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FACIL:50-335 St. Lucie Plant, Unit 1, Florida Power & Light Co. 05000335
AUTH.NAME AUTHOR AFFILIATION
WILLIAMS,J.W. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
MILLER,J.R. Operating Reactors Branch 3

SUBJECT: Forwards results of peak clad temp based on revised ECCS analysis w/all errors corrected,Self-imposed administrative action taken on 850318 by lowering LHGR limit removed.

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FLORIDA POWER & LIGHT COMPANY

March 22, 1985
L-85-124

Office of Nuclear Reactor Regulation
Attention: Mr. James R. Miller, Chief
Operating Reactors Branch #3
Division of Licensing
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Reference: St. Lucie Unit 1
Docket No. 50-335
ECCS Analysis

Dear Mr. Miller:

On March 15, 1985, Exxon notified Florida Power & Light Company that the combined effect of two errors in the ECCS analysis for St. Lucie Unit 1 and the effect of the thermal shield removal resulted in a 7°F increase in peak clad temperature (PCT). Based on the generic effect of the model error, Exxon had already notified the NRC. Florida Power & Light notified the NRC of the errors and the offsetting effect of the absence of the thermal shield which would result in continued satisfaction of 10CFR50.46.

On March 18, 1985 Exxon notified Florida Power & Light Company that due to a third error in the application of the local assembly peaking factor, the ECCS analysis at a core linear heat generation rate (LHGR) of 15.3 kw/ft indicated a PCT in excess of the 2200°F limit required by 10CFR50.46. In addition, Exxon informed FPL that it would take several days to verify that the 15 kw/ft Technical Specification limit was in compliance with the 2200°F PCT limit required by 10CFR50.46. Subsequent to this notification, FPL took administrative action and lowered the LHGR limit by 5%, which was more than sufficient to assure that the PCT remains below 2200°F, this situation was immediately reported to the NRC.

Based on a revised ECCS analysis for St. Lucie Unit 1 with all of the errors corrected and the offsetting effect of the absence of the thermal shield, the resulting PCT of 2187°F was obtained as provided in the enclosure. This represents the limiting case for an axial power peak at elevation X/L=0.81 and an LHGR of 15.0 kw/ft, which is the current Technical Specification limit. Exxon is in the process of redoing the LOCA-ECCS analysis for St. Lucie Unit 1 to account for potential increases in steam generator tube plugging in the future. The reanalysis is expected to show an improvement in the peak clad temperature due to the use of LOCA-ECCS models recently

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approved by the NRC, principally RODEX2, and the use of measured plant flows to determine system loss coefficients. Based upon this information, Florida Power & Light Company is removing the self-imposed administrative action taken on March 18, 1985. Florida Power & Light Company's objective is to assure that future analyses will not encounter similar problems. FPL is developing an action plan to accomplish this objective, which will include a QA design audit by FPL of the NSSS Systems Analysis (ECCS) Group. The scope of this audit would include a thorough check of their procedures and a check of the input to the model for the St. Lucie 1 ECCS analysis.

Very truly yours,

J. W. Williams, Jr.
Group Vice President
Nuclear Energy

JWW/DCP/cb

ATTACHMENT

Re: St. Lucie Unit 1
Docket No. 50-335
ECCS Analysis

A review of the January 1983 LOCA-ECCS analysis for the St. Lucie Unit 1 plant has identified one coding error and two inappropriate inputs in the analysis. First, a multiplier applicable to assemblies with mixing vane spacers was used on the heat transfer coefficient in the code TOODEE2. This multiplier is not applicable because the St. Lucie Unit 1 assemblies do not have mixing vanes. Second, a multiplier on the heat transfer coefficient was used which was intended to account for the effect of local assembly peaking. Three axial elevations were analyzed in January 1983: X/L=.7, X/L=.81, and XL=.9. The assembly local peaking factor for X/L=.7 was 1.0, while for X/L=8.1 and for X/L=.9 it was 1.045. The larger the assembly local, the larger the multiplier on the heat transfer coefficient. The NRC has decided that the use of this multiplier is not appropriate with the heat transfer coefficients used in the St. Lucie Unit 1 LOCA-ECCS analysis. Third, there was an error in the coding of the version of the TOODEE2, computer code used in the analyses for St. Lucie Unit 1 with respect to the equation for the multiplier. The equation should have yielded a multiplier of 1.0 for an assembly peaking factor of 1.0; instead, it yielded a multiplier of 1.045.

The ENC LOCA-ECCS analysis for St. Lucie was originally reported in XN-NF-82-98, Supp. 1, Revision 1 in January 1983 and supported an LHR of 15.3 kW/ft. This analysis was performed with the thermal shield present. The St. Lucie Unit 1 Technical Specification limit on LHR is 15.0 kW/ft. The analysis in XN-NF-82-98, Supp. 1, Rev. 1 addressed axial shapes peaked at relative core heights (X/L) of .7, .81 and .90, and concluded that the case for a relative core height of .81 was the limiting case which should be considered in determining the Technical Specification limit.

The results of a LOCA-ECCS analysis at X/L=.7 with the thermal shield removed are reported in XN-NF-84-11. The removal of the thermal shield results in a decrease in the peak clad temperature of 59°F from 2059°F to 2000°F. The analysis reported in XN-NF-84-11 indicated the acceptability of removing the thermal shield. Both of these analyses contained the error discussed above.

To determine the effect on the peak clad temperature of removing the multipliers, the case without the thermal shield and without the multipliers was analyzed at X/L=.7 and X/L=.81. The peak clad temperature for X/L=.7 was calculated to be 2066°F for an LHR of 15.3 kW/ft. The limiting case for an X/L=.81 was reanalyzed for an LHR of 15.0 kW/ft which is the current Technical Specification limit. The effect on reflood of the assembly spacers was conservatively neglected in previous calculations but was included in this calculation. Accounting for the spacers alters the effective core flow area such that reflood is enhanced. The major codes utilized in the analysis are unchanged from those used in the original report except for the corrected version of TOODEE2 utilized. The peak clad temperature is calculated to be 2187°F at an X/L of .81 and 15.0 kW/ft.

ENC is in the process of redoing the LOCA-ECCS analysis for St. Lucie Unit 1 to account for a possible future steam generator tube plugging level of 15%. The reanalysis is expected to show an improvement in the peak clad temperature due to the use of LOCA-ECCS models recently approved by the NRC, principally RODEX2, and the use of measured plant flows to determine system loss coefficients. The results will be complete by April 25, 1985, and are expected to provide additional confirmation that the plant satisfies the requirements fo 10 CFR 50.46.