

April 26, 1995

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Mr. M. L. Marchi
Manager - Nuclear Business Group
Wisconsin Public Service Corporation
Post Office Box 19002
Green Bay, WI 54307-9002

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SUBJECT: AMENDMENT NO. 120 TO FACILITY OPERATING LICENSE NO. DPR-43 -
KEWAUNEE NUCLEAR POWER PLANT (TAC NO. M90349)

Dear Mr. Marchi:

The Commission has issued the enclosed Amendment No. 120 to Facility Operating License No. DPR-43 for the Kewaunee Nuclear Power Plant (KNPP). This amendment revises the Technical Specifications (TS) in response to your application dated August 24, 1994, as supplemented on January 23, 1995.

The amendment revises KNPP TS 3.1.b.1 and Figure TS 3.1-4 regarding Low Temperature Overpressure (LTOP) protection for the reactor coolant pressure boundary. The change extends the LTOP requirements through the end of operating cycle 21 or 18.40 effective full power years. The Basis Section has also been modified to reflect these changes.

A copy of the Safety Evaluation is also enclosed. Notice of issuance will be included in the Commission's next regular biweekly Federal Register notice.

Sincerely,

Original signed by:

Richard J. Laufer, Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Docket No. 50-305

- Enclosures: 1. Amendment No. 120 to License No. DPR-43
2. Safety Evaluation

cc w/encls: See next page

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

April 26, 1995

Mr. M. L. Marchi
Manager - Nuclear Business Group
Wisconsin Public Service Corporation
Post Office Box 19002
Green Bay, WI 54307-9002

SUBJECT: AMENDMENT NO. 120 TO FACILITY OPERATING LICENSE NO. DPR-43 -
KEWAUNEE NUCLEAR POWER PLANT (TAC NO. M90349)

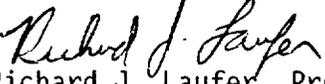
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Richard J. Laufer, Project Manager
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Docket No. 50-305

Enclosures: 1. Amendment No. 120 to
License No. DPR-43
2. Safety Evaluation

cc w/encls: See next page

Mr. M. L. Marchi
Wisconsin Public Service Corporation

Kewaunee Nuclear Power Plant

cc:

Foley & Lardner
Attention: Mr. Bradley D. Jackson
One South Pinckney Street
P. O. Box 1497
Madison, Wisconsin 53701-1497

Chairman
Town of Carlton
Route 1
Kewaunee, Wisconsin 54216

Mr. Harold Reckelberg, Chairman
Kewaunee County Board
Kewaunee County Courthouse
Kewaunee, Wisconsin 54216

Chairman
Public Service Commission of
Wisconsin
Mill Farms State Office Building
Madison, Wisconsin 53702

Attorney General
114 East, State Capitol
Madison, Wisconsin 53702

U. S. Nuclear Regulatory Commission
Resident Inspectors Office
Route #1, Box 999
Kewaunee, Wisconsin 54216

Regional Administrator - Region III
U. S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, Illinois 60532-4531

Mr. Robert S. Cullen
Chief Engineer
Wisconsin Public Service Commission
P. O. Box 7854
Madison, Wisconsin 53707



UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

WISCONSIN PUBLIC SERVICE CORPORATION

WISCONSIN POWER AND LIGHT COMPANY

MADISON GAS AND ELECTRIC COMPANY

DOCKET NO. 50-305

KEWAUNEE NUCLEAR POWER PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 120
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 licensees) dated August 24, 1994, as supplemented on January 23, 1995, 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-43 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No.120, 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, and is to be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION



Richard J. Laufer, Project Manager
Project Directorate III-3
Division of Reactor Projects III/IV
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical
Specifications

Date of issuance: April 26, 1995

ATTACHMENT TO LICENSE AMENDMENT NO. 120

FACILITY OPERATING LICENSE NO. DPR-43

DOCKET NO. 50-305

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

TS 3.1-6

TS B3.1-7

FIGURE TS 3.1-4

INSERT

TS 3.1-6

TS B3.1-7

FIGURE TS 3.1-4

b. Heatup and Cooldown Limit Curves for Normal Operation

1. The reactor coolant temperature and pressure and system heatup and cooldown rates (with the exception of the pressurizer) shall be limited in accordance with Figures TS 3.1-1, TS 3.1-2, and TS 3.1-4. Figures TS 3.1-1 and TS 3.1-2 are applicable for the service period of up to 20 effective full-power years. Figure TS 3.1-4 is applicable through the end of operating cycle 21 or 18.40 effective full-power years.
 - A. Allowable combinations of pressure and temperature for specific temperature change rates are below and to the right of the limit lines shown. Limit lines for cooldown rates between those presented may be obtained by interpolation.
 - B. Figures TS 3.1-1 and TS 3.1-2 define limits to assure prevention of non-ductile failure only. For normal operation other inherent plant characteristics, e.g., pump heat addition and pressurizer heater capacity may limit the heatup and cooldown rates that can be achieved over certain pressure-temperature ranges.
 - C. Figure TS 3.1-4 defines limits to assure prevention of non-ductile failure applicable to low temperature overpressurization events only. Application of this curve is limited to evaluation of LTOP events whenever one or more of the RCS cold leg temperatures are less than or equal to the LTOP enabling temperature of 338°F.
2. The secondary side of the steam generator must not be pressurized > 200 psig if the temperature of the steam generator is < 70°F.
3. The pressurizer cooldown and heatup rates shall not exceed 200°F/hr and 100°F/hr, respectively. The spray shall not be used if the temperature difference between the pressurizer and the spray fluid is > 320°F.

A limit curve (Figure TS 3.1-4) for evaluation of low temperature overpressure protection (LTOP) events has been calculated using the methodology of Regulatory Guide 1.99, Revision 2, Position C.2. The derivation of the LTOP evaluation curve is consistent with Footnotes⁽¹⁵⁾⁽¹⁶⁾. This curve is applicable for 18.40 effective full-power years of fluence (through the end of operating cycle 21). If a low temperature overpressure event occurred, the RCS pressure transient would be evaluated to the limits of this figure to verify the integrity of the reactor vessel. If these limits are not exceeded, vessel integrity is assured and a TS violation has not occurred.

Pressurizer Limits - (TS 3.1.b.3)

Although the pressurizer operates at temperature ranges above those for which there is reason for concern about brittle fracture, operating limits are provided to assure compatibility of operation with the fatigue analysis performed in accordance with Code requirements. In-plant testing and calculations have shown that a pressurizer heatup rate of 100°F/hr cannot be achieved with the installed equipment.

Low Temperature Overpressure Protection - (TS 3.1.b.4)

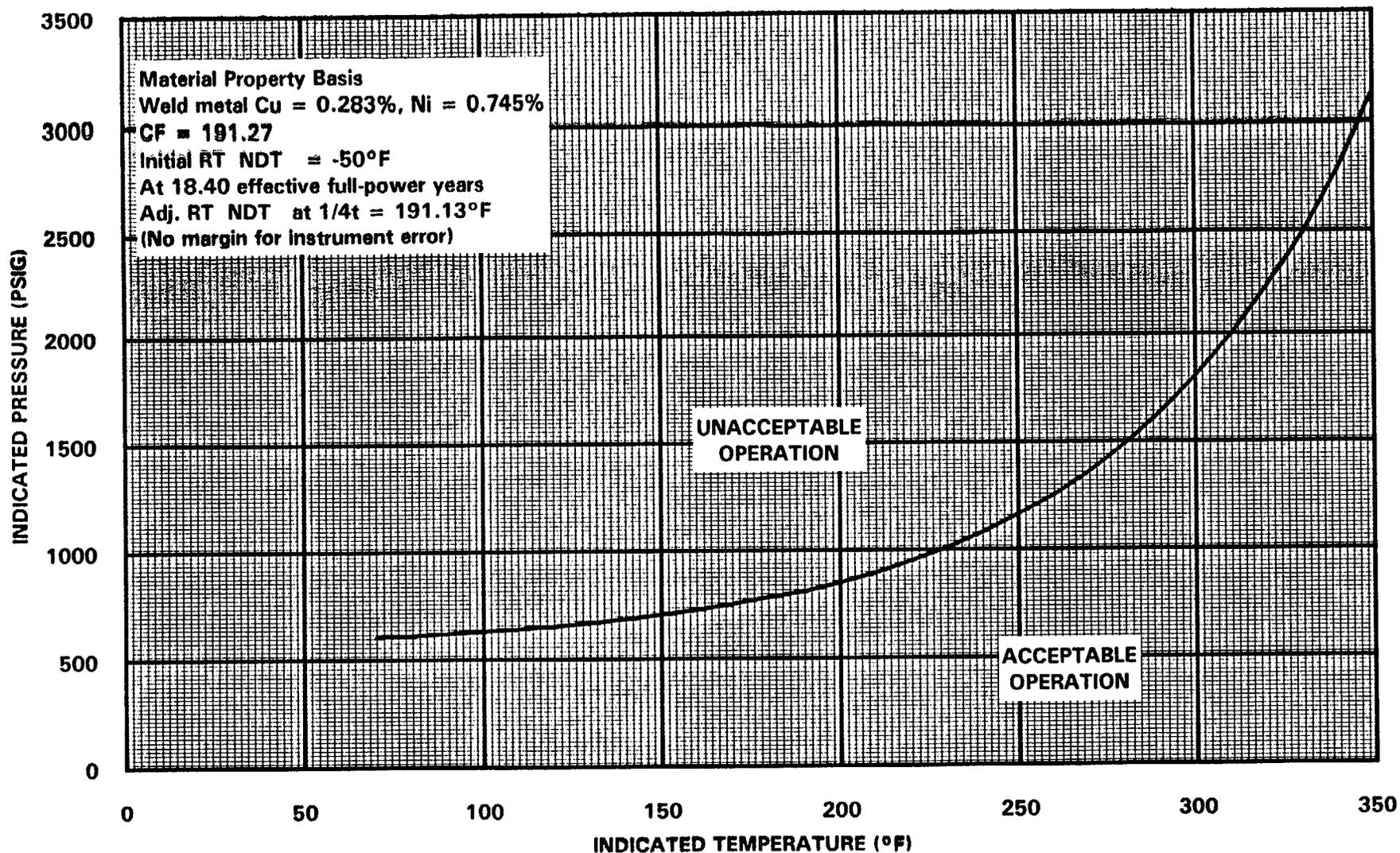
The low temperature overpressure protection system must be OPERABLE during startup and shutdown conditions below the enable temperature (i.e., low temperature) as defined in Branch Technical Position RSB 5-2. Based on the Kewaunee Appendix G pressure-temperature limits calculated through 20 effective full-power years, the LTOP System must be OPERABLE whenever one or more of the RCS cold leg temperatures are $\leq 338^\circ\text{F}$ and the head is on the reactor vessel. The LTOP system is considered operable when all 4 valves on the RHR suction piping (valves RHR-1A, 1B, 2A, 2B) are open and valve RHR-33-1, the LTOP valve, is able to relieve RCS overpressure events without violating Figure TS 3.1-4.

The set pressure specified in TS 3.1.b.4 includes consideration for the opening pressure tolerance of $\pm 3\%$ (± 15 psig) as defined in ASME Boiler and Pressure Vessel Code, Section III, Division 1, Subsection NC: Class 2 Components for Safety Relief Valves. The analysis of pressure transient conditions has demonstrated acceptable relieving capability at the upper tolerance limit of 515 psig.

⁽¹⁵⁾NRC Regulatory Standard Review Plan Directorate of Licensing, Section 5.3.2, "Pressure-Temperature Limits," 1974

⁽¹⁶⁾ASME Boiler and Pressure Vessel Code, "Nuclear Power Plant Components" Section III/XI, 1989 Edition, Non-Mandatory Appendix G - "Fracture Toughness Criteria for Protection Against Failure."

**FIGURE TS 3.1-4
 LOW TEMPERATURE OVERPRESSURE PROTECTION CURVE
 APPLICABLE FOR PERIODS UP TO END OF OPERATING CYCLE 21**





UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATING TO AMENDMENT NO. 120 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

1.0 INTRODUCTION

By letter dated August 24, 1994, as supplemented on January 23, 1995, Wisconsin Public Service Corporation (WPSC), the licensee, requested a revision to the Kewaunee Nuclear Power Plant (KNPP) Technical Specifications (TS). The proposed amendment would revise KNPP TS 3.1.b.1 and Figure TS 3.1-4 regarding Low Temperature Overpressure (LTOP) protection for the reactor coolant pressure boundary. Currently, the TS specify the LTOP pressure-temperature (P-T) limits through the end of operating cycle 20 or 17.14 effective full power years. The proposed amendment would extend the applicable period of the LTOP P-T limits to the end of operating cycle 21 or 18.40 effective full power years (EFPY), which is expected to occur about September 1996.

The staff evaluates the LTOP P-T limits based on the following NRC regulations and guidance: Appendix G to 10 CFR Part 50; Generic Letters (GL) 88-11 and 92-01; Regulatory Guide (RG) 1.99, Rev. 2; Standard Review Plan (SRP) Sections 5.2.2 and 5.3.2; and Branch Technical Position RSB 5-2.

Branch Technical Position RSB 5-2 specifies that P-T limits for the LTOP system should protect the P-T limits for the reactor coolant system. Appendix G to 10 CFR Part 50 requires that P-T limits for the reactor coolant system be at least as conservative as those obtained by Appendix G to Section III of the American Society of Mechanical Engineers (ASME) Code. GL 88-11 requests that licensees use the methods in RG 1.99, Rev. 2, to predict the effect of neutron irradiation by calculating adjusted reference temperature (ART) of reactor vessel materials. The ART is defined as the sum of initial nil-ductility transition reference temperature (RT_{ndt}) of the material, the increase in RT_{ndt} caused by neutron irradiation, and a margin to account for uncertainties in the prediction method. The increase in RT_{ndt} is calculated from the product of a chemistry factor and a fluence factor. The chemistry factor is dependent upon the amount of copper and nickel in the vessel material or can be derived from credible surveillance data in accordance with RG 1.99. GL 92-01 requests that licensees submit reactor vessel materials data, which the staff will use as a basis in the review of the ART calculations.

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SRP 5.3.2 provides guidance on calculation of the P-T limits using linear elastic fracture mechanics methodology specified in Appendix G to Section III of the ASME Code. The linear elastic fracture mechanics methodology postulates sharp surface defects that are normal to the direction of maximum stress and have a depth of one-fourth of the section thickness (1/4T) and a length of 1-1/2 the section thickness. The critical locations in the vessel for this methodology is the 1/4T and 3/4T locations, which correspond to the maximum depth of the postulated inside surface and outside surface defects, respectively. The LTOP transients usually occur under the isothermal condition; therefore, the 1/4T location is limiting for the LTOP P-T limits.

2.0 P-T EVALUATION

The Kewaunee reactor vessel was fabricated by Combustion Engineering with two ring forgings and a circumferential weld. The licensee determined that the circumferential weld is the limiting material to be used in the LTOP P-T limits. For the weld, the licensee reported an initial RT_{ndt} of -50 °F, which was different from -56 °F submitted under GL 92-01. The -50 °F value was determined from the nil-ductility transition temperature (NDTT) data of a test weld. The NDTT data were obtained from a drop weight test conducted by Westinghouse in 1994 and reported in WCAP-14042, Revision 1.

Two blocks of weldment were supplied to Westinghouse by Combustion Engineering in 1970; one block was used to fabricate weld specimens, which were placed in the surveillance capsules and the second block was archived and was retrieved for the recent test program. The block in the test program consisted of sections from the intermediate shell (B6306-1, heat 122X208VA1) and lower shell (B6307-1, heat 123X167VA1) ring forgings welded together using 3/16 inch diameter B-4 weld wire, heat 1P3571, and Linde 1092 flux, lot number 3958, by a submerged arc process. The licensee verified that the test specimens have the same heat treatment as the actual circumferential weld in the Kewaunee reactor vessel. The test was conducted based on American Society for Testing and Materials (ASTM) E208-91. The NDTT results showed a NDTT of -50 °F.

The licensee reported a mean value of copper and nickel contents of 0.283% and 0.745%, respectively, for the circumferential weld. The licensee calculated a chemistry factor of 191.27 based on the surveillance data taken from capsules V, R, and P. A margin of 28 °F was used in accordance with Position C.2 in RG 1.99. The neutron fluence at end of cycle 21 was $2.232E18$ neutron/cm² at inside surface. From the above parameters, the licensee calculated a limiting ART of 191.13 °F at the 1/4T location.

The staff verified copper and nickel contents with respect to the licensee's submitted materials data under GL 92-01. The staff also verified the chemistry factor, neutron fluence, and margin values. The staff's independent calculation of the ART values for the circumferential weld verified that the licensee's limiting ART is within the guidelines of RG 1.99, Revision 2, and is therefore acceptable.

Substituting the limiting ARTs of 191.13 °F into fracture mechanics equations in SRP 5.3.2, the staff verified that the proposed LTOP P-T limits satisfy the requirements in Paragraphs IV.A.2 and IV.A.3 of Appendix G of 10 CFR Part 50.

In addition to beltline materials, Appendix G of 10 CFR Part 50 also imposes a minimum temperature at the closure head flange based on the reference temperature for the flange material. Section IV.A.2 of Appendix G states that when the pressure exceeds 20% of the preservice system hydrostatic test pressure, the temperature of the closure flange regions highly stressed by the bolt pre-load must exceed the reference temperature of the material in those regions by at least 120 °F for normal operation and by 90 °F for hydrostatic pressure tests and leak tests. Based on the flange RT_{ndt} of 60 °F provided by the licensee, the staff has determined that the proposed P-T limits have satisfied the requirement for the closure flange region.

The staff has performed an independent analysis to verify the licensee's proposed LTOP P-T limits. The staff concludes that the proposed LTOP P-T limits are valid up to the end of operating cycle 21 or 18.40 effective full power years, because the limits conform to the requirements of Appendix G of 10 CFR Part 50 and GL 88-11. Hence, the proposed LTOP P-T limits may be incorporated in the KNPP TS.

3.0 FLUENCE EVALUATION

The licensee has been using low leakage cores for several cycles. The values of the current LTOP setpoints were based on estimated fluence from cycles 16-20. The actual fluence from these cycles was lower than the estimates, thus, the revised estimate through cycle 21 (about 18.4 EFPYs) is within the previous estimate through cycle 20 (about 17.1 EFPYs). The fluence reevaluation was performed by Westinghouse and is documented in WCAP-13257 "Evaluation of Pressurized Thermal Shock for 32 and 34 EFPY for Kewaunee," dated March 1992, which was previously submitted to the NRC on May 27, 1992. The licensee's August 24, 1994, submittal, references WCAP-13227 which contains the same information as WCAP-13257 for the operating cycles under consideration, but was not docketed. The WCAP-13257 evaluation used standard fluence estimation methods along with actual neutron sources for these cycles. The discrete ordinates technique in (R,θ) with P₃ scattering and S₈ quadrature approximations were used. The source spectrum modification due to the presence of Pu-239 to Pu-242 was accounted for in the low leakage core loadings. In addition, an adjustment factor of 1.167 was made to account for the dosimetry results for the Kewaunee surveillance capsules V, R and P.

The staff has reviewed the licensee's estimated fluence to the end of cycle 21 and, since it was calculated in accordance with standard industry methodology previously docketed in WCAP-13257, finds it acceptable. The staff also finds that proposed changes to TS 3.1.b.1 and its associated basis, and to Figure TS 3.1-4 accurately reflect the extension of the LTOP requirements and are, therefore, acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Wisconsin State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

This amendment changes a requirement with respect to 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 issued a proposed finding that this amendment involves no significant hazards consideration and there has been no public comment on such finding (59 FR 51632). 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 this amendment.

6.0 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, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributors: J. Tsao
L. Lois

Date: April 26, 1995