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SUBJECT: Provides responses to 971106 RAI re use of high thermal performance DNB correlation in Kewaunee reload methods.

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December 1, 1997

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Gentlemen:

Docket 50-305
Operating License DPR-43
Kewaunee Nuclear Power Plant
Additional Information Regarding the Use of High Thermal
Performance DNB Correlation in the Kewaunee Reload Methods

References: 1) Letter from M. L. Marchi (WPSC) to NRC Document Control Desk, dated September 4, 1997

2) EMF-92-153(P)(A) and Supplement 1, Siemens Power Corporation Report, HTP: Departure From Nucleate Boiling Correlation for High Thermal Performance Fuel, March 1994

3) Letter from R. J. Laufer (NRC) to M. L. Marchi (WPSC), dated November 6, 1997

In Reference 1, Wisconsin Public Service Corporation requested that the Nuclear Regulatory Commission review the use of the Siemens Power Corporation's High Thermal Performance Departure from Nucleate Boiling Correlation at the Kewaunee Plant. The NRC provided two requests for additional information in Reference 3. WPSC's responses are provided below.

Q1. *How does the 1.47 maximum axial peak used in the HTP data base compare with typical values expected in the Kewaunee core? If values greater than 1.47 are expected in the Kewaunee core, please explain why 1.47 is an acceptable maximum value for the HTP data base; and*

Typical measured axial peak values for Kewaunee are presented in Table 1. These values are derived from Cycle 22 flux map measurements.

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TABLE 1			
Flux Map	Cycle Burnup	Measured Maximum Axial Peak	Measured Maximum Axial Peak With Uncertainties
2205	514	1.22	1.39
2206	1041	1.21	1.37
2207	1715	1.22	1.37
2208	2394	1.20	1.35
2209	3498	1.20	1.33
2210	4437	1.17	1.32

As shown, the highest measured axial peak in Cycle 22 to date is 1.22 without uncertainty and 1.39 with uncertainty. All values are bounded by the maximum axial peak of 1.47 that is used in the HTP data base.

Cycle 22 design maximum axial peak values with and without uncertainties and measured maximum axial peak values with uncertainties are presented in Figure 1. All values are shown to be under the 1.47 limit. Measured values are expected to remain below 1.47, following the design value trend curve, as the fuel cycle burns to end of cycle.

Therefore, based on an evaluation of a typical core's (Cycle 22) design and measured results, axial peak values greater than 1.47 are not expected in the Kewaunee core. The 1.47 limit would also be expected to bound future reload cores that are designed and operated to similar constraints.

Q2. *The largest grid spacer pitch in the HTP test sections was 22.4 inches. The Kewaunee value is 26.2 inches. Since a shorter grid spacing would result in a higher critical heat flux, please explain why the HTP data base is acceptable for Kewaunee.*

The grid spacer pitch, defined as the center-to-center axial distance between adjacent grid spacers, is 26.2 inches for Kewaunee fuel. The test case grid spacer pitch values presented in Reference 1, Attachment 1, represent the distance from the top of the upstream spacer to the bottom of the downstream spacer. The Reference 2 definition of grid spacer pitch was provided in Reference 1, Attachment 1, at the bottom of the table. These two different definitions of grid spacer pitch have contributed to the concern expressed in this question.

The HTP critical heat flux correlation is applicable to fuel assemblies whose design characteristics fall within the correlation data base. The following table is recreated from Supplement 1 of Reference 2:

TABLE 2

Nominal Range of Fuel Design Parameters in HTP Correlation Data Base

Parameter	Value
Fuel Rod Diameter, in.	0.360 - 0.440
Fuel Rod Pitch, in.	0.496 - 0.580
Axial Spacer Span, in.	10.5 - 26.2
Hydraulic Diameter, in.	0.4571 - 0.5334
Heated Length, ft.	8.0 - 14.0

Test assembly 49 which was incorporated into the WPS HTP CHF qualification analyses does have a center-to-center axial spacer pitch of 26.2 inches as shown in Table 3.1 of Reference 2. The Kewaunee spacer pitch is 26.2 inches; therefore, this correlation database is acceptable for use with Kewaunee fuel.

Should you have any additional questions concerning this information, please contact me.

Sincerely,

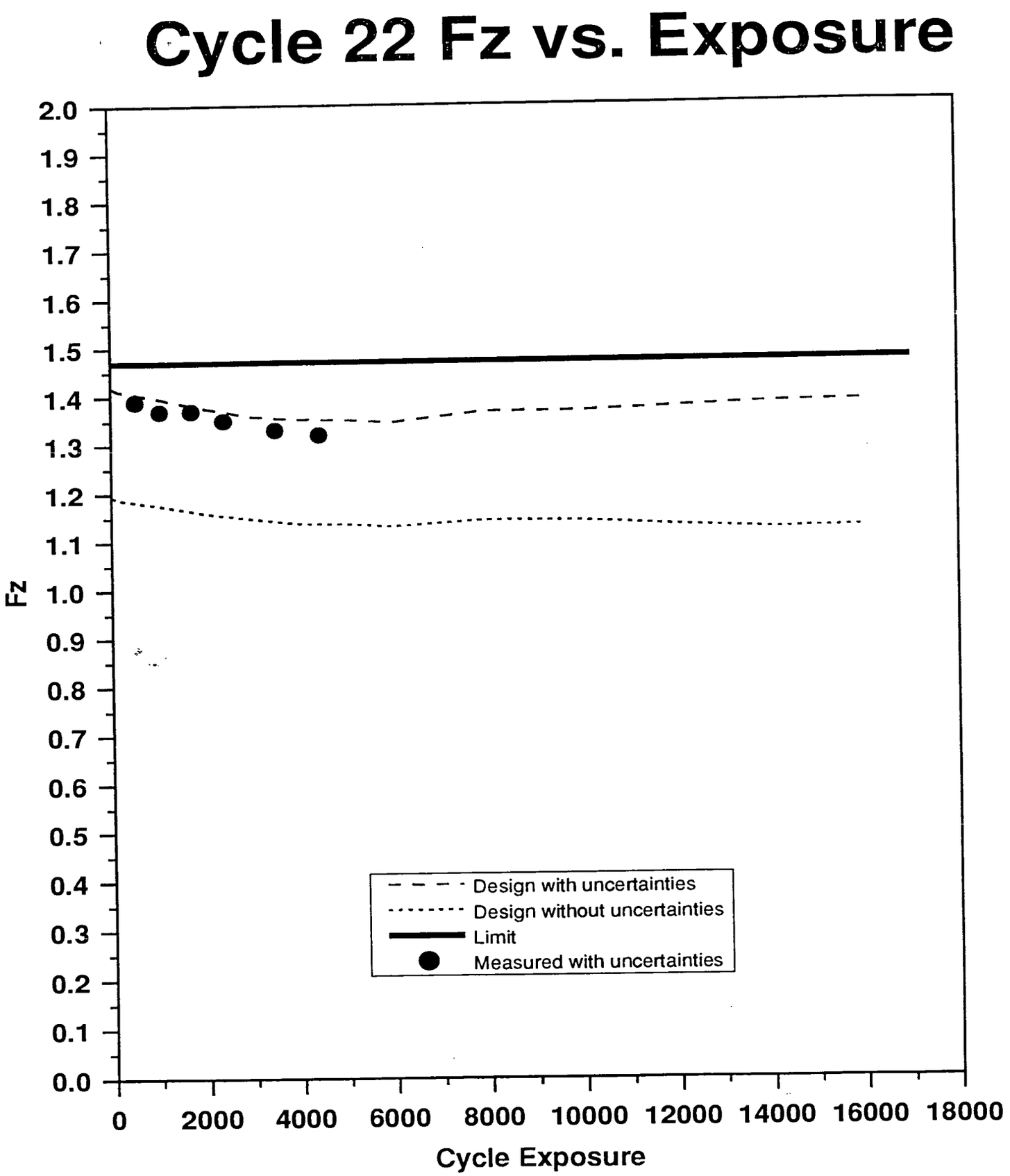
Mark L. Marchi
Manager-Nuclear Business Group

JTH/smm

Attach.

cc - US NRC - Region III
US NRC Senior Resident Inspector

FIGURE 1


Cycle 22 Fz vs. Exposure
Fz
2.0
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1.0
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0.0
0
2000
4000
6000
8000
10000
12000
14000
16000
18000
Cycle Exposure
Design with uncertainties
Design without uncertainties
Limit
Measured with uncertainties