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January 24, 1979
AEP:NRC:00136

Donald C. Cook Nuclear Plant Unit 1
Docket No. 50-315
License No. DPR-58

Mr. Harold R. Denton, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Denton:

On January 18, 1979, we learned that a reanalysis based on the February 1978 Westinghouse ECCS Evaluation Model for 15 x 15 Westinghouse fuel used in a Nuclear Plant (Plant X) with a NSSS design similar to Cook's, had resulted in a lower F_Q peaking factor limit. Since one third of the Donald C. Cook Nuclear Plant, Unit 1 core is fueled with 15 x 15 Westinghouse fuel, concern arose as to whether a similar penalty should be imposed in the Donald C. Cook Nuclear Plant Unit 1 resulting in an F_Q limit below the 1.90 presently in effect. This letter and its enclosures address those concerns and demonstrate that the present Donald C. Cook Unit 1 limit remains valid.

The present value of 1.90 was established on the basis of an NRC staff order issued upon a review of an analysis performed by the Westinghouse Electric Corporation. The analysis was performed to evaluate the effect of correcting a logic inconsistency discovered in the previous evaluation model. The new analysis was performed using the same blowdown and reflood hydraulic transients of the earlier submittal. However, the rod heat-up portion of the calculation (LOCTA-IV) was redone. In this calculation the error in the zirconium-water reaction calculation was corrected and the new 15 x 15 FLECHT coefficients were employed. A worst break condition, the double ended cold leg guillotine break, with a discharge coefficent C_D of 0.8 was assumed. The discussion below demonstrates the conservatism of the interim value of 1.90 in relation to the results of a final reanalysis employing the February 1978 model.

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First, a similar interim calculation was performed for Plant X. The only major difference between the Cook and the Plant X analyses was thatthe margin in as-built pellet temperatures was used in the Plant X analysis.

Second, the interim calculation performed for Plant X resulted in an F_Q of 2.02 for a C_D = 0.6 break. A reanalysis was performed for Plant X following the NRC approval of the February 1978 model. This reanalysis resulted in a preliminary decrease in the F_Q limit of 0.16 for a C_D = 0.8 break. The shift of worst break condition from C_D = 0.6 to C_D = 0.8 was caused by the fact that the 0.6 break received a large benefit resulting from the changes in the SATAN-VI code. Neither break received significant benefit from the improved reflood heat transfer model since the Peak Cladding Temperature (PCT),which peaks a few seconds into reflood, occurred at the burst location.

Third then, the following considerations give the reasons why the Cook 1 limit of 1.90 is unaffected by results for Plant X.

(1) Some of the F_Q reduction for Plant X was caused by the removal of the margin in as-built fuel temperatures. As mentioned before no advantage of this margin was taken in any of the Cook analyses.

(2) The interim Cook analysis indicated a PCT location three feet above the burst location. Figure 1 illustrates the difference in the clad temperature time histories between the burst and the PCT locations. The figure indicates a 500°F difference between the two locations which is quite different from the Plant X situation in which the PCT occurs at the burst location. There are two important points to be made in this regard:

a) The Cook Plant ice condenser containment performance during a LOCA is quite different from that of a dry containment (Plant X) in that the former design leads to lower reflood rates. The low backpressure during a LOCA in an ice condenser containment causes the PCT to occur late in the reflood period ($\simeq$300 seconds) and at an upper axial location.

b) The February 1978 model includes an improved steam cooling model which would have given Cook significant benefit due to the low reflood rate nature of the ice condenser transient. Also, even though the entire new 15 x 15 FLECHT correlations were approved by the NRC for the February 1978 model, a penalty of 0.03 was imposed by the NRC on the interim calculations as additional margin.

(3) The Westinghouse fuel is near the end of its third cycle. The lowest assembly average burnup, as of the date of this letter, is above 27,000 $\frac{MWD}{MTU}$. Therefore, the maximum steady state pellet temperature is approximately 500°F lower than that used in the interim analysis. This is equivalent to an increase in the limit F_Q limit of approximately 0.41.

Finally, we should note (see Figure 2) that the present maximum F_Q peaking factor measured in the Westinghouse fuel is roughly 1.41 (with APDMS penalty applied) and that during Cycle 3 the Westinghouse maximum F_Q value (penalized) has never exceeded 1.65 at 100% power.

On the basis of all the facts presented, it is clear that the present F_Q limit of 1.90 remains a conservative value applicable to the Westinghouse fuel in the D. C. Cook Unit 1 core until its final removal during the April 1979 refueling outage.

Very truly yours,

John Tillinghast
Vice President

Sworn and subscribed to before me
this 21st day of January, 1979
in New York County, New York

Gregory M. Gurican
Notary Public

GREGORY M. GURICAN
Notary Public, State of New York
No. 31-4643431
Qualified in New York County
Commission Expires March 30, 1979

cc: R. C. Callen
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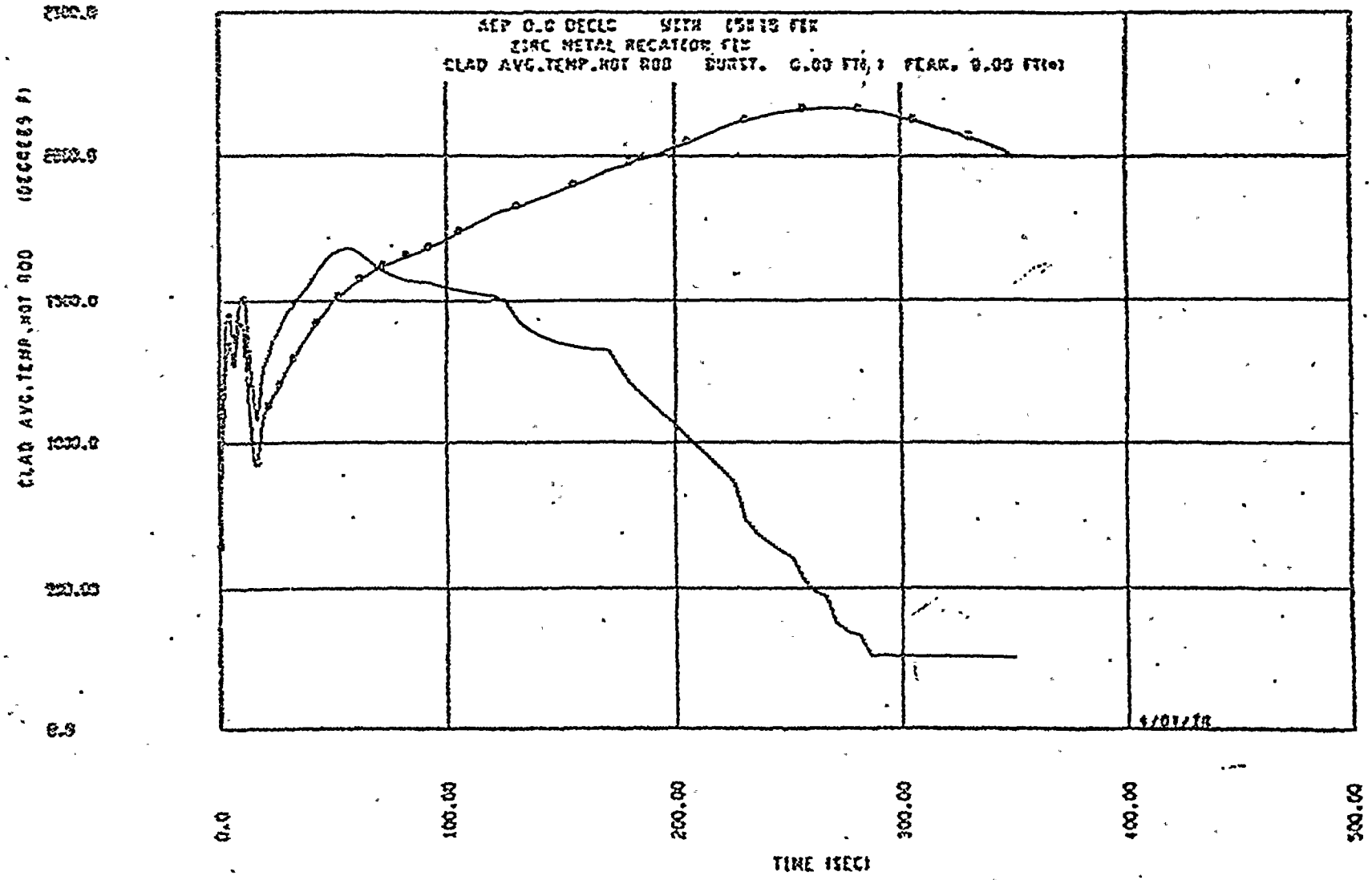
ZIRC METAL REACTION FIX
CLAD AVG.TEMP.HOT ROD
0.0
100.00
200.00
300.00
400.00
500.00
TIME (SEC)

FIGURE 1

D.C. COOK - UNIT I - CYCLE 3

MAXIMUM F_Q IN REGION 3

WESTINGHOUSE FUEL

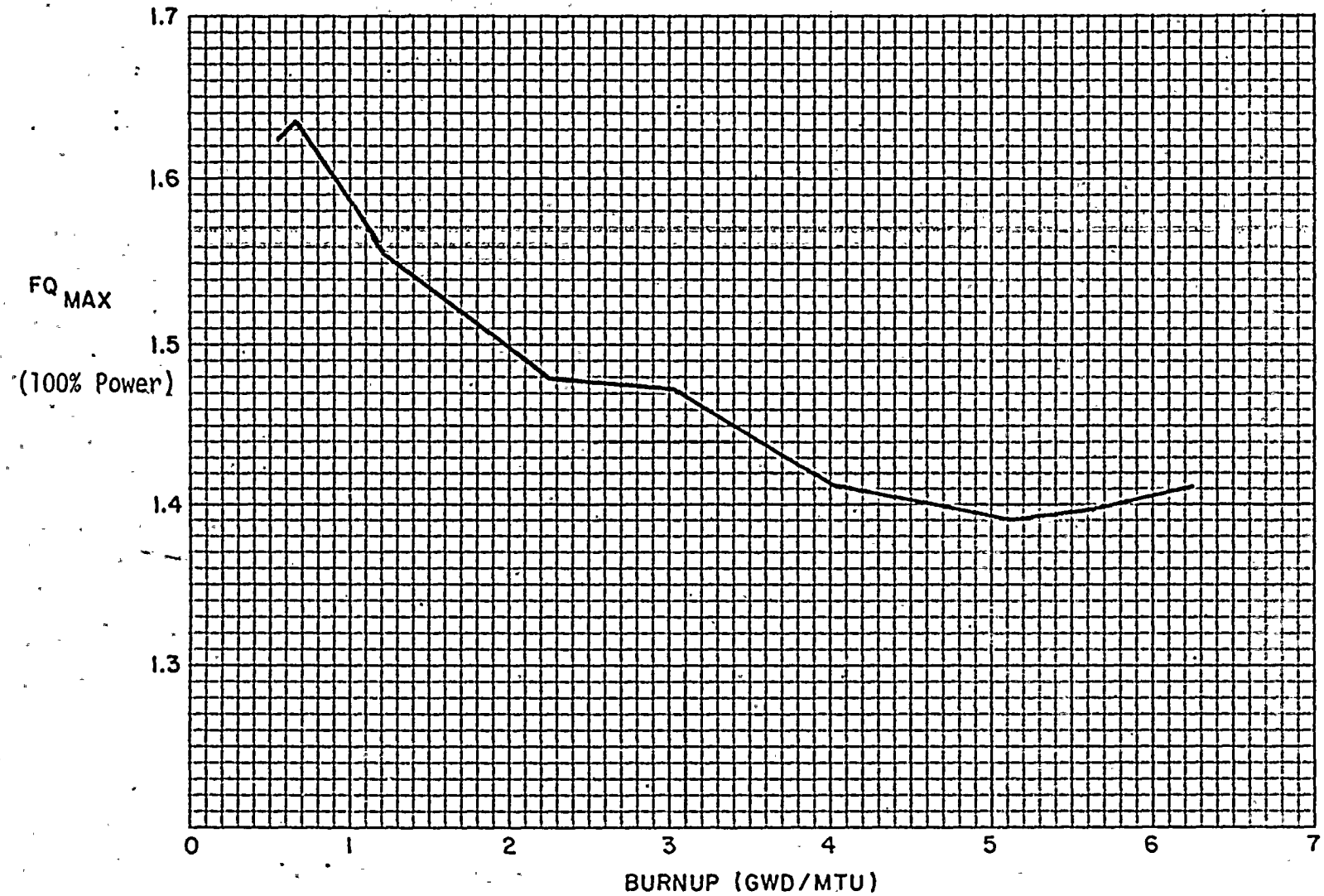

FIGURE 2