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SUBJECT: Forwards response to request for addl info re proposed license amends for small break loss-of coolant accident re-analysis.

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L-96-066
10 CFR §50.36
10 CFR §50.90

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, D. C. 20555

Gentlemen:

Re: Turkey Point Units 3 and 4
Docket Nos. 50-250 and 50-251
Request for Additional Information (RAI)
Proposed License Amendments
Small Break Loss-of Coolant Accident (SBLOCA) Re-analysis

By letter L-95-193, dated July 26, 1995, Florida Power and Light Company (FPL) submitted a request to amend Turkey Point Units 3 and 4 Technical Specifications. In a conference call between the NRC and FPL, the staff requested additional information to support the technical review of the proposed license amendments. The response to these NRC questions is enclosed.

Should there be any questions, please contact us.

Very truly yours,

Robert J. Hovey
Vice President
Turkey Point Plant

enclosure

JAH 190032

cc: S. D. Ebneter, Regional Administrator, Region II, USNRC
T. P. Johnson, Senior Resident Inspector, USNRC, Turkey Point
W. A. Passetti, Florida Department of Health and Rehabilitative Services

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FLORIDA POWER AND LIGHT COMPANY

TURKEY POINT UNITS 3 AND 4

RESPONSE TO NRC QUESTIONS

ON THE

PROPOSED LICENSE AMENDMENTS:

SMALL BREAK LOSS OF COOLANT ACCIDENT RE-ANALYSIS

RESPONSE TO NRC QUESTIONS

Question:

How do you assure you have steam for all the injection points and that you are actually condensing it?

Response:

As described in WCAP-10079-P-A, Section 2-1-1, NOTRUMP interior fluid nodes such as those used to model the Reactor Coolant System cold leg, are defined as fixed control volumes consisting of two regions; a lower "mixture" region and an upper "vapor" region. Further, an interior fluid node, though in general having two regions, can consist of a single region, i.e., one of the regions may be non-existent. NOTRUMP continuously tracks the existence of mixture and vapor regions and the code predicts whether or not a steam space will exist at a given location, such as the safety injection point in the RCS cold leg.

WCAP-10054-P-A, Section 3-3-5, discusses the NOTRUMP non-equilibrium model which is used to calculate mass and energy transfer at the interface between two regions due to bubble rise, drop fall, interface heat transfer, interface condensation and interface evaporation.

The heat flow to the region interface from the mixture and vapor regions, respectively, is given by:

$Q'_{MI} = UMIFN*AMV*(T_M - T_{SAT})$ (WCAP-10054-P-A, Eq. 3-3-4)
$Q'_{VI} = UVIFN*AMV*(T_V - T_{SAT})$ (WCAP-10054-P-A, Eq. 3-3-5)

where:
Q' = total heat flow from the region to the interface
UMIFN = heat transfer coefficient mixture to interface
UVIFN = heat transfer coefficient vapor to interface
AMV = area of mixture-vapor interface
T_V = vapor region temperature
T_M = mixture region temperature
T_{SAT} = saturation temperature at the node pressure

WCAP-10054-P, Addendum 2, describes an improved condensation model based on data obtained from the COSI test facility. This model is implemented through the variable UMIFN in the above equations. However, if at any given time during the transient, NOTRUMP predicts that no vapor region exists within a node, the area of mixture-vapor interface, AMV in the above equations, will be zero and no interfacial heat transfer will be calculated to occur.

Question:

Page 9 states SI may be interrupted for up to 2 minutes. Discuss this interruption, (i.e., transfer to cold leg recirculation).

Response:

Turkey Point Emergency Operating Procedures (EOPs) 3/4-ES-1.3 TRANSFER TO COLD LEG RECIRCULATION, steps 19 through 25, direct the method for switchover to cold leg recirculation. During the performance of these steps, pumped safety injection may be stopped for up to two minutes to allow for operator action and valve stroke times.

For some Westinghouse PWRs, the possibility exists that containment spray actuation may occur for a small break LOCA. Containment spray actuation would result in a faster refueling water storage tank (RWST) draindown time and switchover to cold leg recirculation earlier than previously anticipated. As a result, safety injection may be interrupted sooner in the peak centerline temperature (PCT) transient than expected, and this may result in a second clad heat up which would be more limiting than the initial PCT. This scenario was specifically addressed for the large and small break LOCA analyses performed for the Turkey Point Units 3 and 4 uprate project. A detailed discussion of the small break LOCA evaluation performed for this issue is given below.

CALCULATION OF RWST DRAINDOWN TIME

The switchover time to be used for this evaluation is based on a RWST minimum delivered volume of 260,000 gal prior to switchover to cold leg recirculation. To calculate the switchover time, flow from both the containment spray pumps and high head safety injection (HHSI) pumps must be considered. Although the limiting single failure is typically taken to be failure of a diesel generator to start, a more limiting scenario may be considered for RWST draindown where two diesel generators operate, one auxiliary feedwater pump fails to start and is taken as the single failure, leaving two trains of containment spray and HHSI to operate.

This scenario provides for the fastest draindown of the RWST for a small break LOCA, although only one HHSI is credited in the small break LOCA analysis for PCT calculation.

The small break LOCA safety injection flows are based on Figures 8 and 9 of the SBLOCA Re-analysis submittal L-95-193. Since the safety injection flow rate increases as RCS pressure decreases, the total SI flow from the intact and broken loops at 4000 seconds of the limiting 3-Inch break transient is conservatively assumed since this is the maximum SI flow seen during the transient. Therefore, from Figures 8 and 9, approximately 46 lbm/sec + 24 lbm/sec = 70 lbm/sec per HHSI pump should be used in the RWST draindown time calculation. This flowrate converts to 1020 gpm based on the appropriate density for two HHSI pumps. The containment spray pumps flowrate is conservatively assumed to be 3645 gpm. This results in a total flow of 3645 gpm + 1020 gpm = 4665 gpm draining the RWST. The draindown time is calculated to be 260000 gal / 4665 gpm = 55.7 minutes = 3342 seconds.

EVALUATION OF PCT IMPACT

Westinghouse has determined that a 400°F adiabatic heatup during the two minute SI interruption is conservative. An evaluation was performed for the limiting 3-Inch High Tavg break as well as the non-limiting 2-Inch High Tavg break as this break has a slower system depressurization and core recovery and therefore has the potential to become limiting.

3-Inch Break

The 3-Inch High Tavg break PCT from the initial cladding heatup is 1688°F. The safety injection signal is predicted to occur at 30.4 seconds into the transient. Therefore, the fastest RWST draindown time for this break is 3342 seconds + 30 seconds = 3372 seconds. At this time during the 3-Inch break transient, the cladding temperature is T_{SAT} = 450°F, as the core is covered at this time. With a 400°F adiabatic heatup applied to the cladding temperature at 3372 seconds for a two minute interruption in SI at switchover time, a second cladding heatup to 850°F is predicted. Therefore, the 3-Inch break transient will not exceed the initial PCT of 1688°F.

2-Inch Break

The 2-Inch High Tavg break PCT from the initial cladding heatup is 1656°F. The safety injection signal is predicted to occur at 59 seconds into the transient. Therefore, the fastest RWST draindown time for this break is 3342 seconds + 59 seconds = 3401 seconds. At this time during the 2-Inch break transient, the cladding temperature is 1135°F at 11.75 feet.

With a 400°F adiabatic heatup applied to the cladding temperature at 3342 seconds for a two minute interruption in SI at switchover time, a second cladding heatup to 1535°F is predicted. Therefore, the 3-Inch break transient will not exceed the initial PCT of 1688°F.

In conclusion, even with the conservative assumptions that a 400°F adiabatic heatup be applied and that containment spray pumps are actuated at the same time the SI signal occurs, the SBLOCA evaluation L-95-193 has shown that the initial PCT for the 3-Inch High Tavg break remains limiting.

<u>Question:</u>

Reference 7 of submittal is listed as WCAP 11767-P-A, March 1988. This WCAP was not found in the NRC approved list. Is this WCAP approved?

<u>Response:</u>

WCAP-11767 should have been listed with -P, not -P-A, since it has been submitted to the NRC but has not received review and approval at this time.

Also, in the Uprate Licensing report for Turkey Point Units 3 and 4, references 7 and 8 of Section 3.3.2.7 Small Break LOCA references, should be changed to:

7. Shimeck, D. J., "COSI SI/Steam Condensation Experiment Analysis", WCAP-11767-P (proprietary), March 1988.

8. Rupprecht, S. D., et al., "Westinghouse Small Break LOCA ECCS Evaluation Model Generic Study with the NOTRUMP Code", WCAP-11145-P-A (proprietary) and WCAP-11372-NP-A (non-proprietary), October 1986.