NMC
Committed to Nuclear Excellence

Palisades Nuclear Plant
Operated by Nuclear Management Company, LLC

June 22, 2004 10 CFR 50.90

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, DC 20555-0001

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

Supplement to License Amendment Request: Control Rod Drive Mechanism Surveillance

On May 10, 2004, pursuant to 10 CFR 50.90, Nuclear Management Company, LLC (NMC) requested Nuclear Regulatory Commission (NRC) review and approval of a proposed license amendment for the Palisades Nuclear Plant. The proposed amendment requested NRC approval to replace existing license condition 2.C.(5) and its corresponding table, Table 2.C.(5), which are outdated, with a new license condition stating that performance of Technical Specification surveillance requirement 3.1.4.3 is not required, for control rod drive (CRD) 19 only, until the next refueling outage, but no later than September 30, 2004.

NMC has determined that a supplement to the license amendment request (LAR) is in order to assist the NRC's review of the proposed LAR. Enclosure 1 provides additional technical analysis information related to control rod failure mechanisms and potential reactivity effects.

The information provided in this supplement does not impact the conclusions of the No Significant Hazards Consideration Determination and the Environmental Review Consideration presented in the original May 10, 2004 submittal.

A copy of this request has been provided to the designated representative of the State of Michigan.

A001

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Summary of Commitments

This letter contains one new commitment and no revisions to existing commitments:

- NMC will maintain the requirement to shutdown the reactor if confirmed CRD seal leakage exceeds two gallons per minute for the duration of the surveillance interval extension.

I declare under penalty of perjury that the foregoing is true and correct. Executed on June 22, 2004.

Daniel J. Malone
Site Vice President, Palisades Nuclear Plant
Nuclear Management Company, LLC

Enclosures (1)

CC Regional Administrator, Region III, USNRC
Project Manager, Palisades, USNRC
NRC Resident Inspector, Palisades USNRC

ENCLOSURE 1
SUPPLEMENTAL INFORMATION FOR CONTROL ROD DRIVE MECHANISM SURVEILLANCE LICENSE AMENDMENT REQUEST

Summary of Known Control Rod Drive (CRD) Mechanism Failure Events

Nuclear Management Company, LLC (NMC) has reviewed CRD events, back to 1989, at the Palisades Nuclear Plant and the Fort Calhoun Nuclear Plant (the only other plant with Palisades-style CRDs). This review indicates no instances in which untrippable control rods were detected during periodic rod exercising at power. Fort Calhoun data was obtained from the Equipment Performance and Information Exchange (EPIX) and the Nuclear Plant Reliability Data System (NRPDS). The Fort Calhoun Nuclear Plant data was not verified with Omaha Public Power District. Two relevant control rod events at the Palisades Nuclear Plant are described below.

An event occurred in 1996, while performing rod drop testing during an outage (i.e. prior to power operation), when one control rod was declared inoperable because its drive mechanism could not withdraw it. Repairs were completed and the control rod was declared operable. A major contributory cause was the lack of a maintenance program that would force periodic inspection of each CRD drive package including the clutch assembly. The proximate cause was determined to be foreign material between the stationary clutch coil housing and the upper rotating element. A program was established to perform additional inspections of drive package components.

A control rod trip function problem at Palisades Nuclear Plant occurred in 1999, when one control rod did not trip as expected during a reactor shutdown. The component involved in this failure was determined to be in a sealed bearing in the clutch mechanism. The root cause of the failure was an inadequate preventive maintenance program for CRD internal components. This was exacerbated by higher than design ambient temperatures caused by a lack of proper reactor head forced air cooling, which further shortened the expected service life of the mechanism bearings. The high temperature condition was corrected by increasing the ventilation above the reactor head. The affected CRD had been scheduled for disassembly and rebuild during the impending refueling outage, but failed before this could be performed. The affected CRD was subsequently repaired and declared operable.

Neither of the above two events were caused by increased seal leakage.

Operating experience at Palisades has shown that boric acid can be deposited on components above the CRD vapor seal (refer to original license amendment request dated May 10, 2004 for a description of CRD design). The presence of boric acid has resulted in degradation of CRD package components above the vapor seal. NMC's review of this operating experience has determined control rods that experienced this type of degradation were trippable.

Potential Reactivity Effects

NMC has considered the potential reactivity effects for the proposed change. The safety analyses assume full-length control rod insertion, except the most reactive rod (N-1), upon reactor trip. Control rod drop times are verified during performance of a surveillance that is normally performed during refueling outages. Technical Specification limiting condition for operation (LCO) 3.1.4, "Control Rod Alignment," condition D, which allows one full-length control rod to be immovable provided it is still trippable, is currently being applied to CRD-29. Surveillance requirement (SR) 3.1.4.3 does not apply to CRD-29, because of the application of LCO 3.1.4, condition D. Condition D would continue to be applied to CRD-29 for the duration of the proposed change. The proposed change, if approved, would also allow testing of CRD-19 to be deferred until no later than September 30, 2004. NMC has determined that CRD seal leakage does not increase the likelihood of an untrippable control rod. Therefore, since both CRD-29 and CRD-19 are still considered trippable, the assumptions of the safety analyses are maintained.

NMC's fuel vendor, Areva, has performed calculations to determine the shutdown margin, should CRD-29, CRD-19, and the most reactive CRD fail to insert on a reactor trip signal from a Mode 1 or Mode 2 condition. The Core Operating Limits Report requirement for shutdown margin is 2.0% with the most reactive rod fully withdrawn, from Mode 1 or 2. The current operating cycle for the Palisades Nuclear Plant is Cycle 17. The results of the Areva calculations show a shutdown margin of 2.052% at a Cycle 17 burnup of 12.00 giga-watt-days per metric-ton-uranium (GWD/MTU), and 1.932% at a Cycle 17 burnup of 15.00 GWD/MTU. A Cycle 17 burnup value of 12.083 GWD/MTU was achieved on June 17, 2004. The Cycle 17 burnup value of 15.00 GWD/MTU will not be exceeded prior to our next scheduled refueling outage. NMC has reviewed the Areva calculation results.

CRD Seal Leakage Administrative Limit

NMC is required to shutdown the reactor if confirmed CRD seal leakage exceeds two gallons per minute (gpm), in accordance with plant procedures. For the duration of the surveillance interval extension, NMC commits to maintaining this shutdown requirement. The two gpm limit was established more than 10 years ago and conservatively bounds the Technical Specification identified leakage limit of 10 gpm. Also, as noted in Enclosure 6 of the original May 10, 2004 submittal, the two gpm limit reduces the likelihood of vapor seal failure.

CRD Seal Failure

NMC has determined that a rapid catastrophic failure of a CRD seal is unlikely based on past operating experience and the CRD seal design. Operating experience has shown that leaking CRD seals normally degrade over a period of time. Movement of control rods with leaking CRD seals has been shown to increase the rate of this degradation.

NMC has not identified any conditions that would cause rapid destruction of the rotating carbon face of the face-type rotating seal. Thermal shock is limited because the seal housing is water cooled, and water passing through the seal will also be cooled somewhat during its transit up the support tube. Physical destruction by large entrained debris is prevented because numerous restrictions upstream from (below) the seal will filter out large debris. Abrasion and erosion are progressive phenomena that can be monitored by seal temperature and leak rate.

CRD elastomers are in stationary rather than frictional applications. The elastomers are mounted in grooves from which they cannot easily escape. Stationary seal o-rings are installed in a component cooling water-cooled housing, which will lower their sensitivity to thermal degradation.

Should a CRD seal completely fail, NMC has conservatively assumed that the flow path for a failed CRD seal will be restricted only by metal components. The most limiting gap is at the stainless steel stationary element, which is positioned between the water-cooled seal housing and rotating shaft. The maximum flow area past the element is 0.097 square inches, or the equivalent of a 0.352-inch diameter hole. The actual flow area will be smaller because the element has a stepped outer diameter. Hydraulic pressure will force the element against the housing step, restricting the outer flow path.

Following this hypothetical CRD seal failure, any additional damage would be limited by the chemical composition, pressure, flow rate, and temperature of water escaping from the CRD seal. All of the pressure boundary components in the CRD are designed for reactor coolant at operating pressure. Stainless steel and Alloy 600 components are not susceptible to short-term failure from the conditions that would follow the hypothetical seal failure. Internal metal components are considered too large to be ejected through openings in the CRD pressure boundary.