NRC FORM 195 (2-76) U.S. NUCLEAR REGULATORY COMMISSION

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DESCRIPTION

Ltr notarized 10-26-76.....re our 4-5-76 ltr....trans the following:

PLANT NAME: Kewaunee

ENCLOSURE

Proposed Amdt #20 to OL/Change #22 to Tech Specs: Consisting of revisions with regard to adequacy of shutdown margins throughout core life....(40 cys encl rec'd)

ACKNOWLEDGE

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✓ ACRS 16 CYS ~~HOLDING~~/SENT	To LA Sheppard	

CONTROL NUMBER: 10876

NRC FORM 195 (2-76)

WISCONSIN PUBLIC SERVICE CORPORATION

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

October 26, 1976

Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

ATTN: Mr. A. Schwencer, Chief
Operating Reactors Branch #1
Division of Operating Reactors

Gentlemen:

REF: Docket 50-305
Operating License DPR-43
Amendment No. 10 to Facility License No. DPR-43
dated April 5, 1976 and the associated Safety
Evaluation transmitted by Mr. Purple's letter
of April 5, 1976

The referenced license amendment provided certain operating limits in regard to temperature and pressure and required additional monitoring and reporting of cycle 2 core performance as compared to predictions. Included as one of these additional monitoring requirements was Technical Specification 3.10.m.4 which requires a measurement of control rod bank worth for banks D and C and a measurement of isothermal temperature coefficient between 4000 and 7500 MWD/MTU core burnup. This additional testing requirement was included to provide assurance of shutdown margin at the end of core life by verification of adequate margin past mid-core life. The requirement for this additional assurance resulted from the change in core loading pattern from the Westinghouse designed pattern of 40 new elements designated core 2A, to the Wisconsin Public Service Corporation designed pattern of 32 new elements designated, Core 2B. The calculational methods of Wisconsin Public Service Corporation had not been reviewed by the NRC staff, and as a result, the measurements were required in lieu of calculations by a previously reviewed model. This position is clearly noted in the safety evaluation associated with Amendment No. 10. The staff also stated in the safety evaluation:

> "Any of the measurements required above (rod worth and isothermal temperature coefficient) can be eliminated if the licensee provides analyses using calculational methods which we have approved."

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We have acquired analyses from Westinghouse of the shutdown margin, bank D and C worth, and isothermal temperature coefficient for core 2B at conditions of BOL, MOL (4000 MWD/MTU) and EOL employing a methodology previously reviewed by the staff. Attachment 1, "Rod Worth, Isothermal Temperature Coefficients and Shutdown Margins for Kewaunee Cycle 2" presents the results of those analyses. Although not specifically stated in the attachment, the calculations are for the 32 new element core with the WPS designed loading pattern which has been in power operation since April 1976.

The attached analyses verifies the adequacy of the shutdown margin throughout core life. Based upon this attached analysis, we request that Technical Specification 3.10.m.4 be deleted. Please find attached Proposed Amendment No. 20, Change No. 22, to the Technical Specifications and Operating License DPR-43 which would accomplish this deletion.

The current calculated core 2 burnup is 5600 MWD/MTU. According to Technical Specification 3.10.m.4 the rod worth measurement must be performed by 7500 MWD/MTU. At our maximum rate of fuel burnup, a shutdown would be required by December 14, 1976, to conform to Specification 3.10.m.4. We, therefore, request that this proposed amendment be reviewed promptly and the License with Technical Specifications be amended as suggested by December 14, 1976.

Very truly yours,

E. W. James
Senior Vice President
Power Supply & Engineering

EWJ:sna
Enc.

Subscribed and Sworn to
Before Me This 26TH Day
of OCTOBER 1976

Notary Public, State of Wisconsin

My Commission Expires
FEBRUARY 14 1979

3.10.k During steady state 100% power operation T inlet shall be maintained below 540°F.

3.10.l During steady state 100% power operation reactor coolant system pressure shall be maintained above 2200 psig.

3.10.m Cycle 2 interim requirements to assure conformance to accident analyses are as follows:

1. Control rod worth measurements shall be performed during low power physics tests at beginning of core life for control banks A, B, C and D plus one shutdown bank.

2. Incore mapping shall be performed every 15 calendar days of power operation to compare measured power distribution to prediction. Results of comparisons will be available for NRC review on a monthly interval. 10

3. Boron depletion vs. core burnup data shall be compared to prediction. Comparison of measurement to prediction will be available for NRC review on a monthly interval.

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The rod position indicator channel is sufficiently accurate to detect a rod ±7-1/2 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. 9

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 conditions.

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.

To provide additional assurances during the initial stages of core life that the core for cycle 2 conforms to the accident analysis and the core performance is correctly modeled by the calculations the specifications of section 3.10.m are provided. It is intended that these section 3.10.m specifications be interim measures and that they will be removed from the specifications upon continued indication that measurements and predictions are in agreement within the normal acceptance criteria for such comparisons. 10

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ROD WORTHS, ISOTHERMAL TEMPERATURE COEFFICIENTS AND SHUTDOWN MARGINS

FOR

KEWAUNEE CYCLE 2

by

M. J. BINGLE

OCTOBER, 1976

Approved by R. S. KAISER, ACTING MANAGER
NUCLEAR DESIGN IV

This report contains the results of the Kewaunee Cycle 2 calculations which were performed by Westinghouse at the request of Wisconsin Public Service Corporation.

Rod Worths

The rod worths of the controlling banks D, C, B and A at BOL are given in Table 1. Table 1 also contains the rod worths of banks D and C at MOL and EOL. The results show a 10% change in bank D worth and a 5% change in bank C worth during Cycle 2. All of these calculations were done in X-Y geometry at HZP, no xenon conditions.

Isothermal Temperature Coefficient

Isothermal temperature coefficient is defined as the change in reactivity for a unit change in the moderator, clad and fuel pellet temperatures. The values calculated for BOL, MOL and EOL at HZP, no xenon conditions are shown in Table 2.

Shutdown Margin

The Shutdown requirements and margins at BOL, MOL and EOL are summarized in Table 3. The EOL case is the limiting condition.

Reactivity Defects

The reactivity defects include the Doppler defect, variable average moderator temperature defect, void content, and redistribution. The reactivity defects for BOL, MOL, and EOL are 1.69%$\Delta\rho$, 2.26%$\Delta\rho$ and 2.47%$\Delta\rho$ respectively.

Rod Insertion Allowance

It is necessary at all times to maintain enough reactivity out of the

core (as control rods) to safely cover the power defect with a suitable margin allowed for accident conditions. In order to maintain this required shutdown margin, a rod bank insertion limit is set as a function of power. For Kewaunee Cycle 2 the rod insertion allowance including bite at HFP is set at 0.50%Δρ.

Shutdown Margin Available

In computing the shutdown margin, it is the practice to conservatively reduce the total rod worth at HZP by:

1. The amount lost if the most reactive rod were to remain stuck out of the core.
2. An additional 10% uncertainty.

The design basis requirement for BOL is 1%Δρ and the calculated shutdown margin is 2.68%Δρ. The design basis requirement for MOL is 1.30%Δρ and EOL is 2%Δρ and the calculated shutdown margins are 2.27%Δρ and 2.22%Δρ respectively. Thus, the shutdown requirements are met at BOL, MOL and EOL.

TABLE 1

KEWAUNEE CYCLE 2 ROD WORTH
HZP, NO XENON (IN PCM*)

	PREDICTED WORTH (PCM)		
Control Bank	BOL	MOL	EOL
D	707	745	777
C	1150	1169	1206
B	793		
A	1562		
D+C+B+A	4212		

*PCM - percent mille (a reactivity change of 1 pcm equals a reactivity change of 10^{-5}).

TABLE 2

ISOTHERMAL TEMPERATURE COEFFICIENT (ITC)
KEWAUNEE CYCLE 2-HZP, NO XENON

Core Lifetime	Predicted Isothermal Temp. Coef. (pcm/°F)
BOL	-4.7
MOL	-10.0
EOL	-16.7

TABLE 3

KEWAUNEE CYCLE 2
SHUTDOWN REQUIREMENTS AND MARGINS

Control Rod Worth (% Δρ)	BOL	MOL	EOL
All Rods Inserted Less Worst Stuck Rod	5.41	5.59	5.77
(1) Less 10%	4.87	5.03	5.19
Control Rod Requirements (% Δρ)			
Reactivity Defects (Doppler, Tavg, Void, Redistribution)	1.69	2.26	2.47
Rod Insertion Allowance	.50	.50	.50
(2) Total Requirements	2.19	2.76	2.97
Shutdown Margin ((1)-(2)) (% Δρ)	2.68	2.27	2.22
Required Shutdown Margin (% Δρ)	1.00	1.30	2.00