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DENTON,H.R. Office of Nuclear Reactor Regulation, Director

SUBJECT: Forwards response to 820409 request for addl info per IE Bulletin 80-04 re PWR main steam line break w/continued feedwater addition.

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July 23, 1982

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Oconee Nuclear Station
Docket Nos. 50-269, -270, -287

Dear Sir:

By letter dated April 9, 1982, the NRC Staff requested additional information relative to PWR main steam line break with continued feedwater addition (IE Bulletin 80-04). Please find attached a response to this request. This subject was discussed with the NRC and its consultant, Franklin Research Center, on May 26, 1982. The attached evaluation responds to the three specific concerns of the Staff's letter, is based solely on the analyses presented in the FSAR, and is essentially a clarification of those analyses.

Very truly yours,

William O. Parker, Jr.

RLG/php
Attachment

cc: Mr. James P. O'Reilly, Regional Administrator
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Mr. W. T. Orders
NRC Resident Inspector
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Mr. Philip C. Wagner
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
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Attachment

Response to Request for Additional Information

PWR Main Steam Line Break With Continued Feedwater Addition
Oconee Units 1, 2, 3

REQUEST

Please provide the following information concerning your analysis of containment pressure response to a MSLB with continued feedwater addition:

1. An evaluation of the potential for exceeding containment design pressure using the MFW and AFW runout flow rates.

2. Provide the time after the start of a MSLB that containment design pressure will be exceeded if no operator action is taken to terminate the accident. Provide the magnitude of the peak pressure and the time at which the peak occurs.

3. Provide actions required to be performed by the operator to prevent exceeding containment design pressure, and provide justification for the time at which credit is taken for operator action.

RESPONSE

Feedwater Systems Description

The Main Feedwater System (MFWS) and the Emergency Feedwater System (EFWS) at Oconee are completely independent. The MFWS is controlled by the Integrated Control System (ICS) and the EFWS has a dedicated and separate control system. The EFWS is a safety grade system. The EFW pumps are actuated only on loss of the MFW flow as indicated by the trip of both MFW pumps or low pump discharge pressure. The EFW control valves are subsequently modulated to control steam generator level. Overfeed of the steam generators by the MFWS is prevented by a high steam generator level trip, which trips both MFW pumps on high level in either steam generator. These features preclude the occurrence of the MFWS and EFWS operating at runout flow rates.

Nominal MFW temperature at full power is 460F. MFW temperature decreases following reactor trip due to a loss of extraction steam to the feedwater heaters. The rate of temperature decrease is dependent on the post-trip rate of feedwater delivery. Nominal EFW temperature is 90F. Additional information on these systems has been provided to the NRC in the reference submittals.

Reactor Building Pressure Response to a Main Steam
Line Break Assuming No Operator Action

The response to the three requested items can be found in the analysis of the main steam line break transient in the Oconee FSAR, Section 14.1.2.9 and Supplement 3 pp 8-28. Specifically, item 4 on pages 3-22, 23 provides the requested information. For clarification purposes, the results of the FSAR analysis are discussed in the following paragraphs.

The scenario of interest proceeds as follows: Assuming no operator action, feedwater will be delivered to the affected steam generator by the MFWS following a main steam line break to control steam generator level at the setpoint. More energy will be delivered to the Reactor Building with the MFWS rather than the EFWS in operation, due to the higher fluid enthalpy and higher flow capacity. As the Reactor Building pressure increases, the Reactor Building Spray System (RBSS) and the Reactor Building Cooling System (RBCS) will actuate and begin to remove energy from the building. These two systems are described in the Oconee FSAR. The feedwater delivered to the affected steam generator will continue to boil off and cool down the primary system. The increase in Reactor Building pressure causes the saturation temperature to increase, thereby decreasing the primary to secondary temperature difference across the steam generator tubes. This causes the heat transfer from the primary system to become limited to the heat being added to the primary system, which is the reactor decay heat. The Reactor Building pressure will continue to increase until the energy addition to the building is less than the energy removal by the RBSS and the RBCS.

The results of the FSAR analysis show that at 250 sec the Reactor Building has pressurized to 38 psig, and the heat transfer from the primary has become limited to the decay heat source. At 360 sec the energy removal capacity of the RBCS exceeds the decay heat source, and the pressurization of the building has peaked and begins decreasing. The peak Reactor Building pressure is significantly less than the design pressure of 59 psig. No operator action is assumed. This scenario bounds all credible steam line breaks within the Reactor Building.

Excessive feedwater delivery (runout flow) from the MFWS is prevented by the high steam generator level trip of the MFW pumps and would be limited by the self-limiting heat transfer processes. Excessive feedwater delivery from the EFWS is prevented by the level control system and would have a minimal impact on the building pressure response due to the low enthalpy of the fluid and the low flow capacity of the EFWS in comparison to the MFWS.

References:

1. W. O. Parker, Jr. (DPC) to H. R. Denton (NRC), letter dated July 23, 1980.

2. W. O. Parker, Jr. (DPC) to H. R. Denton (NRC), letter dated January 15, 1982.