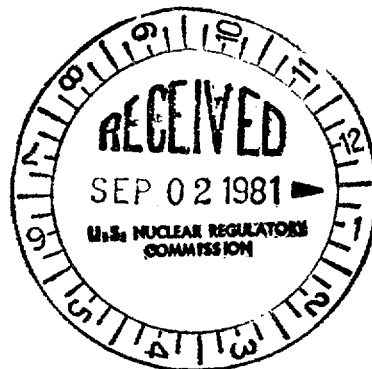


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AUG 27 1981



Mr. Eugene R. Mathews, Vice President
 Power Supply and Engineering
 Wisconsin Public Service Corporation
 Post Office Box 1200
 Green Bay, Wisconsin 54305

Dear Mr. Mathews:

The Commission has issued the enclosed Amendment No. 36 to Facility Operating License No. DPR-43 for Kewaunee Nuclear Power Plant. The amendment consists of changes to the Technical Specifications in response to your application transmitted by letters dated August 7, 1981, as supplemented August 21, 1981.

The amendment revises the Technical Specifications in respect to power distribution limits consequent upon extended burn up for fuel supplied by Exxon Nuclear Company.

Copies of the Safety Evaluation and the Notice of Issuance are also enclosed.

Sincerely,

ORIGINAL SIGNED

Robert B. A. Licciardo, Project Manager
 Operating Reactors Branch #1
 Division of Licensing

Enclosures:

1. Amendment No. 36 to DPR-43
2. Safety Evaluation
3. Notice of Issuance

CP
1

cc w/enclosures:
 See next page

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OFFICE	ORB#1:DL <i>ep</i>	ORB#1:DL <i>RL</i>	C-ORB#:DL	AD-OR:DL	OELD		
SURNAME	CParrish	RLicciardo	SVarga	TMovak	<i>Goodman</i>		
DATE	8/25/81	8/25/81:cb	8/25/81	8/25/81	8/21/81		

notice only

Mr. Eugene R. Mathews
Wisconsin Public Service Corporation

cc: Steven E. Keane, Esquire
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Milwaukee, Wisconsin 53202

Kewaunee Public Library
822 Juneau Street
Kewaunee, Wisconsin 54216

Stanley LaCrosse, Chairman
Town of Carlton
Route 1
Kewaunee, Wisconsin 54216

Mr. Donald L. Quistroff, Chairman
Kewaunee County Board
Kewaunee County Courthouse
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Chairman
Public Service Commission of Wisconsin
Hill Farms State Office Building
Madison, Wisconsin 53702

Mr. Patrick Walsh
Assistant Attorney General
114 East, State Capitol
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U. S. Nuclear Regulatory Commission
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Route #1, Box 999
Kewaunee, Wisconsin 54216

Regional Radiation Representative
EPA Region V
230 South Dearborn Street
Chicago, Illinois 60604



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

WISCONSIN PUBLIC SERVICE CORPORATION
WISCONSIN POWER AND LIGHT COMPANY
MADISON GAS AND ELECTRIC COMPANY

DOCKET NO. 50-305

KEWAUNEE NUCLEAR PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 36
License No. DPR-43

1. The Nuclear Regulatory Commission (the Commission) has found that:
 - A. The application for amendment by Wisconsin Public Service Corporation Wisconsin Power and Light Company and Madison Gas and Electric Company (the licensee) dated August 7, 1981, as supplemented August 21, 1981, 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.

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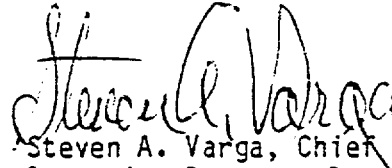
2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 2.C.(2) of Facility Operating License No. DPR-43 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 36, 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 its issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Steven A. Varga, Chief
Operating Reactors Branch #1
Division of Licensing

Attachment:
Changes to the Technical
Specifications

Date of Issuance: August 27, 1981

ATTACHMENT TO LICENSE AMENDMENT

AMENDMENT NO. 36 TO FACILITY OPERATING LICENSE NO. DPR-43

DOCKET NO. 50-305

Revise Appendix A as follows:

Remove Pages

T. S. 3.10-1

T. S. 3.10-2

T. S. 3.10-10a

T. S. 3.10-11

T. S. 3.10-16

T. S. 3.10-17

Insert Pages

T. S. 3.10-1

T. S. 3.10-2

T. S. 3.10-2a

T. S. 3.10-10a

T. S. 3.10-11

T. S. 3.10-16

T. S. 3.10-17

Fig. T. S. 3.10-7

3.10 CONTROL ROD AND POWER DISTRIBUTION LIMITS

Applicability

Applies to the limits on core fission power distributions and to the limits on control rod operations.

Objective

To ensure 1) core subcriticality after reactor trip, 2) acceptable core power distribution during power operation in order to maintain fuel integrity in normal operation transients associated with faults of moderate frequency, supplemented by automatic protection and by administrative procedures, and to maintain the design basis initial conditions for limiting faults, and 3) limited potential reactivity insertions caused by hypothetical control rod ejection.

Specification

a. Shutdown Reactivity

When the reactor is subcritical prior to reactor startup, the hot shutdown margin shall be at least that shown in Figure TS 3.10-1. Shutdown margin as used here is defined as the amount by which the reactor core would be subcritical at hot shutdown conditions if all control rods were tripped, assuming that the highest worth control rod remained fully withdrawn, and assuming no changes in xenon, boron, or part length rod position.

b. Power Distribution Limits

1. At all times, except during low power physics tests, the hot channel factors defined in the basis must meet the following limits:

a. $F_Q(Z)$ Limits

(i) Westinghouse Electric Corporation Fuel

$$F_Q(Z) \leq (2.22/P) \times K(Z) \text{ for } P > .5$$

$$F_Q(Z) \leq (4.44) \times K(Z) \text{ for } P \leq .5$$

(ii) Exxon Nuclear Company Fuel

$$F_Q(Z) \leq P_Q^T (E_j) \times K(Z) \text{ for } P > .5$$

$$F_Q(Z) \leq (4.42) \times K(Z) \text{ for } P \leq .5$$

where

P is the fraction of full power at which the core is operating

K(Z) is the function given in Figure TS 3.10-2

Z is the core height location F_Q

$F_Q^T(E_j)$ is the function given in Figure TS 3.10-7

E_j is the fuel rod exposure for which F_Q is measured

b. $F_{\Delta H}^N$ Limits

$$F_{\Delta H}^N \leq 1.55 [1 + 0.2(1-P)] \quad \text{For 0 to 24,000 MWD/MTU burnup fuel}$$

$$F_{\Delta H}^N \leq 1.52 [1 + 0.2(1-P)] \quad \text{For greater than 24,000 MWD/MTU burnup fuel}$$

where P is the fraction of full power at which the core is operating

2. If either measured hot channel factor exceeds the values specified in 3.10.b.1, the reactor power shall be reduced so as not to exceed a fraction of the design value equal to the ratio of the F_Q^N or $F_{\Delta H}^N$ limit to measured value, whichever is less, and the high neutron flux trip setpoint shall be reduced by the same ratio. If subsequent incore mapping cannot, within a 24 hour period, demonstrate that the hot channel factors are met, the overpower ΔT and overtemperature ΔT trip setpoints shall be similarly reduced.
3. Following initial loading and at regular effective full power monthly intervals thereafter, power distribution maps using the movable detection system, shall be made to confirm that the hot channel factor limits of specification 3.10.b.1 are satisfied. For the purpose of this confirmation:

- a. The measurement of total peaking factor, F_Q^{Meas} , shall be increased by three percent to account for manufacturing tolerances and further increased by five percent to account for measurement error.
 - b. The measurement of enthalpy rise hot channel factor, $F_{\Delta H}^N$, shall be increased by four percent to account for measurement error.
4. The reference equilibrium indicated axial flux difference for each excore channel as a function of power level (called the target flux difference) shall be measured at least once per effective full power quarter. If the axial flux difference has not been measured in the last effective full power month, the target flux difference must be updated monthly by linear interpolation using the most recent measured value and the value predicted for the end of the cycle life.

Measurements of the hot channel factors are required as part of startup physics tests, at least each full power month of operation, and whenever abnormal power distribution conditions require a reduction of core power or a level based on measured hot channel factors. The incore map taken following initial loading provides confirmation of the basic nuclear design bases including proper fuel loading patterns. The periodic monthly incore mapping provides additional assurance that the nuclear design bases remain inviolate and identify operational anomalies which would, otherwise, affect these bases.

For normal operation, it is not necessary to measure these quantities. Instead it has been determined that, provided certain conditions are observed, the hot channel factor limits will be met; these conditions are as follows:

1. Control rods in a single bank move together with no individual rod insertion differing by more than 15 inches from the bank demand position.
2. Control rod banks are sequenced with overlapping banks as shown in Figure TS 3.10-4.
3. The control bank insertion limits are not violated.
4. Axial power distribution control specifications which are given in terms of flux difference control and control bank insertion limits are observed. Flux difference refers to the difference in signals between the top and bottom halves of two-section excore neutron detectors. The flux difference is a measure of the axial offset which is defined as the difference in normalized power between the top and bottom halves of the core.

The permitted relaxation in $F_{\Delta H}^N$ allows radial power shape changes with rod insertion to the insertion limits. It has been determined that provided the above conditions 1 through 4 are observed, these hot channel factors limits are met.

The $F_Q(Z)$ limits of specification 3.10.b.1.a include consideration of enhanced fission gas release at high burn up, off-gassing (release of sorbed gases), and other effects in fuel supplied by Exxon Nuclear Company; this results in

an additional penalty in the form of the function $BU(E_j)$, as shown in Figure TS 3.10-7, which is applied to Exxon fuel. References 7 and 8 discuss these phenomena.

In specification 3.10.b.1.a, F_Q is arbitrarily limited for $P < 0.5$ (except for low power physics tests).

The specifications for axial power distribution control referred to above are designed to minimize the effects of xenon redistribution on the axial power distribution during load-follow maneuvers.

Conformance with specification 3.10.b.6 through 3.10.b.9 ensures the F_Q upper bound envelope is not exceeded and xenon distributions are not developed which at a later time would cause greater local power peaking, even though the current flux difference is within the limits specified.

The target (or reference) value of flux difference is determined as follows: At any time that equilibrium xenon conditions have been established, the indicated flux difference is noted with part length rods withdrawn from the core and with the full length rod control rod bank more than 190 steps withdrawn (i.e., normal full power operating position appropriate for the time in life, usually withdrawn farther as burnup proceeds). This value, divided by the fraction of full power at which the core was operating is the full power value of the target flux difference. Values for all other core power levels are obtained by multiplying the full power value by the fractional power. Since the indicated equilibrium value was noted, no allowances for excore detector error are necessary and indicated deviation of $\pm 5\% \Delta I$ are permitted from the indicated reference value. During periods where extensive load following is required, it may be impractical to establish the required core conditions for measuring the target flux difference every month. For this reason, the specification provides two methods for updating the target flux difference. Figure TS 3.10-6 shows a typical construction of the target.

The rod position indicator channel is sufficiently accurate to detect a rod $\pm 7\text{-}1/2$ inches away from its demand position. If the rod position indicator channel is not operable, the operator will be fully aware of the inoperability of the channel, and special surveillance of core power tilt indications, using established procedures and relying on excore nuclear detectors, and/or movable incore detectors, will be used to verify power distribution symmetry.

One inoperable control rod is acceptable provided the potential consequences of accidents are not worse than the cases analyzed in the safety analysis report. A 30 day period is provided for the re-analysis of all accidents sensitive to the changed initial condition.

The required drop time to dashpot entry is consistent with safety analysis.

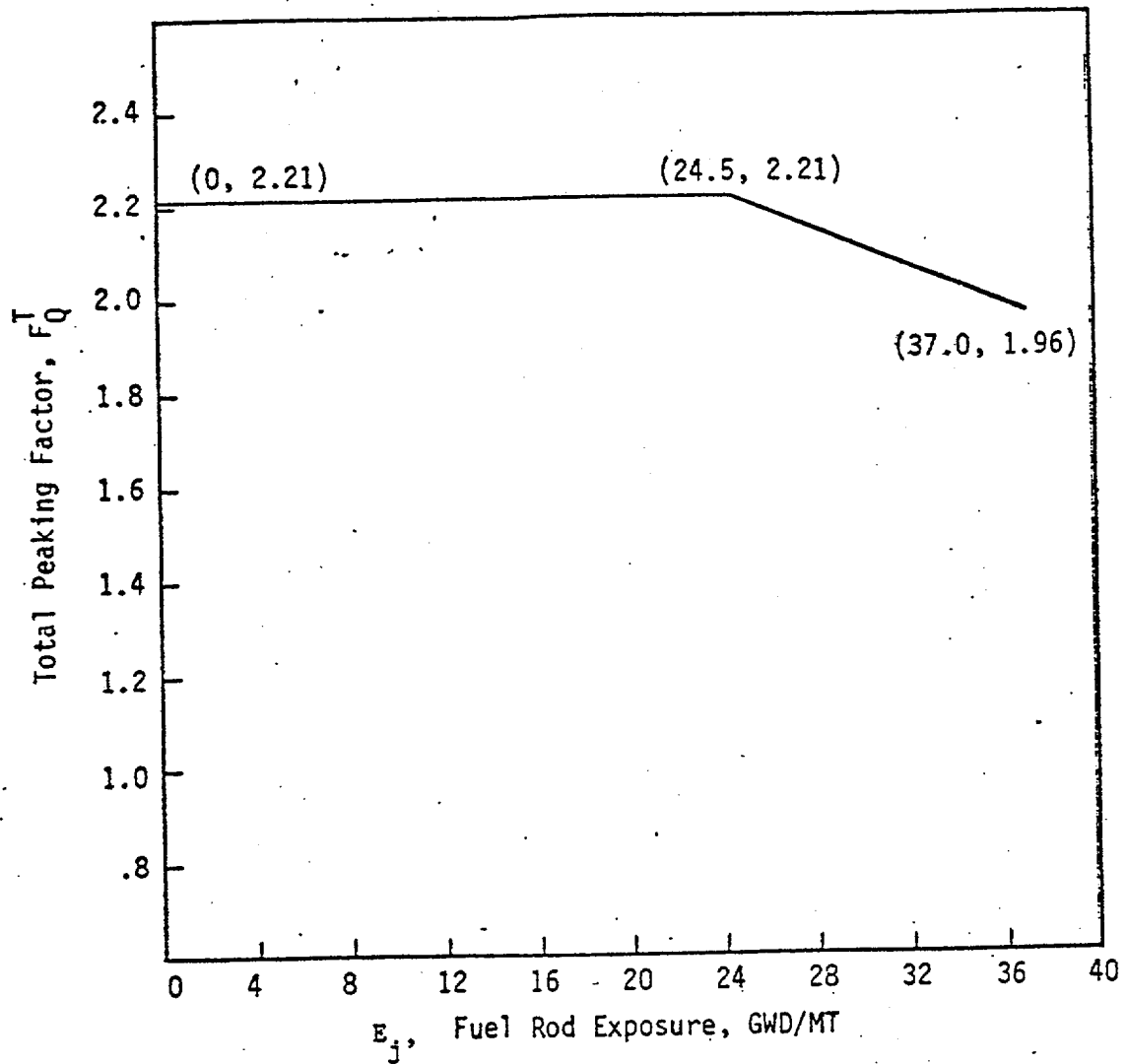
The DNB related accident analysis assumed as initial conditions that the T_{inlet} was 4°F above nominal design or T_{avg} was 4°F above nominal design. The Reactor Coolant System pressure was assumed to be 30 psi below nominal design.

REFERENCES

- (1) Section 4.3
- (2) Section 4.4
- (3) Section 14
- (4)

- (5) Letter from E. R. Mathews, (WPSC) to D. G. Eisenhut (NRC) dated January 8, 1980, submitting information on Clad Swelling and Fuel Blockage Models.
- (6) Letter from E. R. Mathews (WPSC) to A. Schwencer (NRC) dated December 14, 1979, submitting the ECCS Re-analysis properly accounting for the zirconium/water reaction.

- (7) George C. Cooke, Philip J. Valentine; "Exposure Sensitivity Study for ENC XN-1 Reload Fuel at Kewaunee Using the ENC-WREM-IIA PWR Evaluation Model, WN-NF-79-72," Exxon Nuclear Company, October, 1979.
- (8) Letter from L. C. O'Mally (Exxon Nuclear Company) to E. D. Novak (WPSC) providing F_Q exposure dependence as a function of rod burnup.



F_Q^T versus Rod Exposure: $F_Q^T(E_j)$
 (Reference specification 3.10.b.1.a.(ii))

Figure TS 3.10-7



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO AMENDMENT NO. 36 TO FACILITY OPERATING LICENSE NO. DPR-43

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY

MADISON GAS AND ELECTRIC COMPANY

KEWAUNEE NUCLEAR POWER PLANT

DOCKET NO. 50-305

Introduction

By letters dated August 7, 1981, as supplemented August 21, 1981, Wisconsin Public Service Corporation, et al (the licensees) submitted their proposed Amendment No. 46 to the Technical Specifications to the Kewaunee Nuclear Power Plant. Included in this proposed amendment was a change in respect of power distribution limits consequence upon extended burn up for fuels supplied by the Exxon Nuclear Company. This particular proposal has been evaluated to establish its particular features and related safety and environmental impacts, and the necessary safety conclusions have been drawn.

Evaluation

Pages T. S. 3.10-10a and Figure T. S. 3.10-7 of Proposed Amendment No. 46 of the Kewaunee Technical Specifications provide an exposure dependent total peaking factor (F_0) limit for Exxon fuel to account for the effects of burn up (or fuel exposure) on internal pressure in the fuel rods. This exposure dependency is based on an Exxon exposure sensitivity study (Ref. 3) provided as part of the Kewaunee submittal. The study includes the use of an NRC-high burn up fission gas release correction term (Ref. 4) and the resulting F_0 limit remains bounded by an earlier study (Ref. 5) using clad swelling and rupture models in NUREG-0630 (Ref. 6).

The topical report (Ref. 3) also describes the LOCA analysis performed by Exxon to establish the allowable total peaking limit F_0 as a function of burn up for the XN-1 fuel reload in the Kewaunee Nuclear Power Plant. The F_0 dependence on burn up was based on the blowdown transient for a 0.4 DECLB LOCA which was found to produce the highest peak clad temperature (PCT) over the break spectrum analyzed in XN-NF-79-1. The LOCA analysis and the burn up dependent F_0 study were performed with Exxon's reviewed and approved ENC-WREM IIA PWR evaluation model supplemented by the NRC/W SER model of 1978 which model combination is acceptable for an interim period in its application to W 2 loop PWR plants with Upper Plenum Injection. Results have been presented primarily for the interim model combination; we have noted the related Exxon submittal that the use of

the interim UPI model results in a reduction of 23° in PCT, from the ENC-WREM-IIA Evaluation Model. Correcting the primary results by +23° shows that for all cases presented, the calculated peak clad temperature does not exceed the value of 2200°F as required by 10 CFR 50.46. We, therefore, conclude that the calculations, as performed, are acceptable as an interim basis for continued safe operation of the plant.

We have reviewed the analytical processes described in the topical report and have concluded that the assumptions and procedures followed in determining the allowable F_0 over the core life proposed are acceptable. We have concluded that operation of the Kewaunee Nuclear Power Plant with the allowable F_0 determined in the study will not result in compromising the requirements of 10 CFR 50.46 in the event of a LOCA, and that the LOCA and burn up dependent analyses have been performed in accordance with interim methodology that is acceptable.

The proposed amendment to the Technical Specifications is acceptable. The related bases which were proposed have been clarified to more generally describe all the effects influencing internal gas pressure at extended burn up; by subsequent telephone conversation, the licensee, has agreed to this clarification.

Environmental Consideration

We have determined that the amendment does not authorize a change in effluent types or total amounts nor an increase in power level and will not result in any significant environmental impact. Having made this determination, we have further concluded that the amendment involves an action which is insignificant from the standpoint of environmental impact and, pursuant to 10 CFR §51.5(d)(4), that an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with the issuance of this amendment.

Conclusion

We have concluded, based on the considerations discussed above, that: (1) because the amendment does not involve a significant increase in the probability or consequences of accidents previously considered and does not involve a significant decrease in a safety margin, the amendment does not involve a significant hazards consideration, (2) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, and (3) such activities will be conducted in compliance with the Commission's regulations and the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Date: August 27, 1981

REFERENCES

1. E. R. Mathews (WPSC) letter to D. G. Eisenhut (NRC) on "Proposed Amendment 46 to the Kewaunee Technical Specifications" dated August 7, 1981.
2. Memorandum from D. F. Ross and D. G. Eisenhut (NRC) to D. B. Yassallo and K. R. Goller (NRC) on "Revised Interim Safety Evaluation Report on the Effects of Fuel Rod Bowing on Thermal Margin Calculations for Light-Water Reactors" dated February 16, 1977.
3. G. C. Cooke and P. J. Valentine, "Exposure Sensitivity Study for ENC XN-1 Reload Fuel at Kewaunee Using the ENC-WREM-IIA PWR Evaluation Model," Exxon Nuclear Company Report XN-NF-79-72(P), October 1979.
4. R. O. Meyer, C. E. Beyer, and J. C. Voglewede, "Fission Gas Release from Fuel at High Burnup," U. S. Nuclear Regulatory Commission Report NUREG-0418, March 1978.
5. E. R. Mathews (WPSC) letter to D. G. Eisenhut (NRC) on "Clad Swelling and Fuel Blockage Models" dated January 8, 1980.
6. D. A. Powers and R. O. Meyer, "Cladding Swelling and Rupture Models for LOCA Analysis," U. S. Nuclear Regulatory Commission Report NUREG-0630, April 1980.

UNITED STATES NUCLEAR REGULATORY COMMISSIONDOCKET NO. 50-305WISCONSIN PUBLIC SERVICE CORPORATIONWISCONSIN POWER AND LIGHT COMPANYMADISON GAS AND ELECTRIC COMPANYNOTICE OF ISSUANCE OF AMENDMENT TO FACILITY
OPERATING LICENSE

The U. S. Nuclear Regulatory Commission (the Commission) has issued Amendment No. 36 to Facility Operating License No. DPR-43, issued to Wisconsin Public Service Corporation, Wisconsin Power and Light Company, and Madison Gas and Electric Company (the licensees), which revised Technical Specifications for operation of the Kewaunee Nuclear Plant (the facility) located in Kewaunee, Wisconsin. The amendment is effective as of the date of issuance.

The amendment revises the Technical Specifications in respect to power distribution limits consequent upon extended burn up for fuel supplied by Exxon Nuclear Company.


The application for the amendment complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations. The Commission has made appropriate findings as required by the Act and the Commission's rules and regulations in 10 CFR Chapter I, which are set forth in the license amendment. Prior public notice of this amendment was not required since this amendment does not involve a significant hazards consideration.

The Commission has determined that the issuance of this amendment will not result in any significant environmental impact and that pursuant to 10 CFR §51.5(d)(4) an environmental impact statement or negative declaration and environmental impact appraisal need not be prepared in connection with issuance of this amendment.

For further details with respect to this action, see (1) the application for amendment dated August 7, 1981, as supplemented August 21, 1981, (2) Amendment No. 36 to License No. DPR-43 and (3) the Commission's related Safety Evaluation. All of these items are available for public inspection at the Commission's Public Document Room, 1717 H Street, N.W., Washington, D.C. and at the Kewaunee Public Library, 314 Milwaukee Street, Kewaunee, Wisconsin 54216. A copy of items (2) and (3) may be obtained upon request addressed to the U. S. Nuclear Regulatory Commission, Washington, D.C. 20555, Attention: Director, Division of Licensing.

Dated at Bethesda, Maryland, this 27th day of August, 1981.

FOR THE NUCLEAR REGULATORY COMMISSION


Steven A. Yarga, Chief
Operating Reactors Branch #1
Division of Licensing