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MIDDLE SOUTH UTILITIES SYSTEM

February 16, 1984

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3-A1.10
Q-3-N21

Director of Nuclear Reactor Regulation
Attention: Mr. G. W. Knighton, Chief
Licensing Branch Number 3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

SUBJECT: Waterford SES Unit Number 3
Docket Number 50-382
Emergency Feedwater (EFW) Control System

Dear Sir:

On January 17, 1984 a meeting was held in Bethesda to review our December 23, 1983 submittal on the Waterford 3 Emergency Feedwater (EFW) Control System. During this meeting several questions were raised for which LP&L was requested to submit clarification. LP&L's response to each of the eight specific questions raised at this meeting follows.

Question One requested that LP&L provide a statement that the Main Steam line can handle the structural load of overfilling to the Main Steam Isolation Valve (MSIV). LP&L has confirmed that this loading (i.e. with pipe full of water) is considered in the design of pipe supports. It should be noted that these lines have been filled to the MSIV's for hydrotesting.

Question Two requested that LP&L provide a statement as to the amount of time it takes to overfill a steam generator from a 100% wide range level indication to the MSIV (worst-case scenario). LP&L has determined that the fill time from the 100% wide range level to the MSIV is 37.8 minutes.

Recent reviews have indicated that it will be possible to modify the priority signal logic for the EFW Control System such that control of the system will return to the status (automatic vs. manual) that existed prior to generation of the priority signal. This is consistent with FSAR section 7.3.1.1.6.4 as it appeared prior to Amendment 34. The NRC staff has found this acceptable but requested a formal statement to this effect. Therefore, in response to this request (Question Three), Attachment I indicates FSAR section 7.3.1.1.6.4 as it should appear. This revision will be included in the Waterford 3 Final Updated Safety Analysis Report (FUSAR).

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Question Four requested that LP&L verify that FSAR Table 7.2-5 (EFW-FMEA) for Waterford 3 does not take credit for the redundant train or provide justification to the contrary. Our response to this question is included as Attachment II to this letter.

Question Five requested that LP&L describe the duration of operation (cycling) of the accumulators on the EFW valves. Nitrogen accumulators are provided for the EFW modulating and shutoff valves. Each accumulator supplies nitrogen to one modulating valve and one shutoff valve powered from the same channel and associated with the same steam generator. Each accumulator contains sufficient nitrogen for both shutoff valve and modulating valve to be cycled 48 times each during a 24 hour period. The nitrogen supply also permits the modulating valve to modulate for the balance of the 24 hour period.

Question Six requested that LP&L provide a statement that any required FSAR changes pertaining to the EFW Control System will be included in the FUSAR. As indicated by our response to question three, LP&L intends to fully comply with 10CFR50.71(e) and is currently in the process of establishing a system and procedure to do so. Therefore, all required FSAR changes will be included in the Waterford 3 FUSAR upon its submittal.

Question Seven requested that LP&L commit to fully implement any required design changes for the EFW control system prior to Waterford 3 receiving an Operating License. It is our position that all design changes for this system identified to date will be fully implemented before Waterford 3 receives an Operating License. While we do not anticipate that any further design changes will be required, these will be handled on a case-by-case basis should such a situation arise.

The final question, Question Eight, requested that LP&L provide a discussion of planned periodic testing, at power, of the EFW Control System logic. In response, we wish to confirm that the Emergency Feedwater System has the capability for periodic testing at power. This periodic testing capability of the EFW System was designed in accordance with the requirements of the IEEE 338-1977 standards. The testing of the EFW System shall be performed in accordance with written test procedures that are being prepared by LP&L.

The information contained herein and supported by the attachments to this letter should adequately address the concerns raised previously. If there are any questions, please do not hesitate to call.

Sincerely yours,

K W Cook

K. W. Cook
Nuclear Support & Licensing Manager

KWC/RAS/cb

Attachments: (1) FSAR pages 7.3-20b and 7.3-20c
(2) FMEA Review

cc: W. M. Stevenson, E. Blake, J. Wilson (NRC), R. Stevens (NRC-ICSB), H. Calvo (NRC-ICSB), L. Constable (NRC Sr. Resident Inspector)

7.3.1.1.6.3 Isolation of a Ruptured Steam Generator

In the case of a MSLB, inside containment (either as the initiating event or after EFW actuation) it becomes necessary to isolate the ruptured steam generator. The detection and isolation of the ruptured steam generator is performed by an interface between EFAS and MSIS.

The EFAS-MSIS interface as shown on Figure 7.3-13 is implemented in the Plant Protection System (PPS) Cabinet and at the actuated components (i.e., valves). Only the PPS interface is discussed herein with respect to single failure.

MSIS is initiated by low steam generator pressure or high containment pressure.

EFAS is initiated to steam generator 1 either by low steam generator water level coincident with no low pressure trip present for steam generator 1 or by low steam generator water level coincident with differential pressure between the two generators with the higher pressure in generator 1. This EFAS logic is provided for each steam generator.

The low steam generator pressure signal is provided to the EFAS and MSIS logic from a single bistable comparator output in each PPS channel. A single channel failure of this signal would have no effect on EFAS or MSIS operation. This is the only EFAS-MSIS interface present on the PPS. 32

The interrelationship between EFAS and MSIS operation is described by the following scenario assuming a ruptured steam generator:

EFAS logic permits emergency feedwater to be supplied to each steam generator upon receipt of a valid low steam generator water level condition.

Upon receipt of a low steam generator pressure condition, EFAS and MSIS logic will terminate emergency feedwater by causing the emergency feedwater valves to close by resetting EFAS and tripping MSIS. This isolation of the EFW valves will not affect the operation of the EFW pumps. MSIS logic will isolate the steam generators by causing main feedwater and main steam isolation valves to close, thus allowing steam generator pressures to vary independently. The ruptured steam generator pressure will decrease while the intact steam generator pressure will remain constant or increase, thereby causing a differential pressure condition to exist. EFAS logic will permit emergency feedwater to be supplied to the intact steam generator while maintaining isolation of the ruptured steam generator.

7.3.1.1.6.4 Priority Signals

The EFW control system utilizes two signals (priority open, priority close) that override all other automatic or manual controls to the EFW valves.

Priority close is generated when the system is determining which steam generator is ruptured (Subsection 7.3.1.1.6.3). Once this determination is made the priority close signal is deactivated to the intact steam generator only. Upon deactivation of the signal, control of the EFW will ~~remain in manual.~~ return to the status (automatic or manual) that existed prior to the generation of the priority close signal. 34

Priority open is generated when the water level reaches "Lo-Lo Level" (Subsection 7.3.1.1.6.2, Item 5). Once the water level rises above the "Lo-Lo Level", ~~the priority open signal is removed and control of EFW will remain in manual.~~ control of the EFW will return to the status (automatic or manual) that existed prior to the generation of the priority open signal.

In the case of the ruptured steam generator, the EFAS command that generates the priority close signal will prevent a priority open signal.

7.3.1.1.6.5 Initiating Circuits

The initiating circuits are identical to those described in Subsection 7.3.1.1.1.1 for SIS except that the parameters monitored are steam generator level and pressure.

7.3.1.1.6.6 Logic

7.6.1.1.6.6.1 Initiating Logic

The initiating logic is identical to that described in Subsection 7.3.1.1.1.2.1 for SIS except that the provision for multiple initiating signals does not apply.

7.3.1.1.6.6.2 Actuating Logic

Actuating logic is similar to that described in Subsection 7.3.1.1.1.2.2 for SIS. Refer to Figure 7.3-10.

7.3.1.1.6.7 Group Actuation

Group Actuation is identical to that described in Subsection 7.3.1.1.1.3 for SIS.

7.3.1.1.6.8 Bypasses

Bypasses are identical to those described in Subsection 7.3.1.1.1.4 for SIS.

7.3.1.1.6.9 Interlocks

Interlock provisions are identical to those described in Subsection 7.3.1.1.1.5 for SIS.

7.3.1.1.6.10 Redundancy

Redundancy features are identical to those described in Subsection 7.3.1.1.1.6 for SIS.

ATTACHMENT II

REVIEW OF THE FAILURE MODES AND EFFECTS ANALYSIS (FMEA) FOR THE WATERFORD 3 ESFAS AUXILIARY RELAY CABINET - EMERGENCY FEEDWATER CIRCUIT

Question 4 requested that LP&L verify that FSAR Table 7.2-5 (EFW-FMEA) for Waterford 3 does not take credit for the redundant train or provide justification to the contrary.

A review of the FMEA has been conducted with respect to the specific action addressed above. The results indicate four failure modes rely on the redundant train as the "Inherent Compensating Provision for EFW (See sheets 111 and 112 of 119 of the analysis). A closer look at the specific failure modes for Items 212, 213, 215 and 214 (mismarked as 219) reveals that these specific components (actuation logic and relays) provide control logic for the EFW pumps; not the feed or block valves. Therefore, a failure at this point would prevent or cause actuation of the associated pump. However, if the associated pump does not actuate, the redundant pumps actuated by the redundant train would provide the required water inventory. Also, if the pump does actuate due to a failure, the associated valves would be unaffected since they are actuated by different components (actuation logic auxiliary relays). Therefore, reliance on the redundant train is acceptable for these failures.

The above discussion provides the basis for a response to the specific question asked; however, it does not address the more encompassing concern stated by Mr. Calvo (NRC-ICSB). Specifically, is there a single failure within the ESFAS Auxiliary Relay Cabinet which would prevent actuation of the two EFAS cycling relays. If so this would prevent the associated two valves from opening and thereby prevent feed. The relays which control the valves are the cycling relays identified as component 210 and 211 in the FMEA. The failure modes of these components are addressed; however, they are addressed only on an individual basis (a single failure affecting both cycling relays is not specifically analyzed). It should be noted that in the efforts Combustion Engineering (Waterford 3 - NSSS supplier) has conducted to date, no single failure has been identified which would cause a simultaneous failure of both relays. In addition, this aspect of the design is consistent with previous CE designs. In each case the NRC has reviewed and accepted this design of the Auxiliary Relay Cabinet (ARC).

The ESFAS Auxiliary Relay Cabinet is a Class 1E piece of equipment designed to meet all the associated requirements. The ARC was also designed to limit the impact of single failures on an individual ARC train. This was accomplished through the use of mechanical barriers, thermal barriers, conduit, auctioneered power supplies, and the separation of power supply feed lines.

It is LP&L's position that requiring an analysis which postulates a single failure affecting both cycling relays (both channels of a particular train) is contrary to NRC methodology. Therefore, it is also LP&L's position that there is no credible single failure in the EFAS ARC that would cause more than one EFW valve to fail.