performed at least once per 18 months and during each cold shutdown condition unless tested within the last 62 days
* TS 4.3.2.3, Table 3.3-3 : Response time testing on components actuated by MSIS performed every 18 months.

I hope the above answers fully address your questions . If you have any questions, please contact me.

Ron Williams
Waterford 3
Licensing

CC: "BRANDON, MICHAEL K" <MBRANDO@entergy.com>, "DEDEA...