Northern States Power Company
Prairie Island Nuclear Generating Plant
1717 Wakonade Dr. East
Welch, Minnesota 55089

March 27, 1997

Generic Letter 96-04

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

PRAIRIE ISLAND NUCLEAR GENERATING PLANT
Docket Nos.50-282 License Nos. DPR-42
50-306 DPR-60

Supplemental Response to Generic Letter 96-04,
Boraflex Degradation in Spent Fuel Pool Storage Racks

This letter provides supplemental information in response to Generic Letter 96-04: Boraflex Degradation in Spent Fuel Pool Storage Racks. Our original response to Generic Letter 96-04 was submitted to the NRC by letter dated October 23, 1996. Because of additional development work necessary to adapt the EPRI RACKLIFE computer program to the Prairie Island specific spent fuel pool conditions, we were unable to provide a full assessment of the physical condition of the Prairie Island Boraflex spent fuel racks in our October 23, 1996 response.

The assessment of the Prairie Island spent fuel racks using the EPRI RACKLiFE program has provided sufficient information to allow us to complete our response to Generic Letter 96-04. An assessment of the physical condition of the Boraflex in the Prairie Island spent fuel racks is attached.

This letter contains no new NRC commitments. Please contact Gene Eckholt (612-388-1121) if you have any questions related to our response to Generic Letter 96-04.

Joel P. Sorensen

Joel P Sorensen
Plant Manager
Prairie Island Nuclear Generating Plant

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c: Regional Administrator - Region III, NRC
Senior Resident Inspector, NRC
NRR Project Manager, NRC
J E Silberg

Attachments: 1. Affidavit
2. Supplemental Response to Generic Letter 96-04

UNITED STATES NUCLEAR REGULATORY COMMISSION

NORTHERN STATES POWER COMPANY

PRAIRIE ISLAND NUCLEAR GENERATING PLANT DOCKET NO. 50-282
50-306

GENERIC LETTER 96-04, Boraflex Degradation in Spent Fuel Pool Storage Racks

Northern States Power Company, a Minnesota corporation, with this letter is submitting information requested by NRC Generic Letter 96-04.

This letter contains no restricted or other defense information.

NORTHERN STATES POWER COMPANY

BY Joel P. Sorensen
Joel P Sorensen
Plant Manager
Prairie Island Nuclear Generating Plant

On this 27th day of March 1997 before me a notary public in and for said County, personally appeared Joel P Sorensen, Plant Manager, Prairie Island Nuclear Generating Plant; and being first duly sworn acknowledged that he is authorized to execute this document on behalf of Northern States Power Company, that he knows the contents thereof, and that to the best of his knowledge, information, and belief the statements made in it are true and that it is not interposed for delay.

Marcia K. LaCore

MARCIA K. LaCORE
NOTARY PUBLIC-MINNESOTA
HENNEPIN COUNTY
My Commission Expires Jan. 31, 2000

SUPPLEMENTAL RESPONSE TO GENERIC LETTER 96-04

Requested Action:

Provide an assessment of the physical condition of the Boraflex, including any deterioration, on the basis of current accumulated gamma exposure and possible water ingress to the Boraflex and state whether a subcritical margin of 5 percent can be maintained for the racks in unborated water.

Response to the Requested Action:

The Prairie Island Boraflex racks were put into use in late 1981 and were filled to near capacity by 1995. As a result, most of the individual spent fuel cells have a high accumulated gamma dose. A Boraflex coupon surveillance program was established when the racks were installed to monitor long term performance of the Boraflex material. At five year intervals, an irradiated Boraflex test coupon is removed from its location in the spent fuel pool and is sent for analysis of physical dimensions, hardness and B10 areal density. The last coupon was analyzed in 1994 and was found to not be significantly degraded, with the B10 areal density exceeding original specification.

Due to high levels of silica in the Prairie Island spent fuel pool relative to the rest of the industry, EPRI and the EPRI Boraflex Working Group shifted its focus from gap formation in Boraflex to the potential for Boraflex dissolution under long term exposure to spent fuel pool conditions. EPRI sponsored studies have shown that the combination of gamma exposure and water ingress into the Boraflex panel cavity significantly degrades the silica polymer matrix. The Prairie Island rack design allowed for a large amount of water ingress to alleviate the potential for cell wall bulging as a result of the Boraflex material offgassing. The Prairie Island sample coupons were not designed to allow for significant water ingress and are therefore not believed to be accurate indicators of rack Boraflex degradation.

The EPRI sponsored calculational model RACKLIFE has been used to estimate the condition of the Boraflex panels. The RACKLIFE model utilizes spent fuel pool chemistry parameters (including silica levels) and cell-by-cell exposure histories to estimate each Boraflex panel's potential for degradation. The published RACKLIFE model was unable to accurately simulate the rapid silica rise attributable to a few very high dose spent fuel cells so a slightly different curve fit was necessary to model the Prairie Island silica history. The Prairie Island-specific RACKLIFE model indicates that the Prairie Island spent fuel racks have a peak panel boron carbide loss of 100% (four panels), approximately 96% of the panels have <10% boron carbide loss and the average panel boron carbide loss is <2%. The high silica's are primarily due to the early applied dose to the spent fuel cells surrounding the Boraflex coupons resulting in long term exposure of high dose cells to the spent fuel pool water environment. The

Information provided by the Prairie Island-specific RACKLIFE model, in combination with information published in EPRI Interim Report TR-103300, "Guidelines for Boraflex Use in Spent-Fuel Storage Racks" (Dec 1993), indicates that <0.5% of the spent fuel pool cells are outside their design basis and outside the requirements of Prairie Island Technical Specification 5.6.A.1.b, with a margin to criticality of less than 5% assuming no soluble boron in the spent fuel pool water. Per the requirements of 10 CFR Part 50.72, Section 50.72(b)(1)(ii)(B), this condition was reported by phone to the NRC on November 26, 1996.

In response to the Boraflex degradation identified by the EPRI RACKLIFE program, a safety evaluation was performed to address the use of soluble boron in the spent fuel pool to offset the degradation of the Boraflex in the racks. That evaluation determined that the use of credit for soluble boron is an unreviewed safety question. A License Amendment Request, which requests approval of a criticality analysis for the Prairie Island spent fuel storage racks with no credit for Boraflex panels and instead utilizing credit for soluble boron, was submitted on July 28, 1995. This License Amendment Request specifically addresses the unreviewed safety question related to the use of credit for soluble boron in spent fuel pool criticality analyses.

As part of the developmental work for the July 28, 1995 License Amendment Request, spent fuel pool criticality analyses were performed that showed that 1850 ppm boron maintained k_{eff} < 0.95 under accident conditions with no credit for Boraflex or checkerboarding. Analyses crediting soluble boron using the existing checkerboarding requirements have not been performed, but that checkerboarding would provide additional margin. Until review of the July 28, 1995 License Amendment Request is completed, administrative controls have been implemented to ensure that the spent fuel pool soluble boron concentration is maintained at a level adequate to ensure K_{eff} for the spent fuel storage racks will remain less than 0.95. Those administrative controls conservatively require that the spent fuel pool boron concentration be maintained > 2000 ppm and that the spent fuel pool boron concentration will be confirmed weekly.

To ensure that adequate soluble boron is maintained in the spent fuel pool under all conditions, the following actions have been taken.

- Procedures that provide for normal and emergency makeup to the spent fuel pool have been revised to require boron sampling following makeup to verify acceptable boron levels remain. The relevant requirements of the revisions will be permanently incorporated into the procedures once the July 28, 1995 License Amendment Request (revised February 21, 1997) for soluble boron credit has been approved.
- Operator spent fuel pool checks have been increased in frequency from once per day to once per shift to potentially decrease the time an unplanned dilution can go undetected.
- Boric acid has been placed in the immediate vicinity of the spent fuel pool in the event manual addition is required.

- Spent fuel pool dilution sources have been tagged out to eliminate their use without adherence to the new administrative controls.

Finally, as part of the original Prairie Island response to Generic Letter 96-04 a fuel management strategy has been established to ensure that fresh and other high reactivity assemblies (based on a combination of burnup and initial enrichment) will only be placed in spent fuel pool cells that are projected to have little or no boron carbide loss. The determination of boron carbide loss is based on the RACKLIFE simulations.