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DENTON,H.R. Office of Nuclear Reactor Regulation
REID,R.W. Operating Reactors Branch 4

SUBJECT: Forwards response to Item 3 of NRC 790821 ltr re stuck-open power operated relief valve for case of small break which causes RCS to pressurize to power operated relief valve setpoint.

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November 9, 1979

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

Attention: Mr. R. W. Reid, Chief
Operating Reactor Branch No. 4

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

Dear Sir:

With regard to your letter of August 21, 1979 please find attached a response to Item 3, a qualitative discussion of the reactor coolant response to a stuck open PORV for the case of a small break which causes the reactor coolant system to pressurize to the PORV setpoint.

Very truly yours,

William O. Parker, Jr.

RLG:scs
Attachment

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Question 2B: Provide the reactor coolant system response to a stuck open PORV for the case of a small break which causes the reactor coolant system to pressurize to the PORV setpoint.

Response

The resultant system response for a case of a small break which causes the reactor coolant system to pressurize to the PORV setpoint and result in a stuck open PORV can be qualitatively assessed based on previous analyses and is provided below. As is demonstrated the small break operating guidelines which have been developed are adequate for control of this transient.

Numerous small break calculations have been performed for the operating 177 FA plants. These calculations are provided in References 1 through 6. As is demonstrated by these studies, repressurization to the PORV following a small break is possible only if the break is extremely small (<0.01 ft^2) and if there is no feedwater available to the steam generators.

The system response of a very small break (<0.01 ft^2) with a concurrent loss of all feedwater is presented in Reference 5.

The system will initially undergo a subcooled depressurization. During this period of the transient, the reactor trips, the pressurizer drains, and the initial SG inventory boils off. For these smaller sized breaks (<0.01 ft^2), the SG initial inventory boils off prior to system depressurization to the ESFAS signal. Following the loss of the SG heat sink, the fluid in the RCS increases in temperature and becomes saturated. Since the volumetric flowrate out the break, following the establishment of saturation conditions in the RCS, is less than the volumetric steam production caused by decay heat removal, the RCS repressurizes and the pressurizer starts to refill. Thus, for these breaks, no ECCS equipment is automatically actuated prior to system repressurization.

System repressurization would continue until the PORV setpoint is reached if no operator action is taken to prevent it. The earliest time that the PORV setpoint would be reached is $\approx$ 4 minutes, for a zero break case and $\approx$ 20 minutes for the 0.01 ft^2 break. It should be noted that actuation of the AFW system prior to these times would prevent opening of the PORV.

While analysis of this break combination has not presently been performed, the present operator guidelines for small breaks were constructed to mitigate the consequences of such an event. The operator is instructed to re-establish feedwater to the SG as soon as possible if AFW is not automatically initiated. Also, the guidelines require manual initiation of the HPI system upon loss of the SG heat sink. Should feedwater continue to remain unavailable and the primary system pressure starts to increase, the operator is instructed to open the PORV and leave it open in order to maintain the RCS pressure as low as possible and maximize the

ECCS flows. These operator guidelines thus assure maximum utilization of the ECCS and will minimize the consequences of a small break which repressurizes the RCS.

References

1. BAW-10103A, Rev. 2, "ECCS Analysis of B&W's 177-FA Lowered-Loop NSS," July 1977

2. Letter from J. H. Taylor to S. A. Varga of July 18, 1978, concerning 177 FA plants small break analysis.

3. BAW-10075A, Rev. 1, "Multinode Analysis of Small Breaks for B&W's 177-Fuel Assembly Nuclear Plants with Raised Loop Arrangement and Internals Vent Valves," March 1976.

4. Letter from J. H. Taylor to R. Mattson of May 7, 1979, "Evaluation of Transient Behavior and Small Reactor Coolant System Breaks in the 177-Fuel Assembly Plant," Volume I, Section 6.

5. Letter from J. H. Taylor to R. J. Mattson of May 12, 1979, "Small Break in the Pressurizer (PORV) with No Auxiliary Feedwater and One HPI Pump."

6. Letter from R. B. Davis to B&W 177 Owners Group, Technical Subcommittee on TMI-2 Incident Related Tasks, Subject: Responses to IE Bulletin 79-05C Action Items, August 21, 1979.