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PLANT NAME: Cook #1

ENCLOSURE

Effects of burnup on allowable peaking factor
during Cycle 2 operation.....

1p

ACKNOWLEDGED
DO NOT REMOVE

SAFETY

FOR ACTION/INFORMATION

ENVIRO

2-16-77

ehf

ASSIGNED AD:

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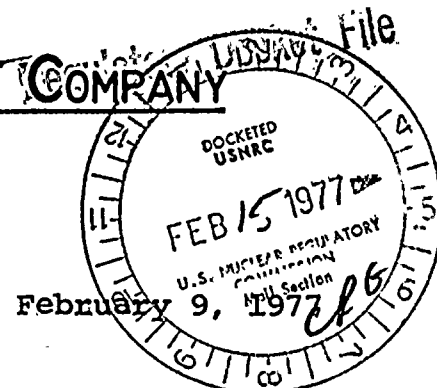
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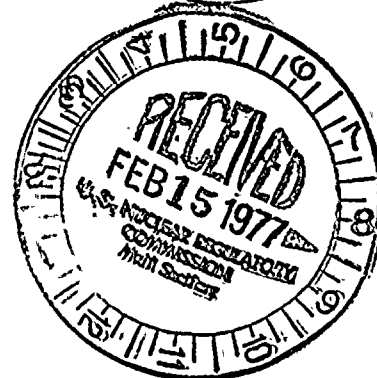
INDIANA & MICHIGAN POWER COMPANY

P. O. BOX 18
BOWLING GREEN STATION
NEW YORK, N. Y. 10004



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

Mr. Benard C. Rusche, Director
Office of Nuclear Reactor Regulation
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555



Dear Mr. Rusche:

This letter transmits information required by the NRC Staff in Revision 1 to the Safety Evaluation Report (SER) dated January 5, 1977 (Reference 1) concerning the effect of burnup on allowable peaking factor (F_Q). The SER revision required that we modify the allowable peaking factor of 1.95 for Cycle 2 operation which was calculated in accordance with the provisions of 10 CFR Part 50 using the Exxon Nuclear Corporation WREM-II Evaluation Model (References 2,3, and 4) using methods specified in the SER revision. These methods specified the manner in which rupture pin pressure uncertainties are to be accounted for in the analysis.

These calculations were performed by Exxon Nuclear Company in accordance with requirements of Reference 1, and the results showed that at the end of Cycle 2 (end of Cycle 1 for fuel supplied by Exxon) the rupture would be 690 psid (pounds per square inch differential pressure) with a resultant blockage of 28%. The F_Q associated with this blockage is 1.90 at a peak clad temperature of 2200°F.

$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

1. 1990年12月28日，在《中国环境报》上刊登了“中国环境报”

[illegible]

1. The first step in the process of identifying a problem is to define the problem. This involves identifying the symptoms of the problem and determining the scope of the problem. Once the problem has been defined, the next step is to identify the causes of the problem. This involves identifying the factors that are contributing to the problem and determining the underlying causes of the problem. Once the causes of the problem have been identified, the next step is to develop a plan to address the problem. This involves identifying the actions that need to be taken to address the problem and determining the resources that will be needed to implement the plan. Once a plan has been developed, the next step is to implement the plan. This involves taking the actions that have been identified in the plan and putting them into practice. Finally, the last step in the process is to evaluate the results of the plan. This involves determining whether the plan has been successful in addressing the problem and identifying any areas that need further attention.

February 9, 1977

The NRC staff also requested verbally that we determine the time during Cycle 2 that the value of F_Q would drop below 1.95 when the above uncertainties were taken into account. Such a calculation was performed and it was determined that F_Q would not drop below 1.95 until the pin rupture exceeded 667 psid (differential pressure). This will occur at a point in time corresponding to 80% of the first cycle; i.e., at an average cycle burnup of 8500 MWD/MTU (peak pellet burnup of 12,000 MWD/MTU).

The time when F_Q dropped below 1.95 was calculated assuming the fission gas contribution to rupture pressure varies linearly through the first cycle, from 0 psi at the beginning of the cycle to 60 psi at the end of the cycle. Similarly, the uncertainty was assumed to vary from 0 to 60 psi during the cycle.

This burnup dependence may be applied to the Donald C. Cook Nuclear Plant by applying a multiplier on F_Q as a function of cycle life. This multiplier is shown on the attached curve, showing no multiplier is required to be applied to the 1.95 peaking factor until a burnup of 8500 MWD/MTU has been reached, and then showing the multiplier to vary linearly between 1.0 and 0.9744, between 8500 and 10,800 MWD/MTU average cycle burnups; which when applied to the 1.95 peaking factor, yields a peaking factor of 1.90 at expected end-of-life.

This direct adaptation of the methods cited in Reference 1 was only used by Exxon due to the inadequate time the NRC staff had available for review of XN-65-51, Supplement 1 (Reference 5). We anticipate that once the appropriate analysis is complete and reviewed by the NRC staff, that the burnup dependence on peaking factor indicated herein will not be required.

Very truly yours,


John Tillinghast
Vice President

JT:mam

Sworn and subscribed to before
me this 9th day of February 1977
in New York County, New York


Notary Public

DAVID G. HUME
NOTARY PUBLIC, State of New York
No. 31-4608113
Qualified in New York County
Commission Expires March 30, 1977,

cc: see next page

Mr. Benard C. Rusche

- 3 -

February 9, 1977

cc: G. Charnoff
R. J. Vollen
P. W. Steketee
R. Walsh
R. C. Callen
R. W. Jurgensen - Bridgman
R. S. Hunter

References

- 1) Revision 1 to the Safety Evaluation Report on the Exxon Nuclear Company WREM-Based Generic PWR-ECCS Evaluation Model Update ENC-WREM-II for Conformance Requirements to 10 CFR 50 by the Office of Nuclear Reactor Regulation, January 5, 1977.
- 2) XN-76-27, "Exxon Nuclear Company WREM-Based Generic PWR ECCS Evaluation Model Update, ENC-WREM-II," July 1976.
- 3) XN-76-27, Supplement 1, "Supplementary Information Relating to Exxon Nuclear Company WREM-Based Generic PWR ECCS Evaluation Model Update, ENC-WREM-II," September 1976.
- 4) XN-76-27, Supplement 2, "Supplementary Information Relating to Exxon Nuclear Company WREM-Based Generic PWR ECCS Evaluation Model Update, ENC-WREM-II," November 1976.
- 5) XN-76-51, Supplement 1, "Flow Blockage and Exposure Sensitivity Study for D.C. Cook Unit 1 Reload Fuel Using ENC WREM-II Model," January 1977.

THE FOLLOWING IS A SUMMARY OF THE INFORMATION
OBTAINED FROM THE INTERVIEW OF THE
SUBJECTS ON 11-11-68. THE INFORMATION
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SUBJECTS ON 11-11-68.

1. "THE SUBJECTS WERE INTERVIEWED ON 11-11-68
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ON 11-11-68."

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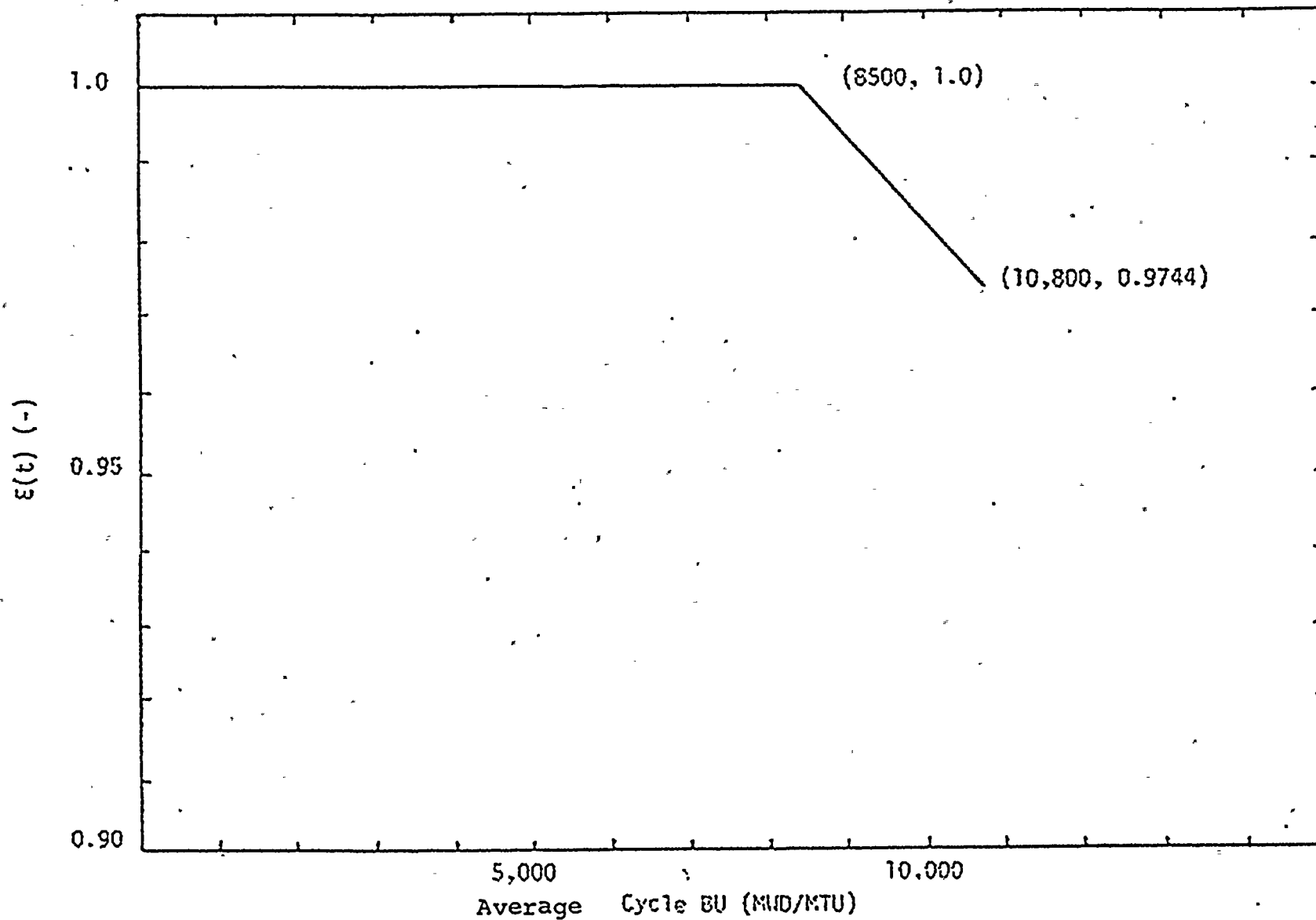


FIGURE 3.2.3 $E(t)$ NORMALIZED CORE POWER AS A
FUNCTION OF CYCLE BURNUP

