January 8, 2004

Mr. Daniel J. Malone
Site Vice President
Palisades Nuclear Plant
Nuclear Management Company, LLC
27780 Blue Star Memorial Highway
Covert, MI 49043-9530

SUBJECT: PALISADES PLANT - ISSUANCE OF AMENDMENT REGARDING THERMAL MARGIN/LOW PRESSURE TRIP (TAC NO. MB7791)

Dear Mr. Malone:

The Commission has issued the enclosed Amendment No. 214 to Facility Operating License No. DPR-20 for the Palisades Plant. The amendment consists of changes to the Technical Specifications (TSs) in response to your application dated October 17, 2002, as supplemented December 10, 2003.

The amendment revises TS Table 3.3.1-2 by modifying a constant in the variable thermal margin/low pressure (TM/LP) trip equation. The change reduces calculated values for the variable TM/LP trip setpoint, and results from improvements in plant equipment used to establish the TM/LP trip setpoint. Ultrasonic feedwater flow measurement devices, which were recently installed at Palisades, result in less uncertainty applied in the methodology used for determining core power level. The devices used to calculate the TM/LP trip setpoint were previously replaced with digital thermal margin monitors having less uncertainty.

A copy of our related safety evaluation is also enclosed. The Notice of Issuance will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Darl S. Hood, Senior Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket No. 50-255

Enclosures: 1. Amendment No. 214 to DPR-20
2. Safety Evaluation

cc w/encls: See next page

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DISTRIBUTION

PUBLIC	OGC	JUhle
PDIII-1 Reading	ACRS	EMarinos
LRaghavan	WBeckner	
DHood	GHill(2)	
RBouling	EDuncan, RGN-III	

**See previous concurrence NLO

ADAMS Accession No. ML032541030 *Provided SE input by memo

OFFICE	PDIII-1/PM	PDIII-1/LA	SRXB/SC*	EEIB/SC**	OGC**	PDIII-1/SC
NAME	DHood	THarris for RBouling	JUhle	EMarinos	AHodgdon	LRaghavan
DATE	01/06/04	01/02/04	07/21/03	12/24/03	12/31/03	01/08/04

OFFICIAL RECORD COPY

Palisades Plant

cc:

Robert A. Fenech, Senior Vice President
Nuclear, Fossil, and Hydro Operations
Consumers Energy Company
1945 Parnall Rd.
Jackson, MI 49201

Arunas T. Udrys, Esquire
Consumers Energy Company
1 Energy Plaza
Jackson, MI 49201

Regional Administrator, Region III
U.S. Nuclear Regulatory Commission
801 Warrenville Road
Lisle, IL 60532-4351

Supervisor
Covert Township
P. O. Box 35
Covert, MI 49043

Office of the Governor
P. O. Box 30013
Lansing, MI 48909

U.S. Nuclear Regulatory Commission
Resident Inspector's Office
Palisades Plant
27782 Blue Star Memorial Highway
Covert, MI 49043

Michigan Department of Environmental Quality
Waste and Hazardous Materials Division
Hazardous Waste and Radiological
Protection Section
Nuclear Facilities Unit
Constitution Hall, Lower-Level North
525 West Allegan Street
P.O. Box 30241
Lansing, MI 48909-7741

Michigan Department of Attorney General
Special Litigation Division
525 West Ottawa St.
Sixth Floor, G. Mennen Williams Building
Lansing, MI 48913

Manager, Regulatory Affairs
Nuclear Management Company, LLC
27780 Blue Star Memorial Highway
Covert, MI 49043

Director of Nuclear Assets
Consumers Energy Company
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043

John Paul Cowan
Executive Vice President & Chief Nuclear
Officer
Nuclear Management Company, LLC
700 First Street
Hudson, WI 54016

Jonathan Rogoff, Esquire
Vice President Counsel and Secretary
Nuclear Management Company, LLC
700 First Street
Hudson, WI 54016

Douglas E. Cooper
Senior Vice President - Group Operations
Nuclear Management Company, LLC
Palisades Nuclear Plant
27780 Blue Star Memorial Highway
Covert, MI 49043

NUCLEAR MANAGEMENT COMPANY, LLC

DOCKET NO. 50-255

PALISADES PLANT

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 214
License No. DPR-20

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by Nuclear Management Company, LLC (the licensee), dated October 17, 2002, as supplemented by letter dated December 10, 2003, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public; and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public;

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to the license amendment and Paragraph 2.C.(2) of Facility Operating License No. DPR-20 is hereby amended to read as follows:

> The Technical Specifications contained in Appendix A, as revised through Amendment No. 214, and the Environmental Protection Plan contained in Appendix B are hereby incorporated in the license. NMC shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

3. This license amendment is effective as of the date of issuance and shall be implemented within 90 days.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

L. Raghavan, Chief, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: January 8, 2004

ATTACHMENT TO LICENSE AMENDMENT NO. 214

FACILITY OPERATING LICENSE NO. DPR-20

DOCKET NO. 50-255

Replace the following page of the Appendix A Technical Specifications with the attached revised page. The revised page is identified by amendment number and contains marginal lines indicating the areas of change.

REMOVE	INSERT
3.3.1-8	3.3.1-8

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 214 TO FACILITY OPERATING LICENSE NO. DPR-20

NUCLEAR MANAGEMENT COMPANY, LLC

PALISADES PLANT

DOCKET NO. 50-255

1.0 INTRODUCTION

By application dated October 17, 2002, as supplemented by letter dated December 10, 2003, the Nuclear Management Company, LLC (the licensee), requested an amendment to the Technical Specifications (TSs) for the Palisades Plant. The proposed amendment would revise TS Table 3.3.1-2 by modifying a constant in the variable thermal margin/low pressure (TM/LP) trip equation. The licensee's supplemental letter dated December 10, 2003, provided additional information in support of the initial application. The supplemental letter did not expand the scope of the application as originally noticed, and did not affect the U. S. Nuclear Regulatory Commission's (NRC) original proposed no significant hazards consideration determination as published in the *Federal Register* on September 2, 2003 (68 FR 52235).

The proposed change would reduce calculated values for the variable TM/LP trip setpoint, and results from improvements in plant equipment used to establish the TM/LP trip setpoint. Ultrasonic feedwater flow measurement devices (also known as the "crossflow" ultrasonic flow meter), which were recently installed at Palisades, result in less uncertainty applied in the methodology used for determining core power level. The devices used to calculate the TM/LP trip setpoint were previously replaced with digital thermal margin monitors (TMMs) having less uncertainty.

The licensee requests that the P_{var} equation in TS Table 3.3.1-2 be changed from:

$$P_{var} = 2012(QA)(QR_1) + 17(T_{in}) - 9493$$

to

$$P_{var} = 2012(QA)(QR_1) + 17(T_{in}) - 9559$$

where:

P_{var} = variable primary coolant low-pressure trip setpoint, in psia
QA = axial shape function
QR_1 = radial peaking function
T_{in} = maximum primary coolant inlet temperature, in degrees F
Constant = bias term

2.0 BACKGROUND

The TM/LP trip function is part of the reactor protection system (RPS). The TM/LP trip is provided to prevent reactor operation when the departure from nucleate boiling ratio (DNBR) is insufficient. The TM/LP trip protects against slow reactivity or temperature increases and pressure decreases. TMMs, which are programmable digital calculators, provide the complex signal processing necessary to continuously calculate the TM/LP trip setpoint. The Nuclear Regulatory Commission (NRC) staff previously approved the use of TMMs at Palisades by License Amendment No. 118, dated November 15, 1988. The TM/LP trip is initiated by a low primary system pressure that is approaching a pressure too low to ensure adequate DNBR in all areas of the core. The TMM calculates a minimum primary pressure based on (1) core power calculated from the primary coolant system hot and cold leg temperatures, or (2) core power calculated from the excore nuclear instrumentation. The TMM selects the higher power level from the two sources to determine the low pressure setpoint. The final low pressure setpoint of P_{var} is calculated based on primary system cold leg temperature and the core axial flux distribution, as measured by the upper and lower excore detectors. The minimum TM/LP low pressure setpoint (P_{min}) is fixed at 1750 psia. Thus, the low pressure trip setpoint is the greater of the P_{var} or P_{min} value (auctioneered high).

3.0 REGULATORY EVALUATION

The NRC staff's evaluation of the acceptability of the licensee's proposed change is based upon the following regulations and guidance:

- Title 10 of the Code of Federal Regulations (10 CFR), Part 50.36, "Technical Specifications." This regulation, at subsection (c)(1)(ii)(A), requires that the TSs specify limiting safety system settings (LSSS) (i.e., "settings for automatic protective devices related to those variables having significant safety functions").

- 10 CFR Part 50, Appendix A, General Design Criterion (GDC) 13, "Instrumentation and Control." GDC 13 requires that "[i]nstrumentation shall be provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrence, and for accident conditions as appropriate to assure adequate safety...."

- 10 CFR Part 50, Appendix A, GDC 20, "Protection System Functions." GDC 20 requires that "[t]he protection system shall be designed (1) to initiate automatically the operation of appropriate systems including the reactivity control systems, to assure that specified acceptable fuel design limits are not exceeded as a result of anticipated operational occurrences and (2) to sense accident conditions and to initiate the operation of systems and components important to safety."

- Regulatory Guide 1.105, "Setpoints for Safety-Related Instrumentation." This guide describes a method acceptable to the NRC staff for complying with the NRC's regulations for ensuring that setpoints for safety-related instrumentation are initially within, and remain within, the TS limits.

4.0 TECHNICAL EVALUATION

The licensee's Engineering Analysis Document EA-ELEC08-0005, which was provided to support the proposed TS change to the TM/LP trip equation bias term, analyzes the uncertainties associated with the TMM and the associated TM/LP trip and alarm functions. The TMM is a digital-based processing unit that continuously calculates the TM/LP low pressure setpoint, based on primary coolant hot and cold leg temperatures, and upper and lower power from the excore nuclear instrumentation (NI). Uncertainties from each of the inputs will be combined with the TMM uncertainties and other analysis uncertainties to determine the worst uncertainty for the TM/LP trip setpoint.

The original uncertainty analysis for the TM/LP trip setpoint used a straight algebraic summation of individual errors to determine the final total uncertainty. The proposed TS change for the new trip setpoint calculation is based on the method described in ISA-S67.04, which was endorsed in Regulatory Guide 1.105. The uncertainties will be calculated by the statistical combination of independent random terms. For the TM/LP trip setpoint uncertainty, the uncertainty will be determined by first determining the uncertainty of the two power inputs (Delta-T and NI) to establish the worst-case power input uncertainty. The power uncertainty will then be used to determine the uncertainty of the power-peaking function setpoint determination. The uncertainties of the NI inputs will be used to determine the uncertainty of the axial flux contribution to the setpoint determination. The flux uncertainties will then be combined with the T_{in} input uncertainty and the uncertainties of the TMM to determine the uncertainty of the calculated TM/LP setpoint. The setpoint uncertainty will then be combined with uncertainties of the trip unit and the pressure input to determine a final TM/LP trip uncertainty.

The calorimetric uncertainty will affect the uncertainty of both the NI and Delta-T based power determinations. Therefore, the calorimetric process measurement effect is included in both power input uncertainty determinations. Ultrasonic feedwater flow measurement devices recently installed at Palisades result in a smaller uncertainty applied in the methodology used for determining core power level. As the power uncertainty may vary over the power range, the power input uncertainty will be determined for the 100-percent power case as this will provide a more conservative value. Reactor power less than full power provides additional margin in the DNBR. Therefore, the 100-percent power case is used as the worst-case uncertainty.

The axial shape index (ASI) is measured by the upper and lower chambers of the power range NI system. It is susceptible to errors due to the uncertainties of the upper and lower chamber measurements. The total ASI measurement uncertainty is defined based on the uncertainties of the upper and lower detection chambers and the calculation within the TMM. In order to combine the power and ASI uncertainties with the remaining loop uncertainties, they must be converted to a common unit. The uncertainties will be combined and converted to percent span of the P_{var} signal.

The licensee has calculated the TM/LP setpoint uncertainty, as discussed above, and expressed the calculated uncertainty in terms of percent span and engineering units as follows:

Total Positive Uncertainty	Total Negative Uncertainty
TM/LP Trip = +6.29 % span	-6.49 % span
TM/LP Trip = +62.86 psia	-64.86 psia

A total TM/LP setpoint uncertainty of ±70 psia has been established as a bounding uncertainty for the TM/LP setpoint.

The uncertainty currently used is 165 psia, and the revised value would be 70 psia. This constitutes a 95 psi decrease in the P_{var} equation constant and a corresponding reduction in the value of P_{var}. The value of P_{var} was also increased to take account of a 1.4-percent increase in rated thermal power (RTP) requested by the licensee in a separate license amendment application dated June 3, 2003. If approved, the 1.4-percent increase would change the current RTP level from 2530 megawatts thermal (MWt) to 2565.4 MWt. This additional adjustment was calculated by the equations defined below using a value for the change in the QR_1, which is based on the proposed 1.4-percent increase in RTP. The TM/LP trip function is modeled in the Final Safety Analysis Report Chapter 14 safety analysis with the QA term set to 1, which maximizes the challenge to the TM/LP trip by maximizing the difference between the initial and trip pressures. Only QR_1 is a function of power. Therefore, the relative change in the QR_1 value (ΔQR_1) can be calculated as follows:

ΔQR_1 = (change in RTP) ÷ (current RTP)

= (2565.4 Mwt - 2530 Mwt) ÷ (2530 Mwt) = 0.014

The adjustment to the P_{var} equation to reflect the proposed 1.4-percent increase in RTP can be calculated using part of the equation from TS Table 3.3.1-2 as follows:

$2012(QA)(\Delta QR_1) = 2012(1)(0.014) = 28.17$ psia

In order to maintain the TM/LP trip setpoints assumed in the safety analyses, the constant term of the P_{var} equation was altered such that a TM/LP trip would be initiated at a pressure that is higher than the current TS value. Therefore, the value of 28.17 psia is a positive adjustment to the negative constant in the P_{var} equation and this value was rounded up to 29 psia. This element of the proposed change to the TM/LP trip equation bounds both the current and the proposed 1.4-percent increase in RTP.

The revised value of the constant in the P_{var} equation, taking into account the combined effect of the reduced uncertainty and proposed 1.4-percent increase in RTP, becomes:

> "current value + measurement uncertainty change + power uprate change = new constant"
>
> (-9493 psia) + (-95 psia) + (+29 psia) = (-9559 psia).

Substituting the new constant, the proposed P_{var} equation is

$$P_{var} = 2012(QA)(QR_1) + 17(T_{in}) - 9559$$

Therefore, based on the review of the licensee's proposed changes to the TM/LP trip setpoint calculation and the previous NRC-approved designs of the TMM and the Crossflow Ultrasonic Flow Measurement Technology, the NRC staff finds that the proposed TS change to modify a constant in the variable TM/LP trip equation is acceptable.

Pursuant to 10 CFR 50.36 the TSs specify limiting safety system settings (LSSS) for those variables that have significant safety functions. Instrumentation Systems and Automation Society (ISA) standard ISA S67.04, "Setpoint for Nuclear Safety-Related Instrumentation" was issued in 1994 and was partially endorsed by the NRC staff in Regulatory Guide (RG) 1.105, Revision 3, dated December 1999. In its endorsement, the NRC staff excludes Part II of the standard. Part II includes three methods for calculating the allowable value (AV) required by 10 CFR 50.36. When using Methods 1 and 2, AVs are calculated that are sufficiently conservative and are acceptable to the NRC staff. However, the NRC staff is generally concerned that Method 3, used by some licensees, including the Palisades licensee, does not necessarily provide an adequate margin to assure that the analytical limit (AL) is not violated. In Method 3, the total loop uncertainty (TLU) value is subtracted from the AL to derive the trip setpoint value, and then the uncertainty associated with the instrument channel operational test or channel functional test (COT/CFT) is added back to derive the AV. The TLU is the statistical combination of all uncertainties of a given instrument channel. The COT/CFT uncertainty is the statistical combination of all uncertainties associated with those instrument channel components that would be tested during the COT/CFT, which may include instrument drift, instrument reference accuracy, and setting tolerance. The NRC staff's concern is that Method 3 may not account for all uncertainties not measured during COT/CFT. An acceptable method for deriving the AV would require an independent calculation that would assure that the margin between AV and AL included all the uncertainties not measured during COT/CFT.

The NRC staff raised the above general concern for Method 3 during its review of the proposed TM/LP trip equation modification. In its supplemental letter dated December 10, 2003, the licensee clarified its use of Method 3 for determining the setpoint AV with respect to the TM/LP uncertainty analysis. The licensee stated that, although it generally performs setpoint calculations using Method 3 to determine the AV for Palisades, this method was not used explicitly in the TM/LP trip uncertainty analysis. For the TM/LP trip only, the setpoint and AV are one and the same. This is due to the setpoint being provided within a digital device (the TMM). As such, the setpoint is not subject to inaccuracy or drift. Because the trip setpoint and AV are the same, the licensee had no need to perform an AV calculation using Method 3, or any other ISA method. The NRC staff agrees with this clarification by the licensee and, therefore, considers that its general concern for use of Method 3 is resolved with respect to the TM/LP trip setpoint methodology.

The NRC staff generically approved the ultrasonic feedwater flow measurement device by letter dated March 20, 2000, from S. Richards, NRC, to I. Rickard, ABB Combustion Engineering, titled "Acceptance for Referencing of CENPD-397-P, Revision-01-P, 'Improved Flow Measurement Accuracy Using Crossflow Ultrasonic Flow Measurement Technology.' " The NRC staff finds that instrumentation has been provided to monitor variables and systems over their anticipated ranges for normal operation, for anticipated operational occurrences, and for accident conditions as appropriate to assure adequate safety for this protective function. Therefore, the NRC staff finds that the licensee has satisfied the requirements of GDC-13 with respect to the TM/LP trip.

The TM/LP trip at Palisades protects the core from an unacceptable departure from nucleate boiling ratio (DNBR) situation caused by slow primary coolant system heat-up or slow depressurization events. The TM/LP trip is initiated automatically by a low primary system pressure which, based on power level and nuclear flux, is approaching a pressure too low to

ensure adequate DNBR in all areas of the core. The NRC staff finds that when the reactor protection system senses the abnormal condition from the TMM, it will initiate the reactor trip function and, with the proposed change to the constant value, the trip function will continue to assure that the acceptance criteria established in the safety analysis will be met. Therefore, the proposed change continues to satisfy the GDC-20 requirements.

Accordingly, the NRC staff finds the proposed amendment to change a constant in the variable TM/LP trip equation in TS Table 3.3.1-2 to be acceptable.

5.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Michigan State official was notified of the proposed issuance of the amendment. The Michigan State official had no comments.

6.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirement with respect to the installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The staff has determined that the amendment involves no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding (68 FR 52235). Accordingly, the amendment meets the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b), no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendment.

7.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: H. Li

Date: January 8, 2004