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SUBJECT: Forwards evaluation of effect of auxiliary feedwater sys runout flow & impact of other energy sources on containment pressure response,per IE Bulletin 80-04, "Analysis of PWR Main Steam Line Break w/Continued Feedwater Addition."

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FLORIDA POWER & LIGHT COMPANY

May 19, 1981
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U.S. NUCLEAR REGULATORY COMMISSION

Office of Nuclear Reactor Regulation
Attention: Mr. Darrell G. Eisenhut, Director
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Eisenhut:

Re: Turkey Point Units 3 & 4
Docket No. 50-250 & 50-251
NRC I & E Bulletin 80-04

Our letter L-80-148 dated May 8, 1980 addressed a portion of I & E Bulletin 80-04 and committed to evaluate the effect of runout flow of the Auxiliary Feedwater System and the impact of other energy sources on the containment pressure response as required by the Bulletin. Please find attached the results of our evaluation.

Very truly yours,

J. A. De Mastry
for

Robert E. Uhrig
Vice President
Advanced System and Technology

REU/JEM/ras

Attachment

cc: Mr. James P. O'Reilly, Region II
Harold F. Reis, Esquire

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CONTAINMENT PRESSURE RESPONSE TO STEAM LINE BREAK

QUESTION:

Review the containment pressure response analysis to determine if the potential for containment overpressure for a main steam line break inside containment included the impact of runout flow from the auxiliary feedwater system and the impact of other energy sources, such as continuation of feedwater for condensate flow. In your review, consider your ability to detect and isolate the damaged steam generator from those sources and the ability of the pumps to remain operable after extended operation at runout flow.

RESPONSE:

A. The response to this question was prepared considering both the current Turkey Point steam generators and the steam generators to be installed as part of the repair effort. The major difference in steam generator design is that the new design includes integral flow restrictors in the steam generator outlet nozzles.

NEW STEAM GENERATORS

An analysis was performed to provide an estimate of the containment pressure response during a steamline break. Although this analysis did not include a full spectrum of break sizes, initial power levels, and single failures which would be performed for a full scope analysis, the results do provide a high degree of confidence that a steam line break would not cause the containment design pressure of 59 psig or the vessel test pressure of 65 psig to be exceeded. The analyses did specifically account for main feedwater flow and auxiliary feedwater flow.

The mass/energy release portion of the transient was calculated using the LOFTRAN code. LOFTRAN has been used for accident analyses in numerous safety analysis reports. The containment pressure and temperature transients are calculated using the COCO code. COCO has been used and found acceptable to calculate containment pressure transients for the H. B. Robinson and Zion plants.

Cases were analyzed at zero power and full power (2500 MWt) to evaluate the sensitivty to initial power level. Conservatively high steam generator masses were assumed. A full double-ended break was analyzed assuming dry steam blowdown, i.e. no credit was taken for liquid entrainment in the mass/energy releases. Credit was taken for integral flow restrictors in the steam generator outlet nozzles. The assumption of dry steam in conjunction with a double ended break typically provides a pressure transient which bounds smaller breaks. No credit was taken for steamline check valves to prevent reverse flow from the intact steam generators. It was assumed there was no BIT in the Safety Injection System, resulting in a conservatively high return to power. Conservatively high main feedwater flow was assumed prior to feedline isolation. Analyses were run assuming various auxiliary

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feed flows. The 1200 gpm is well in excess of either the 800 gpm or the 1000 gpm which could be supplied by the existing auxiliary feed system. Credit was taken for operator action at 10 minutes to isolate auxiliary feed flow to the faulted steam generator.

For the containment pressure transient calculation, a conservatively low value for containment heat sinks was assumed. The containment atmosphere was conservatively assumed to reach a maximum of only 280°F for the purpose of calculating the heat removal capability of the fan cooler. The spray pumps were assumed to supply only 400 gpm. For most cases, failure of a spray pump and/or a fan cooler were assumed as the most limiting single failure.

In addition, a zero power steambreak (which the sensitivity studies indicate is more limiting) with the assumptions listed above was performed. This analysis specifically considered 800 gpm auxiliary feedwater to the faulted steam generator, and operation of one containment spray pump and two fan coolers. The results of this analysis indicate a peak containment presure of 56.1 psig.

CURRENT STEAM GENERATORS

An analysis was performed with the current steam generator design assuming a full double ended break upstream of the flow restrictor with a break area of 4.35 ft^2, i.e. assuming flow restrictors are located in the steamline. The break was assumed to occur at zero power. The auxiliary feedwater flow was assumed to be 800 gpm to the faulted steam generator with credit for operator action at 10 minutes to isolate the flow. The blowdown was assumed to be dry steam. In the containment response calculation, credit was taken for the operation of only 1 spray pump and 2 fan coolers, i.e. minimum safeguards. It was assumed that there was a BIT with 20,000 ppm boron solution in the Safety Injection System. This case resulted in a peak pressure of 56.0 psig. Based on the conservatism noted above, these cases are expected to bound other power levels break sizes and single failures such as auxiliary feed runout, provided that credit for operator action at ten minutes is retained.

B. The ability to detect and isolate the damaged steam generator from sources of feedwater flow has been reviewed and are summarized below:

(a) Main feedwater flow, including condensate flow, will be isolated automatically following Safety Injection actuation. The feedwater isolation signal resulting from Safety Injection will close the main feedwater control valves, close the bypass feedwater control valves, trip the main feed pumps, and close the feedwater pump discharge valves, thereby terminating both main feedwater flow and condensate flow to the damaged steam generator.

(b) Auxiliary feedwater flow to the damaged steam generator must be determined manually and isolated as

required by the plant's Emergency Operating Procedure. Following closure of the Main Steamline Isolation Valves, the faulted steam generator may be determined by comparing steamline pressure among the various loops. A low steamline pressure compared to the other loops denotes a faulted loop. The valves in the auxiliary feedwater line supplying the damaged steam generator may then be closed to terminate flow to the faulted loop.

C. The Turkey Point auxiliary feedwater pumps do not attain runout flow conditions during a main steam line break accident. The flow control valves are in a preset position and the turbine driver maximum horsepower limits the flow to 800 gpm. This flow rate is within the normal operating bounds of auxiliary feedwater pumps. Therefore, pump runout is not applicable to the Turkey Point auxiliary feedwater system as presently designed.