May 19, 1987

Docket Nos. 50-315

Mr. John Dolan, Vice President
Indiana and Michigan Electric Company
c/o American Electric Power Service Corporation
1 Riverside Plaza
Columbus, Ohio 43216

Dear Mr. Dolan:

The Commission has issued the enclosed Amendment No. 109 to Facility Operating License No. DPR-58 for the Donald C. Cook Nuclear Plant, Unit No. 1. The amendment consists of changes to the Technical Specifications in response to your application dated February 20, as supplemented by letter dated March 13, 1987.

The amendment revises the Technical Specifications to reflect an increase in peak pellet exposure from 48.0 MWd/kg to 48.7 MWd/kg for Advanced Nuclear Fuel Corporation (formerly Exxon Nuclear Company) fuel.

A copy of the Safety Evaluation is also enclosed. The notice of issuance will be included in the Commission's next bi-weekly Federal Register notice.

Sincerely,

/s/

David L. Wigginton, Project Manager
Project Directorate III-3
Division of Reactor Projects

Enclosures:
1. Amendment No.109 to DPR-58
2. Safety Evaluation

cc w/enclosures:
See next page

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Date:	05/7/87	05/12/87	05/7/87

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

INDIANA AND MICHIGAN ELECTRIC COMPANY

DOCKET NO. 50-315

DONALD C. COOK NUCLEAR PLANT, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 109
License No. DPR-58

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Indiana and Michigan Electric Company (the licensee) dated February 20, as supplemented March 13, 1987, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-58 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 109 , are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

David L. Wigginton, Acting Project Director
Project Directorate III-3
Division of Reactor Projects

Attachment:
Changes to the Technical
Specifications

Date of Issuance: May 19, 1987

ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 109 FACILITY OPERATING LICENSE NO. DPR-58

DOCKET NOS. 50-315

Revise Appendix A Technical Specifications by removing the pages identified below and inserting the enclosed pages. The revised pages are identified by amendment number and contain marginal lines indicating the area of change.

REMOVE	INSERT
3/4 2-7	3/4 2-7
3/4 2-20	3/4 2-20
3/4 2-23	3/4 2-23

SURVEILLANCE REQUIREMENTS (Continued)

where

$F_Q^M(Z) = F_Q(Z,\ell)$ at ℓ for which

$\frac{F_Q(Z,\ell)}{T(E_\ell)}$ is a maximum

$F_Q^L(Z) = F_Q^L(E_\ell)$ at ℓ for which

$\frac{F_Q(Z,\ell)}{T(E_\ell)}$ is a maximum

$F_Q^M(Z)$ and $F_Q^L(Z)$ are functions of core height, Z, and correspond at each Z to the rod ℓ for which $\frac{F_Q(Z,\ell)}{T(E_\ell)}$ is a maximum at that Z

V(Z) is a cycle dependent function and is provided in the Peaking Factor Limit Report. K(Z) is defined in Figure 3.2-2 for Exxon Nuclear Company fuel and in Figure 3.2-3 for Westinghouse fuel. $T(E_\ell)$ is defined in Figures 3.2-4 and 3.2-5. $E_P(Z)$ is an uncertainty factor to account for the reduction in the $F_Q^L(E_\ell)$ curve due to accumulation of exposure prior to the next flux map.

Westinghouse Fuel	Exxon Nuclear Co. Fuel	
$E_P(Z) = 1.0$	$E_P(Z) = 1.0$	$0.0 \leq E_\ell \leq 17.62$
$E_P(Z) = 1.0$	$E_P(Z) = 1.0 + [.0040 \times F_Q^M(Z)]$	$17.62 < E_\ell \leq 34.5$
$E_P(Z) = 1.0$	$E_P(Z) = 1.0 + [.0093 \times F_Q^M(Z)]$	$34.5 < E_\ell \leq 42.2$
	$E_P(Z) = 1.0 + [.0060 \times F_Q^M(Z)]$	$42.2 < E_\ell \leq 48.0$
	$E_P(Z) = 1.0$	$48.0 < E_\ell \leq 48.7$

LIMITING CONDITION FOR OPERATION (Continued)

Westinghouse Fuel	ENC Fuel	
$F_P = 1.0$	$F_P = 1.0$	$0.0 \leq E_\ell \leq 17.62$
$F_P = 1.0$	$F_P = 1.0 + [.0015 \times W]$	$17.62 < E_\ell \leq 34.5$
$F_P = 1.0$	$F_P = 1.0 + [.0033 \times W]$	$34.5 < E_\ell \leq 42.2$
	$F_P = 1.0 + [.0020 \times W]$	$42.2 < E_\ell \leq 48.0$
	$F_P = 1.0$	$48.0 < E_\ell \leq 48.7$

where W is the number of effective full power weeks (rounded up to the next highest integer) since the last full core flux map.

APPLICABILITY: MODE 1 above the minimum percent of RATED THERMAL POWER indicated by the relationships.*

$$\text{APL} = \min \text{ over Z of } \frac{2.10 \times K(Z)}{F_Q(Z,\ell) \times V(Z)} \times 100\% \quad \text{Westinghouse Fuel}$$

$$\text{APL} = \min \text{ over Z of } \frac{F_Q^L(E_\ell) \times K(Z)}{F_Q(Z,\ell) \times V(Z) \times E_P(Z)} \times 100\% \quad \text{Exxon Nuclear Co. Fuel}$$

where $F_Q(Z, \ell)$ is the measured $F_Q(Z, \ell)$, including a 3% manufacturing tolerance uncertainty and a 5% measurement uncertainty, at the time of target flux determination from a power distribution map using the movable incore detectors. V(Z) is the function given in the Peaking Factor Limit Report. The above limit is not applicable in the following core plane regions.

1. Lower core region 0% to 10% inclusive.
2. Upper core region 90% to 100% inclusive.

* The APDMS may be out of service when surveillance for determining power distribution maps is being performed.

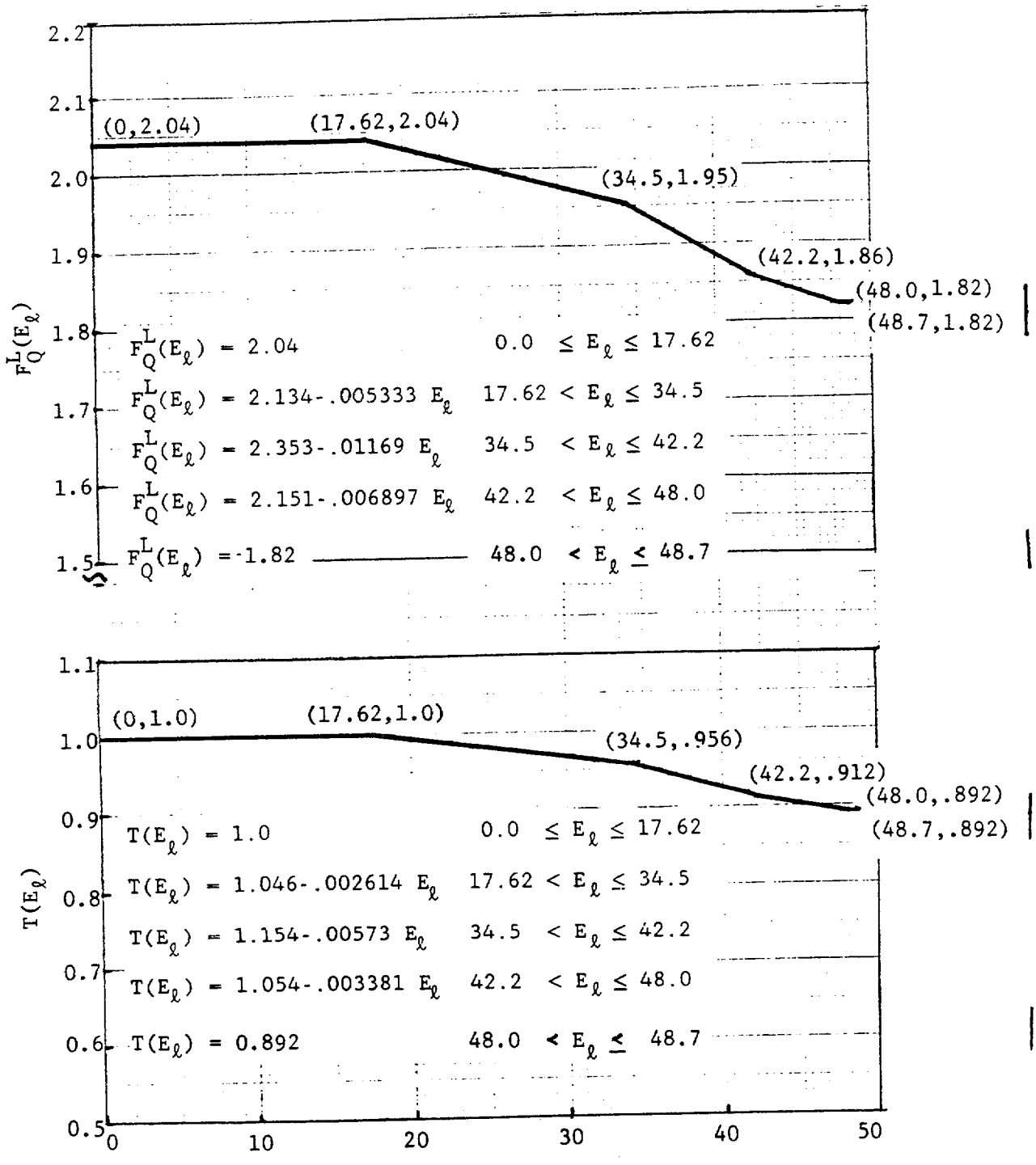

FIGURE 3.2-4

Exposure Dependent F_Q Limit, $F_Q^L(E_\ell)$, and Normalized Limit $T(E_\ell)$ as a function of Peak Pellet Burnup for Exxon Nuclear Company Fuel

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 109 TO FACILITY OPERATING LICENSE NO. DPR-58

INDIANA AND MICHIGAN ELECTRIC COMPANY

DONALD C. COOK NUCLEAR PLANT, UNIT NO.1

DOCKET NO. 50-315

1. Introduction

By letter dated February 20, 1987 as supplemented by letter dated March 13, 1987, the Indiana & Michigan Electric Company (I&MEC) submitted a request for Technical Specification changes for a burnup extension of the Cook 1, Cycle 9 core. Changes were requested for (1) Heat Flux Hot Channel Factor F_Q, (2) Axial Power Distribution, and (3) an increase in the peak pellet exposure for Advanced Nuclear Fuel Co. fuel from 48,000 MWd/MTU to 51,000 MWd/MTU.

The present cycle (Cycle-9) core consists of 159 Westinghouse 15 x 15 optimized fuel assemblies (OFA's) and 34 Advanced Nuclear Fuel Corporation (ANF) (formerly Exxon Nuclear Company) 15 x 15 fuel assemblies. The Cook 1 core is on a transition to full Westinghouse fuel; i.e., during the upcoming outage, which is scheduled in late May 1987, none of the ANF fuel will be reused for Cycle 10. However, the licensee discovered through flux mapping that four ANF fuel assemblies will exceed the current peak pellet exposure limit of 48,000 MWd/MTU before the scheduled outage. To avoid an early shutdown of the unit, the licensee requested a burnup extension by proposing changes to the Technical Specifications.

The staff has reviewed the documents related to the Technical Specification changes and its evaluation follows.

2. Fuel Mechanical Design Analysis

The analysis supporting the current peak pellet exposure of 48,000 MWd/MTU is documented in ANF report XN-NF-84-25, entitled "Mechanical Design Report Supplement for D. C. Cook 1 Extended Burnup Fuel Assemblies." This report was approved on November 29, 1984. To extend the applicability of this report beyond 48,000 MWd/MTU, ANF determined that all criteria except strain, corrosion, hydrogen absorption, and internal pressure are essentially independent of the peak pellet exposure limit. For strain, corrosion, and

hydrogen absorption, ANF performed extrapolations of the analysis documented in XN-NF-84-25 to peak pellet burnup of 48,700 MWd/MTU. The results of these extrapolations show significant margins to the ANF design limits. For rod internal pressure, ANF performed an analysis using the approved RODEX2 code to 48,700 MWd/MTU peak pellet. The result shows that the rod pressure remains below the system pressure as specified in XN-NF-84-25. The staff agrees with the licensee's analyses because the overall changes from 48,000 MWd/MTU to 48,700 MWd/MTU involving mechanical design are very limited. Therefore, the staff approves the extension of mechanical design applicability from 48,000 MWd/MTU to 48,700 MWd/MTU peak pellet for Cycle 9.

3. ECCS Analysis

For ANF fuel in ECCS analysis, the governing factor is the heat flux hot channel factor F_Q which varies as a function of burnup. To extend the applicability of ECCS analysis beyond 48,000 MWd/MTU peak pellet, ANF recently performed a new limiting break LOCA analysis and documented it in XN-NF-85-115, Rev. 2, for Cook Unit 1 up to 51,000 MWd/MTU peak pellet (47,000 MWd/MTU peak rod average). The result shows that the peak cladding temperature still occurs early in life; i.e., the limiting condition happens in beginning of life (BOL). ANF then proposed a constant value (1.82) of F_Q extended from 48,000 MWd/MTU to 51,000 MWd/MTU peak pellet. Based on the applicable burnup range of mechanical design analysis (up to 48,700 MWd/MTU) and the licensee conservative approach in ECCS analysis, the staff concludes that the new ECCS analysis is applicable for Cook 1 up to 48,700 MWd/MTU peak pellet rather than 51,000 MWd/MTU requested by the licensee.

4. Technical Specification Changes

The preceding sections have shown the acceptability of the extension of the peak pellet burnup in ANF fuel from 48,000 MWd/MTU to 48,700 MWd/MTU based on the evaluation of fuel mechanical and ECCS analyses. The staff reviewed each of the Technical Specification changes, which are the result of the burnup extension, and find that they appropriately reflect these analyses and are, therefore, acceptable.

Specifically, the change to Technical Specification Figure 3.2-4 on page 3/4 2-23 concerning the exposure-dependent peaking factor limit $F_Q^L(E_1)$ shows a constant value of 1.82 from 48,000 MWd/MTU to 51,000 MWd/MTU peak pellet. The staff has accepted this value previously. However, the applicable burnup limit should be up to 48,700 MWd/MTU instead of 51,000 MWd/MTU as described in Section 3. The normalized $F_Q^L(E_1)$, $T(E_1)$, which is also contained in Figure 3.2-4, should be also made applicable up to 48,700 MWd/MTU peak pellet.

Next, the changes to Technical Specification pages 3/4 2-7 and 3/4 2-20 on $E_D(Z)$ and F_D, respectively, provide a value of unity from 48,000 MWd/MTU to 51,000 MWd/MTU peak pellet. $E_D(Z)$ is an uncertainty factor to account for a reduction in the F_Q curve in the axial direction. The quantity F_D is a similar factor for use with the Axial Power Distribution Monitoring System. The values of these two factors are related to the slope of the F_Q curve in Figure 3.2-4. A flat slope for $E_D(Z)$ and F_D is thus consistent with the flat slope of F_Q between 48,000 MWd/MTU and 51,000 MWd/MTU. However, since the mechanical design analysis is not available beyond 48,700 MWd/MTU, the staff approves the extension of $E_D(Z)$ and F_D on pages 3/4 2-7 and 3/4 2-20, respectively, with a value of unity between 48,000 MWd/MTU and 48,700 MWd/MTU peak pellet only.

The staff has reviewed the proposed changes to Cook 1 Technical Specifications to extend the burnup limit beyond 48,000 MWd/MTU peak pellet and concludes that the proposed changes are acceptable up to the burnup limit of 48,700 MWd/MTU peak pellet only, rather than the licensee's proposed limit of 51,000 MWd/MTU for Cycle 9.

5. Environmental Consideration

This amendment involves a change in the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously published a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding. Accordingly, this amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR §51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

6. Conclusion

The staff has concluded, based on the considerations discussed above, that (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (2) such activities will be conducted in compliance with the Commission's regulations, and the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: S. L. Wu

Dated: May 19, 1987