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SUBJECT: Special rept: on 970731, determined that use of conservative min value for pin/box factor in analysis of record, compared to actual value of Cycle 10 min pin/box factor, introduced conservation of .0073 in energy redistribution factors.

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August 8, 1997

L-97-205
10 CFR 50.46

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

Re: St. Lucie Unit 2
Docket No. 50-389
Error in the use of LBLOCA Evaluation Model;
30 Day 10-CFR 50.46 Report

Ref: CENPD-132P, "Calculative Methods for the CE Large Break LOCA Evaluation Model," August, 1974, and approved supplements thereto.

This report is submitted pursuant to 10 CFR 50.46(a)(3)(ii) to provide notification of an error discovered in the use of an acceptable large break loss of coolant accident (LBLOCA) evaluation model (Reference) which is employed to calculate cooling performance of the St. Lucie Unit 2 emergency core cooling system (ECCS). The error led to lesser values of peak cladding temperature (PCT) than should have been calculated in the limiting ECCS analyses of record. Corrected PCT values for the present and previous operating cycles conform to the required acceptance criterion and demonstrate continued compliance with 10 CFR 50.46.

On July 11, 1997, Florida Power and Light Company (FPL) was informed by ABB Combustion Engineering (CE), the fuel vendor for St. Lucie Unit 2, that CE had initiated an evaluation of Energy Redistribution Factors (ERF) used in the large and small break LOCA/ECCS evaluation models, and approved supplements thereto. ERFs represent the fraction of the total energy generated by the limiting fuel rod which is actually deposited in that rod, and the evaluation was initiated due to concerns involving proper consideration of the effect on ERF from moderator voiding that occurs during a LOCA. On July 16, 1997, CE informed FPL that the ERF cited in the topical reports for the large break evaluation model did consider the effects from moderator voiding, but the ERF calculated in 1975 for 16 x 16 lattice fuel assemblies did not consider the effects of moderator voids. St. Lucie Unit 2 uses the 16 x 16 lattice fuel design.

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It was determined that the ERF deficiency applied to the limiting analysis of record (LBLOCA), but did not impact analyses performed for the small break LOCA. As a result of the deficiency, the energy deposition in the hypothetical hot fuel pin is underpredicted by 0.5 to 1.5%, depending upon the location of the hot pin within the lattice, and a generic assessment indicated that ERFs should have been 0.015 greater than the values employed. On July 31, 1997, CE provided FPL with a unit-specific estimate of the impact on PCT from the modeling error. In contrast to the ERF deficiency, it was determined that use of a conservative minimum value for the pin/box factor in the analysis of record, compared to the actual value of the Cycle 10 (present operating cycle) minimum pin/box factor, had introduced a

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conservatism of .0073 in the ERF. Combining this conservatism with the increase in ERFs due to voiding results in a net non-conservative ERF value of .0077. A unit-specific sensitivity of PCT to increases in the ERF was determined, and it was concluded that an increase in the ERF of .0077 will increase the calculated PCT by less than 30 °F.

The PCT calculated in the limiting ECCS analysis of record, updated through the present operating Cycle 10 prior to discovery of the ERF deficiency, was 2143 °F. The revised PCT is 2173 °F. This peak cladding temperature, and the PCTs for previous operating cycles after considering the ERF deficiency, demonstrate continued conformance to the criterion for PCT set forth in 10 CFR 50.46(b).

Without taking credit for the contrasting conservatism associated with the minimum pin/box factor assumed in the analyses of record, it was determined that the impact of the modeling error (an underestimate of ERF by 1.5%) could increase the calculated PCT by as much as 60 °F. The impact of this error on PCT is greater than 50 °F and, therefore, is reportable as significant. The impact on the limiting PCT calculated using the last acceptable model, based on the sum of the absolute magnitudes of respective temperature changes resulting from a cumulation of all modeling changes and/or errors to date, is approximately 61 °F.

Interim compensatory actions taken by FPL to ensure compliance with 10 CFR 50.46 during the time that evaluations were in progress at ABB-CE to confirm or revise, as necessary, the ERF values employed for LOCA analyses included: (a) Initially, a penalty was applied to the measured values of the Total Planar Radial Peaking Factors- F_{xy}^T , and (b) subsequent to this initial action, the F_{xy}^T penalty was replaced with a penalty applied to the Local Power Density (peak linear heat rate) alarm setpoint.

Please contact us if there are any questions.

Very truly yours,



J. A. Stall
Vice President
St. Lucie Plant

JAS/RLD.

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