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50-251 Turkey Point Plant, Unit 4, Florida Power and Light C 05000251
AUTH.NAME AUTHOR AFFILIATION
UHRIG,R.E. Florida Power & Light Co.
RECIP.NAME RECIPIENT AFFILIATION
EISENHUT,D.G. Division of Licensing

SUBJECT: Forwards addl clarification re 811210 proposed license amend re moderator temp coefficient,in response to NRC 820125 request.

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FLORIDA POWER & LIGHT COMPANY

January 28, 1982
L-82-35

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 Unit 3 & 4
Docket Nos. 50-250 and 50-251
Proposed License Amendment
Moderator Temperature Coefficient

On December 10, 1981 we sent you the subject proposed amendment with an attached safety evaluation (FPL letter L-81-517). Mr. Ron Frahm requested clarification concerning this submittal which was discussed by telephone on January 18, 1982. Additional clarification was requested on January 25, 1982, a formal response to which is submitted with this letter.

Very truly yours,

Robert E. Uhrig
Vice President
Advanced Systems & Technology

REU/SKM:jc

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

Attachment

A001 s 1/1

COMPARISON OF RESULTS FOR THE BANK WITHDRAWAL FROM SUBCRITICAL ANALYSIS USING DIFFERENT MODELS

The bank withdrawal from subcritical is a Condition II event and therefore, the DNBR must remain above the limit value during the transient. In the Turkey Point FSAR, this limit is met by demonstrating that the core average heat flux remains below the full power nominal value. This method of demonstrating that the DNBR limit is met constitutes the licensing basis for this accident for Turkey Point, even though the DNBR is not explicitly calculated.

More recent analyses (e.g. SNUPPS, Seabrook, Byron/Braidwood and later plants) use a different methodology which includes the calculation of the DNBR. A comparison of results for these plants with those of FP&L using consistent input assumptions (such as reactivity insertion rate) can be made to further demonstrate that the DNBR limit is met for FP&L. This is done by showing that transient results obtained for FP&L are conservative with respect to equivalent results from the recent analysis.

The bank withdrawal from subcritical accident is analyzed for Turkey Point using WIT-6 (WCAP-7980), a standard neutron-point, kinetics core model to calculate nuclear power, and FACTRAN (WCAP-7908) a thermal transient model for the fuel rod, to calculate the heat flux, fuel and clad temperatures. These calculations are done for the average channel. The conservatism inherent in the point kinetics model is sufficient to ensure that the DNBR remains above the limit value in the hot spot, as will be demonstrated in this comparison.

The Seabrook, SNUPPS, and Byron/Braidwood analyses use TWINKLE (WCAP-7979), a multi-dimensional neutron kinetics code instead of WIT-6 to calculate nuclear power. A 1-D axial model is used, thus removing a large amount of conservatism caused by point kinetics. (Further conservatism could be removed by 3-D calculations, but this is not necessary). FACTRAN is used to calculate heat flux, and the THINC code (WCAP-7015) uses the FACTRAN calculated heat flux to calculate DNBR. The average channel heat flux is used in this calculation because the peaked axial and radial power distributions which could occur during this transient are incorporated into THINC via separate input. Conservatively

peaked distributions are used to ensure that the results are bounding for all times in the plant cycle.

For purposes of comparing the relative conservatism between the two models, the transient values of nuclear power and heat flux should be used since it is these (especially the latter) which would vary due to model changes as input into the DNBR calculation. Note that although the model differences will also affect the fuel and clad temperatures, these changes do not affect the DNBR calculations since THINC does not use these values. The temperatures can be used to compare the relative amount of subcooling in the core, which is related to DNBR.

In Table 1, the results of the Turkey Point Unit 4 Cycle 6 analysis of the bank withdrawal from subcritical are compared with those of Seabrook, SNUPPS, and Byron/Braidwood. (Byron/Braidwood results are presented as information only. Direct comparison with Turkey Point is inappropriate since the reactivity insertion rate is different. Additionally, Byron/Braidwood has optimized fuel , which has different core physics parameters.) Maximum values of core average heat flux and fuel and clad temperatures are presented for all plants, hot spot fluxes are presented for the three plants using the 1-D neutronics model. The transient values for Turkey Point and Seabrook are presented in Figures 1 and 2, respectively. Note that the hot spot values are presented in the FSAR only as upper calculated limits of flux and temperature (see Figure 3 for Seabrook) and are not used in the DNBR calculation. Direct comparison with respect to the two models, and hence the conservatism of the Turkey Point model in meeting the DNBR limit, is based on the calculated values of nuclear power and average channel heat flux.

The conservatism inherent in the point kinetics model is easily seen by comparing the values in Table 1 and the transients in Figures 1 and 2. For the same reactivity insertion rate of 75 pcm/sec, the maximum nuclear power as calculated by MIT-6 is approximately six times the value calculated by TWINKLE. The maximum average heat flux is more than twice the value calculated for Seabrook (.901 vs .339). The predicted fuel and clad temperatures are also higher in the Turkey Point analysis than in the other three calculations, indicating

a conservatively low amount of subcooling. Thus, the Turkey Point analysis bounds the 1-D analysis for the average channel. The minimum DNBR's for all three plants presented remain above the limit values, for Seabrook, the minimum DNBR is 1.59. This is well above the limit value of 1.30.

In conclusion, the table and figures show that the point kinetics model is highly conservative since a comparable 1-D model analysis of the bank withdrawal from subcritical analysis yields acceptable results, i.e., DNBR above the limit value. Therefore, it can be concluded that the licensing basis of Turkey Point is sufficient to show that the minimum DNBR is greater than the limit value of 1.30.

TABLE 1*

	Turkey Point Cycle 6	Seabrook		SNUPPS		Bryon/ Braidwood	
			**		**		**
Reactivity Insertion Rate, pcm/s	75	75		75		100	
Maximum Heat Flux, Fraction of Nominal	.901	.339	1.62	.342	1.64	.424	.201
Maximum Fuel Average Temperature, °F	839	740	1938	741	1935	801	2458
Maximum Clad Temperature, °F	623	590	712	590	711	601	735
Plots are in Figure	1	2	3	-	-	-	-

*Results presented are for a least negative MTC of zero pcm/°F.

**Hot Spot

FIGURE 1: TURKEY POINT BANK WITHDRAWAL FROM SUBCRITICAL AVERAGE CHANNEL TRANSIENT

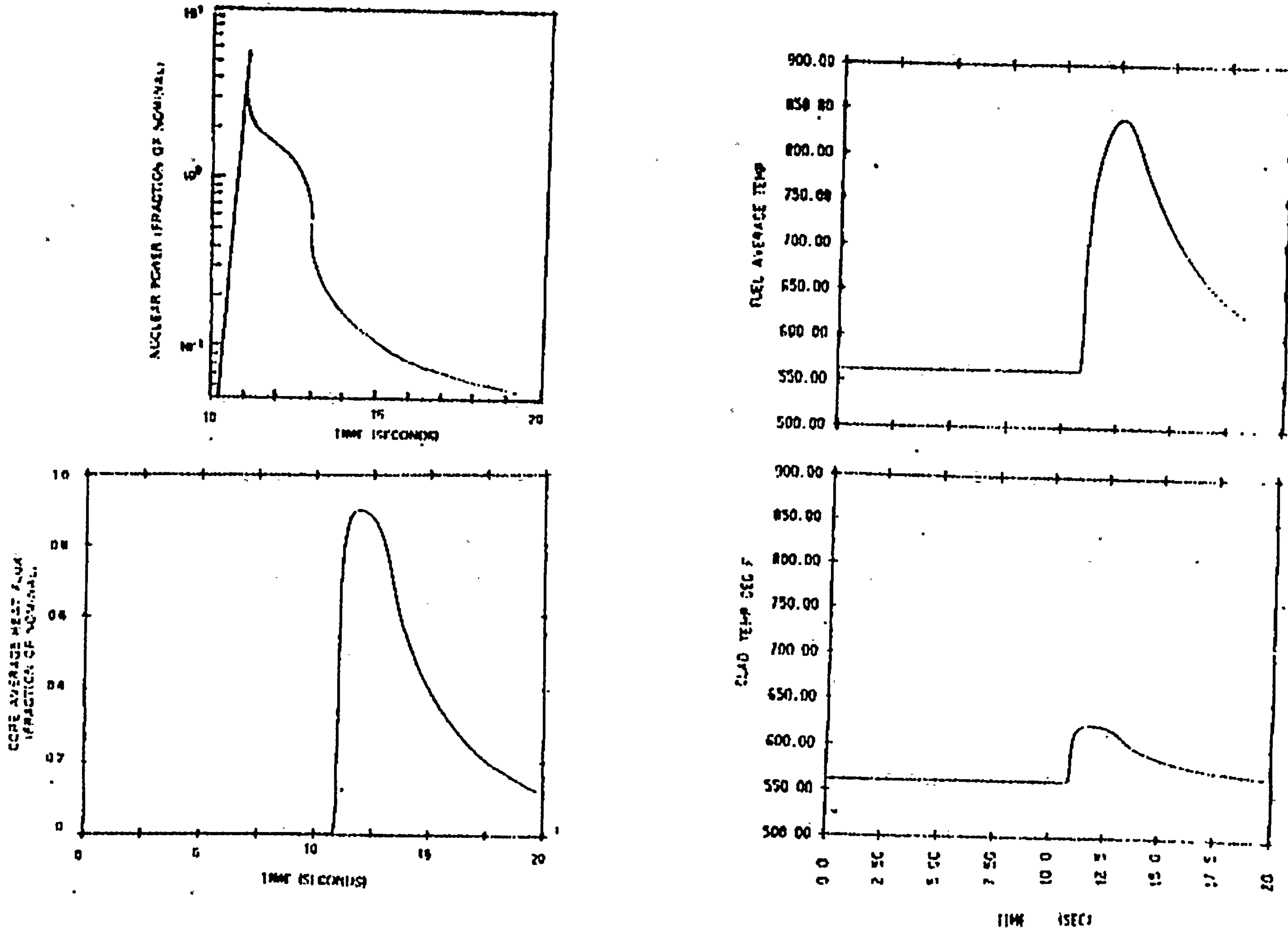

FIGURE 2: SEABROOK BANK WITHDRAWAL FROM SUBCRITICAL
AVERAGE CHANNEL TRANSIENT
MINIMUM DNBR AT HOT SPOT = 1.59

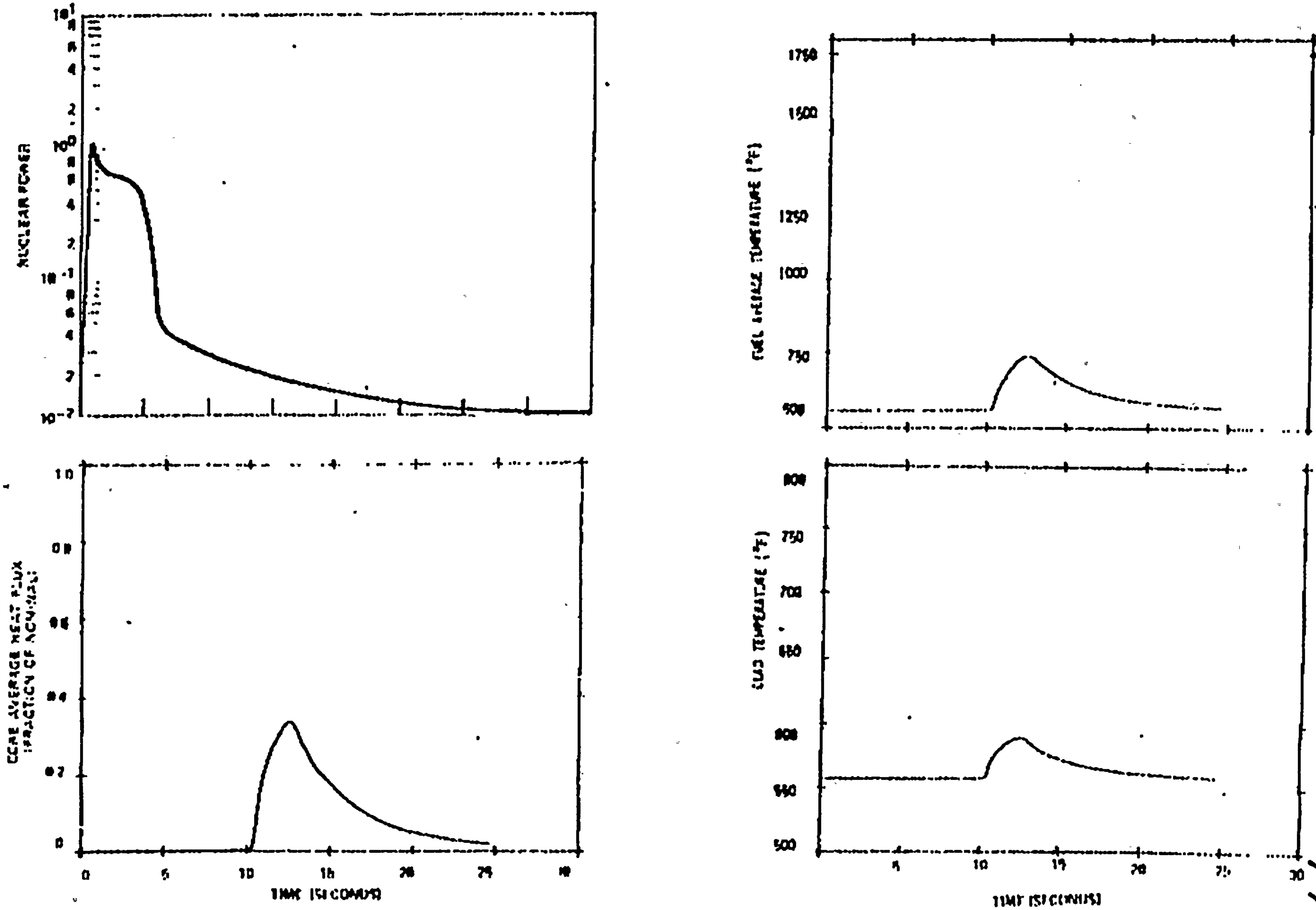

FIGURE 3: SEABROOK BANK WITHDRAWAL FROM SUBCRITICAL
HOT SPOT TRANSIENT FROM FSAR