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GIESLER,C.W. Wisconsin Public Service Corp.
RECIP.NAME RECIPIENT AFFILIATION
Office of Nuclear Reactor Regulation, Director

SUBJECT: Application for proposed Amend 56 to License DPR-43, requesting change to burnup dependent total peaking factor. Encl proprietary "Extension of FQ Burnup Curve to Peak Rod Burnup of 43.0 GWD/MTU" withheld (ref 10CFR2.790).

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NRC-83-225

# WISCONSIN PUBLIC SERVICE CORPORATION

*P.O. Box 1200, Green Bay, Wisconsin 54305*

December 14, 1983

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

Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Proposed Amendment No. 56 to the Kewaunee Nuclear
Power Plant Technical Specifications

This letter transmits a request and the supporting documentation for an amendment to the Kewaunee Nuclear Power Plant Technical Specifications. Accordingly, we have enclosed three (3) originals and 40 copies of proposed amendment No. 56. The amendment requests a change to the burnup dependent total peaking factor, $F_Q^T$, applicable to only the Exxon Nuclear Company fabricated fuel used at the Kewaunee Nuclear Power Plant. Specifically, the exposure range for which $F_Q^T$ is defined has been extended from 37 GWD/MT to 43 GWD/MT (peak rod). The only page affected by this change is Figure TS 3.10-6.

A description of the change, along with the appropriate safety evaluation and the significant hazards determination, is included in Enclosure 1 to this letter. The affected technical specifications page is included in Enclosure II.

Enclosure III contains the ENC safety and design evaluation report to support the proposed amendment. The Exxon Nuclear Company considers the information contained in this report to be proprietary. In accordance with 10CFR2.790(b), the affidavit contained in Enclosure IV provides the necessary information to support the withholding of the subject ENC report from public disclosure.

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Finally, because the next refueling outage is presently scheduled for March 1984, WPSC requests your response regarding the proposed amendment as soon as practical.

We have determined that this change is a Class III amendment since it involves a single safety issue which is deemed not to involve a significant hazards consideration.

A check in the amount of $4,000 is enclosed in accordance with the requirements of 10CFR170.22.

Very truly yours,

C. W. Giesler
Vice President - Nuclear Power

Enc.

MSL/js

cc - Mr. S. A. Varga, US NRC
Mr. Robert Nelson, US NRC
Mr. Clarence Riederer, Wisconsin Public Service Commission

Subscribed and Sworn to
Before Me This 14th Day
of December 1983

Jeanne M. Stein
Notary Public, State of Wisconsin

My Commission Expires:
June 28, 1987

Enclosure I to Letter from C. W. Giesler

To H. R. Denton

Dated December 14, 1983

Proposed Amendment No. 56 to the KNPP
Technical Specifications

Description, Safety Evaluation,

and

Significant Hazards Determination

# Proposed Amendment No. 56 to the KNPP Technical Specifications

## Introduction

In August 1981, Wisconsin Public Service Corporation (WPSC) proposed revisions to the Kewaunee Nuclear Power Plant Technical Specifications to incorporate an exposure dependent total peaking factor, $F_Q^T$, applicable for only Exxon fabricated fuel.[1] The revision was based on results of an exposure sensitivity study performed by the Exxon Nuclear Company (ENC) for reload fuel at the Kewaunee Nuclear Power Plant (KNPP).[2] The study indicated that the dependency of $F_Q^T$ on fuel burnup was necessary to maintain appropriate Peak Clad Temperature limits. The NRC approved the ENC analysis, and granted the requested proposed amendment.[3]

It is important to note, however, that the ENC analysis used an end-of-life fuel rod burnup of 37 GWD/MTU. (This burnup limit was not selected because of a safety implication, but was chosen by the Exxon Nuclear Company as a design value only for the purposes of the study.) Consequently, the burnup of Exxon fuel rods was implicitly limited to less than 37,000 MWD/MTU, and WPSC was obligated to include this constraint in our technical specifications.

In contrast, neither an exposure dependent peaking factor nor a burnup limit has been imposed on the Westinghouse fabricated fuel assemblies also used at the Kewaunee Nuclear Plant. Consequently, higher burnups with Westinghouse fuel assemblies have been achieved with no indications of fuel degradation.

## Summary

WPSC is submitting a proposed amendment to the Kewaunee Nuclear Power Plant Technical Specifications to extend the burnup range over which the total peaking factor is defined from 37 GWD/MTU to 43 GWD/MTU (peak rod).

Based on the design and safety evaluations conducted by the Exxon Nuclear Company and Wisconsin Public Service Corporation, as discussed below, WPSC has determined that the proposed amendment does not involve a safety concern.

## Discussion

### Description of Change

Figure 1 presents the total peaking factor, $F_Q^T$, as a function of peak rod burnups for Exxon fabricated fuel at the Kewaunee Nuclear Plant. The solid line represents the current $F_Q^T$ values presently defined in the technical specifications. As shown, an $F_Q^T$ of 2.21 is applicable out to a peak rod burnup of 24.5 GWD/MTU. At higher exposures, the allowable $F_Q^T$ limit decreases linearly to 1.96 at 37 GWD/MTU. As proposed, above 37 GWD/MTU, $F_Q^T$ would continue at a constant value of 1.96 to an exposure of 43 GWD/MTU as indicated by the dotted line.

### Technical Evaluations and Justifications

The Exxon Nuclear Company performed an evaluation of the KNPP design and safety analyses to verify their adequacy with regards to the proposed technical specifications amendment. Specifically, the Exxon Nuclear Company examined the thermal hydraulic design, plant transient analyses, fuel mechanical design, and the LOCA ECCS calculations. The ENC evaluation is included as Enclosure III to this letter and is summarized below.

1) Thermal hydraulic design - Because the proposed amendment does not result in any configuration changes in the fuel assembly, the previously approved thermal hydraulic calculations will continue to remain valid.

2) Plant transient analysis - Because each reactor cycle is designed such that the neutronic parameters are within those used in the original plant transient analyses, the original analyses will also remain valid under the proposed technical specifications amendment.

3) Fuel mechanical design - The fuel mechanical design was reanalyzed at a peak rod exposure of 43 GWD/MTU.[4] All the design limits meet the ENC criteria and thus support a peak rod exposure of 43 GWD/MTU.

4) LOCA ECCS evaluation - The ENC evaluation of the existing KNPP LOCA ECCS analysis demonstrated that the existing analysis is bounding and thus the analysis is valid for an $F_Q^T$ limit of 1.96 at 43 GWD/MTU.

In addition, WPSC has also performed a review of the impact of the proposed amendment on the off-site radiological dose calculations and analyses contained in the FSAR. This review has shown that the proposed amendment will not affect the FSAR radiological analyses because the isotopic inventories contained in these analyses are not based on fuel rod exposure, but on reactor power level, assuming the reactor has operated long enough so that the isotopic inventories have reached equilibrium concentrations. Thus, the radiological calculations and analyses previously approved by the NRC will continue to remain valid.

The proposed technical specifications amendment is very similar to the recent amendments submitted by the Northern States Power Company [5,6] and approved by the NRC Staff[7,8] which demonstrated that the burnup dependent peaking factor could be extended to higher burnups. The amendments increased peak pellet burnups at the Prairie Island Nuclear Generating Plants from 41,850 MWD/MTU to

51,000 MWD/MTU. These burnups are equivalent to peak rod exposures from 38,000 to 46,300 MWD/MTU.

The design of the Kewaunee Nuclear Plant 2-loop steam supply system is virtually identical to that of the Prairie Island Nuclear Plants. The reactor core and the thermal and hydraulic characteristics of the plants are substantially the same, and the emergency core cooling system (ECCS) for the Kewaunee Nuclear Plant consists of the same basic subsystems as the Prairie Island Nuclear Plants. These similarities have been used by both Exxon and Westinghouse in their analyses of the ECCS. The Westinghouse generic documents, Westinghouse Emergency Core Cooling System - Plant Sensitivity Studies[9] and ECCS Evaluation Model for 2-Loop Upper Plenum Injection Plants[10] are typical examples of documents which apply to both the Kewaunee and Prairie Island Plants and other sister plants.

In addition, ENC has provided ECCS analyses[11,12] for the Kewaunee Nuclear Plant which also demonstrate the similarities in fuel behavior between the two sister plants during ECC conditions. The latter referenced analysis, which specifically treats upper plenum injection for 2-loop reactors was submitted by the Northern States Power Company on February 3, 1983[13] and was recently included on our docket[14]. The analysis is presently being reviewed by the NRC Staff.

Conclusion and Safety Evalution

In conclusion, WPSC is submitting the proposed amendment to the Kewaunee Nuclear Power Plant Technical Specifications to extend the burnup dependent total peaking factor ($F_Q^T$) to peak rod burnups of 43 GWD/MTU. Based on the following safety evaluation, we have determined that the proposed amendment does not represent a safety concern.

1) The appropriate design and safety analyses have been evaluated to assure their validity under the proposed amendment. The LOCA ECCS analysis, plant transient analyses, fuel mechanical design, thermal hydraulic design, and radiological analyses are all valid for an $F_Q^T$ limit of 1.96 at 43 GWD/MTU.

2) The NRC Staff recently approved very similar technical specifications amendments submitted by the Northern States Power (NSP) Company. The amendments extended the burnup of Exxon fuel used at the Prairie Island Nuclear Generating Plants from about 42 GWD/MTU to 51 GWD/MTU (peak pellet), and demonstrated that the exposure dependent peaking factor could be extended to higher burnups. Because the proposed technical specifications amendment is substantially the same as that submitted by NSP and approved by the NRC Staff, and due to the similarities between the Kewaunee and Prairie Island Nuclear Plants as presented in the discussion, WPSC believes that the proposed technical specifications amendment is justifiable.

3) The end-of-life fuel rod burnup of 37 GWD/MTU used in the initial ENC exposure sensitivity study which defined $F_Q^T$ was not based on a safety concern. Enclosure III provides the ENC basis for extending the $F_Q^T$ limit.

4) Westinghouse fuel is not constrained by a burnup limit in the technical specifications. As a result, WPSC would not have to revise technical specifications in order to achieve higher burnups of Westinghouse fuel. The fact that WPSC is required to submit for review the proposed extension of burnup of Exxon fuel is an artifact of the analysis employed.

5) The Kewaunee Plant has routinely experienced similar burnups with co-resident Westinghouse fuel.

6) The peak burnups will be achieved in only a few assemblies. The extension will actually result in a relatively small incremental increase in discharge exposure (approximately 5,000 MWD/MTU on a batch average basis). The batch average discharge exposure is expected to be less than 35,000 MWD/MTU, comparable to discharge exposures routinely experienced with Westinghouse fuel assemblies.

Significant Hazards Determination

Based on the above safety evaluation and the guidelines provided in 10CFR50.92(c), we have determined that the proposed amendment does not represent a significant hazards concern.

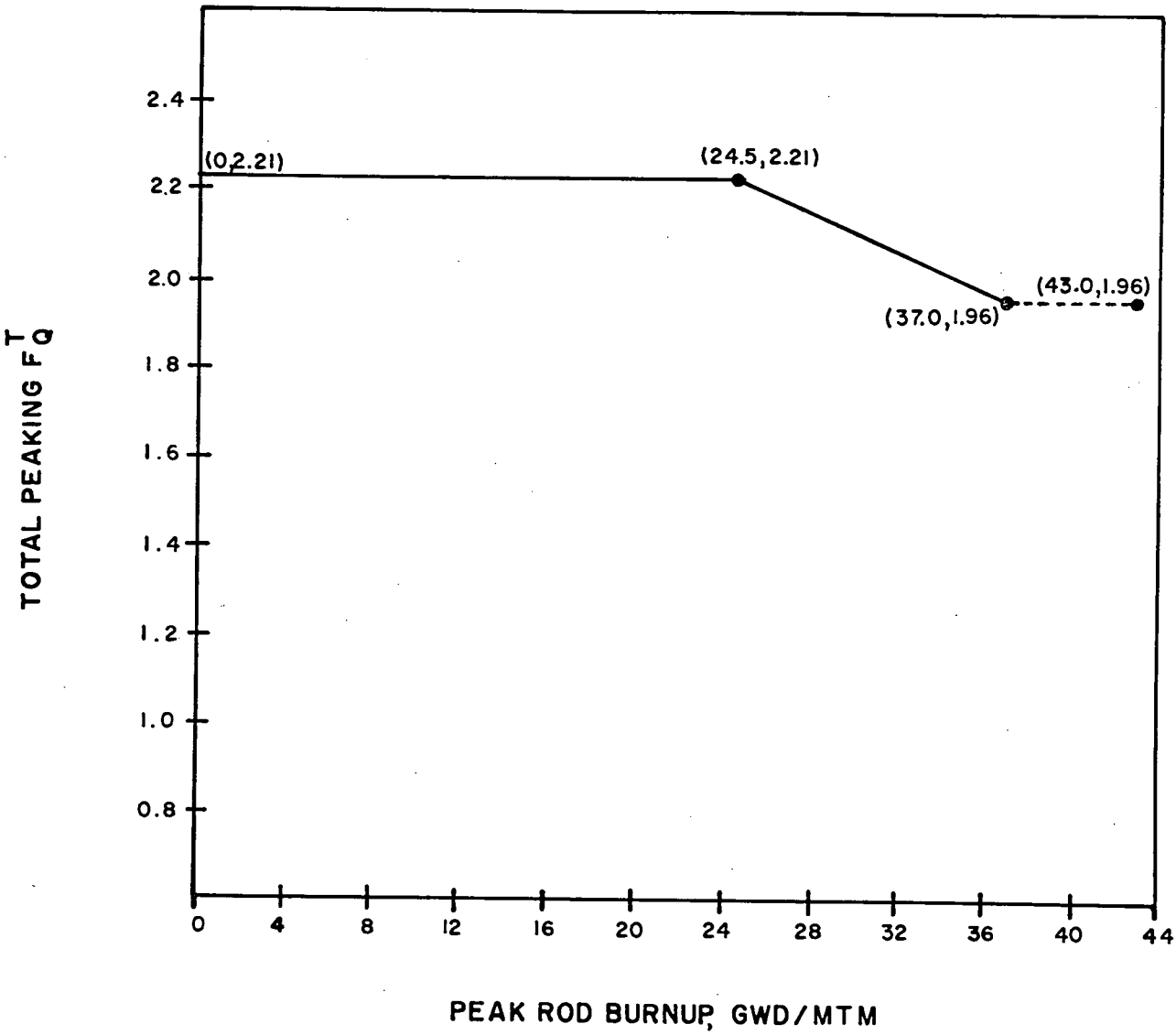
TOTAL PEAKING $F_Q^T$
2.4
2.2
2.0
1.8
1.6
1.4
1.2
1.0
0.8
(0,2.21)
(24.5,2.21)
(37.0,1.96)
(43.0,1.96)
0
4
8
12
16
20
24
28
32
36
40
44
PEAK ROD BURNUP, GWD/MTM

FIGURE 1

## REFERENCES

1. Letter from E. R. Mathews (WPSC) to D. G. Eisenhut (NRC) dated August 7, 1981.

2. Exposure Sensitivity Study for ENC XN-1 Reload Fuel at Kewaunee Using the ENC-WREM-IIA PWR Evaluation Model dated October 1979, XN-NF-79-72(P); Exxon Nuclear Company, Inc.

3. Letter from R. Licciardo (NRC) to E. R. Mathews (WPSC) dated April 29, 1982.

4. Kewaunee Design Report - Extended Burnup Analysis dated October 1983, XN-NF-82-23, Revision 1; Exxon Nuclear Company, Inc.

5. Letter from D. Musolf (NSP) to Director, Office of Nuclear Reactor Regulation (NRC) dated June 14, 1982.

6. Letter from D. Musolf (NSP) to Director, Office of Nuclear Reactor Regulation (NRC) dated September 24, 1982.

7. D. C. Ianni (NRC) to D. M. Musolf (NSP) dated July 16, 1982.

8. D. C. Ianni (NRC) to D. M. Musolf (NSP) dated October 18, 1982.

9. Westinghouse Emergency Core Cooling System - Plant Sensitivity Studies dated July 1974, WCAP-8340, Westinghouse Electric Corporation.

10. Modified W ECCS Evaluation Model dated February 1978, WCAP 9220, Westinghouse Electric Corporation.

11. ECCS Analysis for Kewaunee Using ENC WREM-IIA PWR Evaluation Model dated January 1979, XN-NF-79-1, Exxon Nuclear Company.

12. REFLEX/UPI: An Analytical Model to Calculate Reflood Rates for PWR's with Upper Plenum Injection dated February 1983 XN-NF-79-49(P), Exxon Nuclear Company.

13. Letter from D. M. Musolf (NSP) to Director, Office of Nuclear Reactor Regulation (NRC) dated February 3, 1983

14. Letter from S. A. Varga (NRC) to C. W. Giesler (WPSC) dated April 22, 1983.