October 6, 2000

Mr. Michael B. Sellman, President
Nuclear Management Company, LLC
700 First Street
Hudson, WI 54016

SUBJECT: POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2 - EXEMPTION FROM THE REQUIREMENTS OF 10 CFR 50.60 (TAC NOS. MA9680 AND MA9681)

Dear Mr. Sellman:

By letter dated July 14, 2000, the licensee submitted a request for exemption from the requirements of 10 CFR 50.60 and Appendix G to 10 CFR Part 50, to allow the use of American Society of Mechanical Engineers (ASME) Code, Section XI, Code Case N-641, for Point Beach Nuclear Plant (PBNP), Units 1 and 2. This exemption would support the licensee's application for a license amendment, dated March 10, 2000, to revise the Technical Specifications (TSs) to implement the pressure-temperature limits report (PTLR), which contains revised pressure-temperature (P-T) limits that are valid to 32.2 effective full power years (EFPYs) for PBNP Unit 1 and 34 EFPYs for PBNP Unit 2. A methodology for P-T limit calculations was previously reviewed and approved in a letter to the licensee dated March 20, 1996. The licensee currently would like to revise that methodology to incorporate Code Case N-641. Code Case N-641 deviates from the current ASME Appendix G methodology in two areas: (1) the postulation of a circumferentially oriented flaw in lieu of an axially oriented flaw for the evaluation of reactor pressure vessel (RPV) circumferential welds, and (2) the use of K_{IC} fracture toughness curve instead of K_{Ia} fracture toughness curve for RPV materials in determining the P-T limits.

Generic Letter (GL) 96-03, "Relocation of the Pressure Temperature Limit Curves and Low Temperature Overpressure Protection System Limits," provides guidance to the industry that curves and setpoints may be relocated outside the TSs to a licensee-controlled document (i.e., PTLR), provided that the parameters for constructing the curves and setpoints are derived using a methodology approved by the NRC.

The staff has completed its review of the licensee's exemption request. As a result of the use of the methodology incorporating Code Case N-641, the current P-T limit curves (which were approved by Amendment No. 168 for PBNP, Unit 1, and Amendment No. 172 for PBNP, Unit 2) could be extended for at least a year. This will give the staff adequate time to complete the review of the proposed PTLR amendment request. As discussed during a teleconference with the licensee on September 20, 2000, the licensee will evaluate the current P-T limits to determine the impact of Code Case N-641 on the expiration date of the curves. The licensee plans to submit the results of its evaluation to the staff for approval.

The exemption and the ASME Appendix G methodology modified by Code Case N-641 apply to the current TSs and the proposed PTLR amendment request. Approval of the use of Code Case N-641 is contained in the enclosed Exemption.

Sincerely,

/RA/

Beth A. Wetzel, Senior Project Manager, Section 1
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-266 and 50-301

Enclosure: Exemption

cc w/encl: See next page

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Point Beach Nuclear Plant, Units 1 and 2

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7590-01P

UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

In the Matter of	)	
	)	
NUCLEAR MANAGEMENT COMPANY, LLC	)	Docket Nos. 50-266 and 50-301
	)	
(Point Beach Nuclear Plant, Units 1 and 2)	)	

EXEMPTION

I.

The Nuclear Management Company, LLC (the licensee) is the holder of Facility Operating License Nos. DPR-24 and DPR-27, which authorize operation of the Point Beach Nuclear Plant (PBNP), Units 1 and 2. The licenses provide, among other things, that PBNP is subject to all rules, regulations, and orders of the U.S. Nuclear Regulatory Commission (the Commission) now or hereafter in effect.

The facility consists of two pressurized-water reactors (Units 1 and 2) located on the licensee's Point Beach site in Two Rivers, Wisconsin. This exemption refers to both units.

II.

Title 10 of the Code of Federal Regulations (10 CFR), Section 50.60, and 10 CFR Part 50, require that pressure-temperature (P-T) limits be established for reactor pressure vessels (RPVs) during normal operating and hydrostatic or leak rate testing conditions. Specifically, 10 CFR Part 50, Appendix G, states that "The appropriate requirements on both the pressure-temperature limits and the minimum permissible temperature must be met for all conditions." Appendix G of 10 CFR Part 50 specifies that the requirements for these limits are the American Society of Mechanical Engineers Code (ASME Code), Section XI, Appendix G, limits.

By letter dated July 14, 2000, the licensee submitted a request for exemption from the requirements of 10 CFR 50.60 and Appendix G to Part 50, to allow the use of ASME Code, Section XI, Code Case N-641, for PBNP, Units 1 and 2. Code Case N-641 combines former Code Cases N-514, N-588, and N-640, and provides guidelines for the appropriate use of the three former Code Cases in combination.

Code Case N-641, similar to former Code Case N-588, permits the postulation of a circumferentially oriented flaw (in lieu of an axially oriented flaw) for the evaluation of the circumferential welds in RPV P-T limit curves. Also, Code Case N-641, similar to former Code Case N-640, permits the use of an alternate reference fracture toughness (K_{IC} fracture toughness curve instead of K_{Ia} fracture toughness curve) for reactor vessel materials in determining the P-T limits. Since the pressure stresses on a circumferentially oriented flaw are lower than the pressure stresses on an axially oriented flaw by a factor of 2, postulating a circumferentially oriented flaw for the evaluation of the circumferential welds (as permitted by Code Case N-641) in establishing the P-T limits would be less conservative than the methodology currently endorsed by 10 CFR Part 50, Appendix G. Further, since the K_{IC} fracture toughness curve shown in ASME Code, Section XI, Appendix A, Figure A-2200-1, provides greater allowable fracture toughness than the corresponding K_{Ia} fracture toughness curve of ASME Code, Section XI, Appendix G, Figure G-2210-1, using the K_{IC} fracture toughness (as permitted by Code Case N-641) in establishing the P-T limits would be less conservative than the methodology currently endorsed by 10 CFR Part 50, Appendix G. Considering both, an exemption to apply Code Case N-641 would be required by 10 CFR 50.60.

<u>Postulation of Circumferential Flaws in Circumferential Welds (formerly Code Case N-588)</u>

The licensee proposed to revise the P-T limits in the pressure-temperature limits report (PTLR) for PBNP, Units 1 and 2, using the postulation of a circumferentially oriented reference

flaw as the limiting flaw in an RPV circumferential weld in lieu of an axially oriented flaw required by the 1995 edition (1996 addenda) of ASME Code, Section XI, Appendix G.

Postulating the Appendix G reference flaw (an axially oriented flaw) in a circumferential weld is physically unrealistic and overly conservative because the length of the flaw is 1.5 times the vessel's thickness, which is much longer than the width of the reactor vessel girth weld. Industry experience with the repair of weld indications found during preservice inspections, and data taken from destructive examinations of actual vessel welds, confirms that all detected flaws are small, laminar in nature, and do not transverse the weld bead orientation. Therefore, any potential defects introduced during the fabrication process that are not detected during subsequent nondestructive examinations would only be expected to be oriented in the direction of weld fabrication. For circumferential welds, this indicates a postulated defect with a circumferential orientation.

An analysis provided to the ASME Code's Working Group on Operating Plant Criteria (WGOPC) (in which the former Code Case N-588 was developed) indicated that if an axial flaw is postulated on a circumferential weld, then based on the stress magnification factors (M_m) given in the Code Case for the inside diameter circumferential (0.443) and axial (0.926) flaw orientations, it is equivalent to applying a safety factor of 4.18 on the pressure loading under normal operating conditions. Appendix G requires a safety factor of 2 on the contribution of the pressure load in the case of an axially oriented flaw in an axial weld, shell plate, or forging. By postulating a circumferentially oriented flaw on a circumferential weld and using the appropriate stress magnification factor, the margin of 2 is maintained for the contribution of the pressure load to the integrity calculation of the circumferential weld. Consequently, the staff determined that the postulation of an axially oriented flaw on a circumferential RPV weld is a level of conservatism that is not required to establish P-T limits to protect the RCS pressure boundary from failure during hydrostatic testing, heatup, and cooldown.

The staff also noted that former Code Case N-588 includes a revised methodology for determining the thermal stress intensity, K_{IT}, which was later incorporated into Section XI of the 1995 edition (1996 addenda) of the ASME Code. The licensee used this methodology to calculate K_{IT}.

In summary, the ASME Code, Section XI, Appendix G, procedure was developed for axially oriented flaws, which is physically unrealistic and overly conservative for postulating flaws of this orientation to exist in circumferential welds. Hence, the NRC staff agrees that relaxation of the requirements of ASME Code, Section XI, Appendix G, by postulating a circumferentially oriented flaw for the evaluation of the circumferential welds (as permitted by Code Case N-641) is acceptable and would maintain, pursuant to 10 CFR 50.12(a)(2)(ii), the underlying purpose of the ASME Code and the NRC regulations to ensure an acceptable margin of safety.

Using the K_{IC} Fracture Toughness Curve (formerly Case N-640)

The licensee proposed to revise the P-T limits in the PTLR for PBNP, Units 1 and 2, using the K_{IC} fracture toughness curve in lieu of the K_{Ia} fracture toughness curve as the lower bound for fracture toughness.

Use of the K_{IC} curve in determining the lower bound fracture toughness in the development of the P-T operating limits curve is more technically correct than the K_{Ia} curve since the rate of loading during a heatup or cooldown is slow and is more representative of a static condition than a dynamic condition. The K_{IC} curve appropriately implements the use of static initiation fracture toughness behavior to evaluate the controlled heatup and cooldown process of a reactor vessel. The staff has required use of the initial conservatism of the K_{Ia} curve since 1974, when the curve was codified. This initial conservatism was necessary due to the limited knowledge of RPV materials. Since 1974, additional knowledge has been gained about RPV materials, which demonstrates that the lower bound on fracture toughness provided

by the K_{Ia} curve is well beyond the margin of safety required to protect the public health and safety from potential RPV failure. In addition, P-T curves based on the K_{IC} curve will enhance overall plant safety by opening the P-T operating window with the greatest safety benefit in the region of low temperature operations.

In summary, the ASME Code, Section XI, Appendix G, procedure was conservatively developed based on the level of knowledge existing in 1974 concerning RPV materials and the estimated effects of operation. Since 1974, the level of knowledge about these topics has been greatly expanded. The NRC staff agrees that this increased knowledge permits relaxation of the requirements of ASME Code, Section XI, Appendix G, by applying the K_{IC} fracture toughness (as permitted by Code Case N-641) while maintaining, pursuant to 10 CFR 50.12(a)(2)(ii), the underlying purpose of the ASME Code and the NRC regulations to ensure an acceptable margin of safety.

III.

Pursuant to 10 CFR 50.12, the Commission may, upon application by any interested person or upon its own initiative, grant exemptions from the requirements of 10 CFR Part 50 when (1) the exemptions are authorized by law, will not present an undue risk to public health or safety, and are consistent with the common defense and security; and (2) when special circumstances are present. The staff accepts the licensee's determination that an exemption from 10 CFR 50.60 and Appendix G to Part 50 would be required to approve the use of Code Case N-641. The staff examined the licensee's rationale to support the exemption request and agrees that the use of Code Case N-641 would meet the underlying intent of these regulations. Based upon a consideration of the conservatism that is explicitly incorporated into the methodologies of (1) 10 CFR Part 50, Appendix G, (2) Appendix G of the ASME Code, and (3) Regulatory Guide 1.99, Revision 2, the staff concludes that application of Code Case N-641, as described above, would provide an adequate margin of safety against brittle failure of the

RPV. This is also consistent with the determination that the staff has reached for other licensees under similar conditions based on the same considerations. Therefore, the staff concludes that requesting exemption under the special circumstances of 10 CFR 50.12(a)(2)(ii) is appropriate and that the methodology of Code Case N-641 may be used to revise the P-T limits in the current and the proposed TSs for PBNP, Units 1 and 2.

IV.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), the exemption is authorized by law, will not endanger life or property or common defense and security, and is, otherwise, in the public interest. Therefore, the Commission hereby grants the licensee an exemption from the requirements of 10 CFR 50.60(a), and 10 CFR Part 50, Appendix G, for PBNP, Units 1 and 2.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will not have a significant effect on the quality of the human environment (65 FR 59472).

This exemption is effective upon issuance.

Dated at Rockville, Maryland, this 6th day of October 2000.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Suzanne C. Black, Deputy Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

RPV. This is also consistent with the determination that the staff has reached for other licensees under similar conditions based on the same considerations. Therefore, the staff concludes that requesting exemption under the special circumstances of 10 CFR 50.12(a)(2)(ii) is appropriate and that the methodology of Code Case N-641 may be used to revise the P-T limits in the current and the proposed TSs for PBNP, Units 1 and 2.

IV.

Accordingly, the Commission has determined that, pursuant to 10 CFR 50.12(a), the exemption is authorized by law, will not endanger life or property or common defense and security, and is, otherwise, in the public interest. Therefore, the Commission hereby grants the licensee an exemption from the requirements of 10 CFR 50.60(a), and 10 CFR Part 50, Appendix G, for PBNP, Units 1 and 2.

Pursuant to 10 CFR 51.32, the Commission has determined that the granting of this exemption will not have a significant effect on the quality of the human environment (65 FR 59472).

This exemption is effective upon issuance.

Dated at Rockville, Maryland, this 6th day of October 2000.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/
Suzanne C. Black, Deputy Director
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

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