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Palisades Nuclear Plant
Operated by Nuclear Management Company, LLC

September 23, 2005 10 CFR 54

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

Palisades Nuclear Plant
Docket 50-255
License No. DPR-20

NMC Response to NRC Requests for Additional Information Dated August 23, 2005 Relating to License Renewal for the Palisades Nuclear Plant

In a letter dated August 23, 2005, the Nuclear Regulatory Commission (NRC) transmitted Requests for Additional Information (RAIs) regarding the License Renewal Application for the Palisades Nuclear Plant. This letter responds to those requests.

Enclosure 1 provides the text of, and the NMC response to, each NRC request.

Please contact Mr. Darrel Turner, License Renewal Project Manager, at 269-764-2412, or Mr. Robert Vincent, License Renewal Licensing Lead, at 269-764-2559, if you require additional information.

Summary of Commitments

This letter contains no new commitments or changes to existing commitments.

I declare under penalty of perjury that the foregoing is true and correct. Executed on September 23, 2005.

Paul A. Harden
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Nuclear Management Company, LLC

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Enclosure (1)

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ENCLOSURE 1

NMC Responses to NRC Requests for Additional Information
Dated August 23, 2005

(3 pages)

RAI 3.5.2-1

In Section 3.3.2.2.10 of the license renewal application (LRA), the applicant describes the neutron absorbing panels in the spent fuel pool (SFP) Region 1 racks as B_4C plates sheathed between stainless steel plates. To complete its review, the staff requests the applicant to provide a detailed description of the neutron absorbing panels, to include, at a minimum, the B_4C content, existing areal density, B_4C matrix, and composition. In addition, the staff requests the applicant to clarify that this material is also known as Carborundum.

NMC Response to NRC RAI 3.5.2-1

The boron carbide neutron absorber plate is B_4C powder bonded together in a carbonaceous matrix. The absorber is 50% B_4C by volume with the remainder being phenolic binder material and voids. The areal density is 0.0959 grams per cm squared. Specifications for the B_4C powder used for the absorber plates require that the median particle size be 125 microns by volume consistent with maintaining the criticality allowance for heterogeneity. Specifications also require that no more than 3% of the boron in the powder be in the oxide (B_2O_3) form. This B_2O_3 boron is not credited in the minimum boron loading considered in the criticality analysis.

While the Carborundum Company is the manufacturer of Palisades' boron carbide (B_4C) plates, the B_4C material is not the material referred to by the trade name carborundum. NMC's research indicates that the material known by trade name carborundum is silicon carbide and not boron carbide.

RAI 3.5.2-2

Section 9.11.3.2 of the applicant's current Final Safety Analysis Report (FSAR) states that the B4C panels have been in service since 1977. In addition, in Section 3.2.2.10 of the LRA, the applicant states that there is no industry experience that boron carbide sheathed in stainless steel has experienced loss of material due to corrosion. However, a site audit recently identified Corrective Actions (CAPs) CAP032988 (2003) and CAP004729 (1995). These documents discuss the evaluation of stuck fuel assemblies in the spent fuel racks. The possible cause of the stuck assemblies is the swelling of individual cell locations due to vent hole plugging. The vent hole documents indicate that plugging may be caused by any of the following: (1) B4C degradation, (2) improperly drilled vent holes, and (3) debris in the SFP. The exact root cause for the stuck fuel assemblies has not been determined. In addition, the swelling and stuck fuel assemblies has not been an industry problem, except at Palisades. Therefore, the staff requests the applicant to further discuss and justify that there is no aging effect applicable to this material given the discussion in the referenced documents (i.e., CAPs) report. This discussion should also address Carborundum Test Report No. CBO78-299. This report is typically used to qualify the material for 40 years. For Palisades, the use of this report would bring the service life of the material approximately 6 years into the period of extended operation. The staff requests the applicant to discuss why this component is not defined as a Time Limited Aging Analysis (TLAA) per 10 CFR 54.3.

NMC Response to NRC RAI 3.5.2-2

A. NMC has concluded that the stuck fuel assemblies are not due to aging effects in the racks, based on the following:

1) NMC concurs with the questioner's statement that having fuel assemblies sticking in spent fuel racks is not prevalent in the industry, even though racks of similar material and environments exist at other facilities. This is consistent with NMC's conclusion that Palisades' condition is more a problem of rack size as it relates to fuel assembly size (i.e. the fuel assembly is a tight fit in the cell), and/or the possible lack of adequate vent holes to relieve the gas generated during irradiation of the absorber material.

2) Palisades' documentation from when the racks were originally installed indicates that vent hole drilling was problematic, and there was uncertainty whether all cells were successfully vented. Correspondence indicates vent hole positions were altered because initial hole drilling did not provide satisfactory venting of the cells. It is probable, then, that not all cells were properly drilled and vented during original rack installation. Thus, improperly drilled vent holes, and not corrosion or other aging effects, is the most likely cause for the stuck assemblies documented in the CAPs referenced above.

3) The compatibility of stainless steel in treated borated water with proper chemistry controls is well established in the GALL and the Palisades LRA. Material compatibility between the boron carbide neutron absorber plates and the stainless steel spent fuel racks is excellent because the absorber plates do not exhibit a galvanic potential with

respect to the stainless steel storage cans. The gas generated by the neutron absorber binder material under irradiation is primarily hydrogen, and is reducing rather than oxidizing in nature, which would minimize corrosion.

Therefore, NMC has concluded that the sticking of fuel assemblies in the rack is not due to rack degradation related to corrosion or aging.

B. NMC has concluded that Carborundum Test Report No. CB078-299 should not be considered a TLAA for the NUS fuel racks with the B_4C absorber, based on the following:

1) The Carborundum Test Report does not specify 40 years or any specific period as the qualified service life. Rather, it subjects the test specimens to a fluence value of 10E11 rads gamma radiation to ensure the physical and mechanical properties are maintained "...for a period of time in excess of the designed original life of the reactor facility."

2) The Carborundum Test Report CB078-299 describes test conditions for the coupons that are more severe than actually encountered during use in the Palisades racks. For example, the test coupons were immersed in a circulating fluid during irradiation that does not represent actual use in the racks. In the Palisades racks the material is encapsulated with only a small vent hole providing a possible exposure point to spent fuel pool water. This configuration would substantially reduce any dissolution or washout of the B_4C material.

3) Since the year 2000, Palisades has sampled the spent fuel pool water periodically for Total Organic Carbon (TOC), with the results being very low, stable, TOC values (typically less than 0.2 ppm). These sample results indicate that the B_4C absorber is not degrading. This periodic confirmatory sampling adequately assures that neutron absorber degradation is not occurring.

4) Palisades has been in contact with another nuclear plant which has the same basic rack design with its B_4C absorbers. This plant has a test coupon surveillance program in progress that has results dating back to 1982. It shows that test coupon B^{10} loading has not degraded during the duration of the test. The most recent test results from early in 2005 are essentially the same as the results documented in the early 1980's. This plant's test program inspects the test coupons every three (3) years. After each test, the coupons are placed adjacent to fuel assemblies freshly discharged from the core, which would subject them to higher than average neutron and gamma doses. Thus the test coupons receive bounding high irradiation doses that exceed those likely to be received by the actual absorber material in the racks. It is expected that, should a degrading trend be noted at another plant in the future, industry operating experience would be reported that would alert Palisades to a potential developing rack problem.

5) Palisades' fuel rack loading practices for irradiated fuel freshly discharged from the reactor spreads the irradiation doses throughout the racks. During refueling, Palisades distributes the freshly discharged assemblies throughout the rack to spread out the heat load. This provides the additional benefit of distributing the highest radiation sources, thus reducing the potential B_4C absorber dose rate at any single location.