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SUBJECT: Forwards addl info on proposed license amend re increased max allowable RTD delay time,per 891219 telcon.

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FPL

MARCH 27 1990

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

Gentlemen:

Re: St. Lucie Unit 2
Docket No. 50-389
Additional Information on Proposed License Amendment -
Increased Maximum Allowable RTD Delay Time (NRC TAC No. 69863)

On December 19, 1989, a conference call was held between Florida Power & Light Company (FPL) and the NRC to discuss questions which the NRC had pertaining to the St. Lucie Unit 2 proposed license amendment entitled, "Increased Maximum Allowable RTD Delay Time." The NRC asked FPL to review several reports related to the effects of aging on the performance of resistance temperature detectors (RTDs). FPL has reviewed these reports and determined that FPL's conclusions in its request to increase the St. Lucie Unit 2 RTD response time to 16.0 seconds remain unchanged.

Attached are FPL's detailed comments related to the review of these reports, as well as a summary of the original safety analysis (FPL letter L-88-463 dated October 24, 1988) supporting the proposed change to increase the RTD response time from 8.0 to 16.0 seconds.

Please contact us if there are any questions concerning this information.

Very truly yours,

D A Sager

D. A. Sager
Vice President
St. Lucie Plant

DAS/MSD/gp

Attachment

cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC
Senior Resident Inspector, USNRC, St. Lucie Plant

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ADDITIONAL INFORMATION
ST. LUCIE UNIT 2
INCREASED MAXIMUM ALLOWABLE RTD DELAY TIME
(NRC TAC No. 69863)

Summary of Original Safety Analysis

By letter L-88-463 dated October 24, 1988 (St. Lucie Unit 2, Docket No. 50-389, Proposed License Amendment - Increased Allowable RTD Delay Time), Florida Power & Light Company (FPL) submitted a safety analysis to support the technical justification for the increased RTD response time. The bases for the Thermal Margin/Low Pressure (TM/LP) Limiting Safety System Setting (LSSS) trip setpoint includes a pressure bias term to account for the RTD response time. The limiting transient affected by the increased RTD response time is the Control Element Assembly Withdrawal (CEAW) event.

The TM/LP trip setpoint equation considers the auctioneered higher of the ex-core neutron power and the delta-T power signals. During reactor power excursions, the most accurate power measurement is usually provided by the ex-core detectors, except in cases when the power increase is slow enough that the ex-core detectors become decalibrated due to temperature shadowing or rod shadowing effects. In the CEAW event it is assumed that a low worth CEA is withdrawn from the core at an extremely slow withdrawal rate in an effort to decalibrate the ex-core detector signal and make the delta-T power signal limiting.

FPL letter L-88-463 discusses in detail the analytical method and selection of input parameters for the CEAW event which was re-analyzed to verify the adequacy of the TM/LP trip setpoint for the increased RTD response time from 8.0 to 16.0 seconds. An examination of the previous CEAW transient analysis for the TM/LP trip setpoint showed that several physics input parameters could be modified to reflect more realistic St. Lucie Unit 2 core design conditions. Specifically, two improvements were made: 1) the selection of the minimum reactivity insertion rate (the minimum CEA withdrawal worth representative of typical St. Lucie Unit 2 core configurations) and; 2) a rod shadowing factor consistent with this reactivity. The physics input to the CEAW transient presented in FPL letter L-88-463 is conservative to the actual St. Lucie Unit 2 Cycle 4 core design. The inputs would be reverified on a cycle specific basis, although the selection of the CEAW input parameters did include sufficient conservatism such that a re-analysis is not anticipated.

As shown in FPL letter L-88-463, these two improvements in the physics data input to the CEAW transient analysis were sufficient to demonstrate analytically that the ex-core neutron power measurement input and a cold leg temperature with an RTD time constant of 16.0 seconds input to the TM/LP calculator provides adequate protection of all physically possible uncontrolled CEAW events. Thus, the existing St. Lucie Unit 2 TM/LP LSSS limits and setpoints were verified to bound the most limiting CEAW event.

Discussion on Reports

Reports: 1) Hashemian, H. M., et.al., "Effect of Aging on Performance of Nuclear Plant RTDs".

2) Hashemian, H. M., et.al., "Aging Effects on Calibration and Response Time of Temperature Sensors in PWRs," Analysis and Measurement Services Corporation, Knoxville, Tenn.

3) Hashemian, H. M., "Degradation of Nuclear Plant Temperature Sensors," Analysis and Measurement Services Corporation, June 17, 1987.

FPL has reviewed and evaluated the referenced reports. According to Report 1), the response time of an RTD, particularly an RTD mounted in a thermowell, "...is an intrinsic characteristic of the instrument which cannot be altered without mechanical repositioning of the RTD constituents." Additionally, it is stated that, "[a]ging effects on response time are known because response time testing has been performed in many plants for more than ten years. These test results have revealed many problems, a majority of which have been resolved." In the subject report, several tables are provided which show the various changes which have been seen in RTD response time. The tables provide data for the worst examples of RTD response time problems, the worst examples of RTD response time degradation in one operating cycle, and some additional examples of improvements in RTD response time with aging. It is also stated that: "It must be mentioned that the results in Table 1 and 2 are representative of problems encountered in the past and are not typical for the current RTD installation in nuclear power plants. Nevertheless, problems are still encountered with RTD response time, but their frequency and magnitude are less than those experienced before 1985." The authors, in conclusion, go on to state, "[t]o account for response time degradation of RTDs, most utilities are using an in-situ method called the Loop Current Step Response test. The tests in most places are performed every refueling outage which is a suitable frequency for those plants with a better than 20 percent margin between the nominal response time and the required value." The response time of the RTDs in place on St. Lucie Unit 2, which are Weed fast response type detectors, typically have response times which fall within the recommended 20% margin. Testing is performed on RTDs prior to unit shutdown for refueling outages to determine RTD operability; surveillance testing is performed in accordance with the existing technical specification requirements. All response time testing is performed using the Loop Current Step Response (LCSR) method.

The contents of Report 2) relative to the potential for degradation in response time constants of RTDs, mirror those of Report 1), discussed above. In this paper, the authors discuss several potential mechanisms by which the response time of an RTD may change over time. The Abstract states that, "[e]xperimental results indicate that both response time and calibration of temperature sensors can change with aging and that periodic tests

are necessary to identify and compensate for performance degradation. However, the changes are not generally dramatic and test intervals that coincide with plant refueling outages should be adequate to verify that the performance limits are satisfied."

Report 3) is a series of slides. Due to the nature of Report 3), FPL could draw no conclusions with respect to FPL's proposed amendment.

FPL believes that the stated concerns relative to RTD response time degradation are addressed by the existing testing program and by the performance characteristics of the installed RTDs. FPL also notes that the response time currently allowed by the St. Lucie Unit 2 Technical Specifications was the same response time assumed in all applicable analyses. After reviewing the referenced reports, and consulting with other knowledgeable individuals in this field, FPL maintains its position with respect to the acceptability of a 16.0 second RTD response time Surveillance Requirement.