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10 CFR 50.12
10 CFR 50.60

Document Control Desk
U. S. NUCLEAR REGULATORY COMMISSION
Mail Station P1-137
Washington, DC 20555

Ladies/Gentlemen:

DOCKETS 50-266 AND 50-301
REQUEST FOR EXEMPTION FROM THE REQUIREMENTS OF 10 CFR 50.60;
ASME SECTION XI CODE CASE N-641
POINT BEACH NUCLEAR PLANT, UNITS 1 AND 2

In accordance with the provisions of 10 CFR 50.12, "Specific Exemptions," Wisconsin Electric Power Company, Licensee for the Point Beach Nuclear Plant, Units 1 and 2, requests an exemption from the requirements of 10 CFR 50.60, "Acceptance Criteria for Fracture Prevention Measures for Light Water Nuclear Power Reactors for Normal Operation." We are requesting this exemption to allow the application of the ASME Section XI Code Case N-641, "Alternative Pressure-Temperature Relationship and Low Temperature Overpressure Protection System Requirements, Section XI, Division 1," for determining the pressure-temperature limit curves, the power operated relief valve (PORV) setpoint for low temperature overpressure protection (LTOP), and the LTOP effective (or enable) temperature.

10 CFR 50.60 requires all power reactors to meet the criteria in 10 CFR 50, Appendix G, "Fracture Toughness Requirements". 10 CFR 50, Appendix G, requires pressure-temperature limits for the reactor vessel to be at least as conservative as those obtained in using the methods of analysis with margins of safety as established by Appendix G of the ASME Boiler and Pressure Vessel Code Section XI. 10 CFR 50.60 (b) stipulates that an exemption is required to implement alternate methods to those specified in Appendix G to 10 CFR 50.

10 CFR 50.55a, "Codes and Standards," incorporates the use of the ASME Code Section XI, and includes addenda through the 1988 Addenda and editions through the 1989 Edition. Because Code Case N-641 was published subsequent to those addenda and editions, we request an exemption from 10 CFR 50.60 to use N-641 in determining the LTOP setpoint applicable to Point Beach.

As specified in 10 CFR 50.12, the Commission may grant exemptions from the regulations when special circumstances are present. We believe the requested exemption satisfies the special circumstances criterion of 10 CFR 50.12 (a)(2)(iv) in that operation in accordance with the requested exemption will result in a benefit to the public health and safety. Our evaluation supporting this determination is attached.

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This submittal supports Wisconsin Electric's application to adopt a Pressure and Temperature Limits Report (PTLR), and revised P-T and LTOP limits which were submitted under separate cover on March 10, 2000. The changes proposed in the Point Beach PTLR and the revised P-T and LTOP limits are dependent upon NRC approval of the exemption request and authorization to utilize ASME Code Case N-641 provided by this submittal.

Sincerely,

A. J. Cayia
Manager
Site Services & Assessment

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Attachment

cc: NRC Resident Inspector
NRC Regional Administrator
NRC Project Manager
Public Service Commission of Wisconsin

Justification for ASME Section XI Code Case N-641 Exemption Request

The following information provides the basis for the exemption request to 10 CFR 50.60 for use of ASME Section XI Code Case N-641, "Alternative Pressure-Temperature Relationship and Low Temperature Overpressure Protection System Requirements, Section XI, Division 1," in lieu of the methods specified in 10 CFR 50, Appendix G.

10 CFR 50.12 Requirements: The requested exemption will allow use of ASME Code Case N-641 to: 1) determine stress intensity factors for postulated circumferential defects in circumferential welds, and for postulated axial defects in plates, forgings, and axial welds; 2) use the K_{Ic} fracture toughness curve shown on ASME XI, Appendix A, Figure A-2200-1, in lieu of the K_{Ia} fracture toughness curve of ASME XI, Appendix G, Figure G-2210-1, as the lower bound for fracture toughness; and 3) determine the Low Temperature Overpressure Protection (LTOP) System effective temperature on a plant specific basis consistent ASME XI, Appendix G. The requested exemption will meet the criteria of 10 CFR 50.12 as addressed below.

10 CFR 50.12 states that the Commission may grant an exemption from requirements contained in 10 CFR 50 provided that:

1. The requested exemption is authorized by law: No law exists which precludes the activities covered by this exemption request. 10 CFR 50.60(b) allows the use of alternatives to 10 CFR 50, Appendices G and H when an exemption is granted by the Commission under 10 CFR 50.12.

2. The requested exemption does not present an undue risk to the public health and safety:

   A. 10 CFR 50, Appendix G, requires, in part, that Article G-2120 of ASME XI, Appendix G, be used to determine the maximum postulated defects in reactor pressure vessels when determining pressure-temperature limits for the vessel. These limits are determined for normal operation and pressure test conditions.

      Article G-2120 specifies, in part, that the postulated defect be in the surface of the vessel material and normal to the direction of maximum stress. ASME XI, Appendix G, also provides a methodology to determine the stress intensity factors for a maximum postulated defect normal to the maximum stress. The purpose of this article is, in part, to prevent nonductile fractures by providing procedures to identify the most limiting postulated fractures to be considered in the development of pressure-temperature limits.

      Due to progress made in NDE techniques over the last thirty years, it is very unlikely to have large, undetected defects present in the beltline region of reactor vessels. It is further unlikely to have axial cracks originating from a circumferential weld perpendicular to the weld seam orientation in reactor vessels. Both experience and engineering studies indicate that the primary degradation mechanism affecting the beltline region of the reactor vessel is neutron embrittlement. No other service

induced degradation mechanism exists at a pressurized water reactor to cause a prior existing defect located in the beltline region of the reactor vessel to grow while in service. Based on these considerations, and the fact that the pressure-temperature (P-T) limit for reactor operation is the limiting pressure for any of the materials in the vessel, it is not necessary to include additional conservatism in the assumed flaw orientation for circumferential welds. ASME Section XI, Code Case N-641, and a previous Section XI, Appendix G Code change correct this inconsistency in assumed flaw orientation for circumferential welds in vessels when calculating operating P-T limits.

Code Case N-641 provides benefits in terms of calculating P-T limits by revising the Section XI, Appendix G reference flaw orientation for circumferential welds in reactor vessels. The reference flaw is a postulated flaw that accounts for the possibility of a prior existing defect that may have gone undetected during the fabrication process. When considering a reference flaw with respect to a weld, the reference flaw would represent any prior existing defect that may have been introduced during fabrication. Thus, the intended application of a reference flaw is to account for prior existing defects that could physically exist within the geometry of the weldment. The currently endorsed ASME Section XI, Appendix G approach mandates consideration of an axial reference flaw in circumferential welds for purposes of calculating P-T limits. Postulating the Appendix G reference flaw in a circumferential weld is physically unrealistic and overly conservative, because the length of the flaw is 1.5 times the vessel thickness, which is much longer than the width of the reactor vessel girth weld. The possibility that an axial flaw may extend from a circumferential weld into a plate/forging or axial weld is already adequately covered by the requirement that axial defects be postulated in plates/forging and axial welds.

ASME Code Case N-641 reflects fabrication and NDE experience by allowing consideration of maximum postulated defects oriented circumferentially within circumferential welds. Code Case N-641 also provides appropriate procedures to determine limiting circumferential weld defects and associated stress intensity factors for use in developing P-T limits per ASME XI, Appendix G procedures. The procedures allowed by Code Case N-641 are conservative and provide a margin of safety in the development of pressure-temperature operating and pressure test limits which will prevent nonductile fractures.

B. The revised pressure-temperature (P-T) limits and LTOP setpoint being proposed for Point Beach Units 1 and 2 have been developed using the K_{Ic} fracture toughness curve shown on ASME XI, Appendix A, Figure A-2200-1, in lieu of the K_{Ia} fracture toughness curve of ASME XI, Appendix G, Figure G-2210-1, as the lower bound for fracture toughness. Use of the K_{Ic} curve in determining the lower bound fracture toughness in the development of P-T operating limits curve is more technically correct than the K_{Ia} curve. The K_{Ic} curve models the slow heat-up and cooldown process of a reactor vessel.

Use of this approach is justified by the initial conservatism of the K_{Ia} curve when the curve was codified in 1974. This initial conservatism was necessary due to limited knowledge of reactor pressure vessel materials over time and usage. Since 1974, additional knowledge has been gained about the affect of usage on reactor pressure vessel materials. The additional knowledge demonstrates the lower bound on fracture toughness provided by the K_{Ia} curve provides a margin of safety that is adequate to protect the public health and safety from potential reactor pressure vessel failure.

C. The revised LTOP enable temperature being proposed for Point Beach Units 1 and 2 was developed using the plant specific method provided in Code Case N-641. Use of the Code Case N-641 methodology in the determination of the LTOP enable temperature is more technically correct than the generic value included in earlier versions of ASME Section XI and eliminates inconsistencies in the margin of safety between reactor vessels of geometries.

The basis for the enable temperature in Code Case N-641 provides bounding reactor vessel low temperature integrity protection during LTOP design basis transients. The LTOP PORV lift setpoint utilizes 100% of the pressure determined to satisfy Appendix G, paragraph G-2215 of ASME Section XI, Division 1, as a design limit. The approach is justified by consideration of the overpressurization design basis events and the resulting margin to reactor vessel failure.

P-T curves based Code Case N-641 will enhance overall plant safety by opening the pressure-temperature operating window with the greatest safety benefit in the region of low temperature operations. The primary safety benefit in opening the low temperature operating window is a reduction in the challenges to Reactor Coolant System (RCS) power operated relief valves.

The proposed P-T limits include restrictions on allowable operating conditions and equipment operability requirements to ensure that operating conditions are consistent with the assumptions of the accident analysis. Specifically, RCS pressure and temperature must be maintained within the heatup and cooldown rate dependent pressure-temperature limits specified in TS 3.4.3. Therefore, this exemption does not present an undue risk to the public health and safety.

3. The requested exemption will not endanger the common defense and security: The common defense and security are not endangered by this exemption request.

4. Special circumstances are present which necessitate the request for an exemption to the regulations of 10 CFR 50.60: Pursuant to 10 CFR 50.12(a)(2), the NRC will consider granting an exemption to the regulations if special circumstances are present. This exemption meets the special circumstances of paragraphs:

(a)(2)(ii) - demonstrates that the underlying purpose of the regulation will continue to be achieved;
(a)(2)(iii) - would result in undue hardship or other cost that are significant if the regulation is enforced and;
(a)(2)(v) - will provide only temporary relief from the applicable regulation and the licensee has made good faith efforts to comply with the regulations.

10 CFR 50.12(a)(2)(ii): The underlying purpose of 10 CFR 50, Appendix G and ASME XI, Appendix G, is to satisfy the requirement that the reactor coolant pressure boundary be operated in a regime having sufficient margin to ensure that when stressed the vessel boundary behaves in a non-brittle manner and the probability of a rapidly propagating fracture is minimized, and the P-T operating and test curves provide margin in consideration of uncertainties in determining the effects of irradiation on material properties.

Application of Code Case N-641 to determine P-T operating and test limit curves per ASME XI, Appendix G, provides appropriate procedures to determine limiting maximum postulated defects and considering those defects in the P-T limits. This application of the code case maintains the margin of safety originally contemplated for reactor pressure vessel materials.

ASME Code Case N-641 permits a plant-specific formulation for the enable temperature which maintains the margin of safety inherent in the generic formulation for the enable temperature. Application of Code Case N-641 permits implementation of LTOP PORV lift setpoints that preserve an acceptable margin of safety while maintaining operational margins for reactor coolant pump operation at low temperatures and pressures. The LTOP enable temperature established in accordance with Code Case N-641 will also minimize the unnecessary actuation of protection system pressure relieving devices. Therefore, establishing the LTOP setpoint and enable temperature in accordance with Code Case N-641 satisfies the underlying purpose of the ASME Code and the NRC regulations to ensure an acceptable level of safety.

Therefore, use of Code Case N-641, as described above, satisfies the underlying purpose of the ASME Code and the NRC regulations to ensure an acceptable level of safety.

10 CFR 50.12(a)(2)(iii): The Reactor Coolant System pressure-temperature operating window is defined by the P-T operating and test curves developed in accordance with the ASME XI, Appendix G procedure. Continued operation with these P-T curves without the relief provided by ASME Code Case N-641 would unnecessarily restrict the pressure-temperature operating window for Point Beach Units 1 and 2. This restriction requires that under certain low temperature conditions that only one reactor coolant pump be operated. The effect of this restriction is to force undesirable operating restrictions at low RCS temperatures. Further, the proposed LTOP guidelines will reduce the potential for an undesired challenge to the reactor coolant system power operated relief valve.

Implementation of an LTOP enable temperature without the additional margin associated with of ASME Code Case N-641 would unnecessarily restrict the pressure-temperature operating window. Use of Code Case N-641 will minimize the potential for RCP impeller cavitation wear while operating in the LTOP region and reduce the potential for undesired actuation of LTOP PORVs. Use of ASME Code Case N-641 in the development the proposed P-T curves and LTOP setpoint and enable temperature alleviates an unnecessary burden. Implementation of the proposed P-T curves and LTOP parameters as allowed by ASME Code Case N-641 does not reduce the margin of safety originally contemplated by either the NRC or ASME.

10 CFR 50.12(a)(2)(v): The exemption provides only temporary relief from the applicable regulation and PBNP has made a good faith effort to comply with the regulation. We request that the exemption be granted until such time that the NRC generically approves ASME Code Case N-641 for use by the nuclear industry. However, to retain sufficient pressure-temperature operating margin to the end of the proposed Point Beach Units 1 and 2 pressure-temperature limits, we require an exemption to use Code Case N-641.

Code Case N-641, Conclusion for Exemption Acceptability: Compliance with the specified requirements of 10 CFR 50.60 would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. ASME Code Case N-641 allows:

1. Postulation of a circumferential defect in circumferential welds to be considered in lieu of requiring the defect to be oriented across the weld from one plate or forging to the adjoining plate or forging. This circumstance was not considered at the time ASME XI, Appendix G was developed and imposes restrictions on P-T operating limits beyond those originally contemplated.

2. A reduction in the fracture toughness lower bound used by ASME XI, Appendix G, in the determination of reactor coolant pressure-temperature limits. This proposed alternative is acceptable because the Code Case maintains the relative margin of safety commensurate with that which existed at the time ASME XI, Appendix G, was approved in 1974. Therefore, application of Code Case N-641 for PBNP will ensure an acceptable margin of safety. The approach is justified by consideration of the overpressurization design basis events and the resulting margin to reactor vessel failure.

3. Implementation of the ASME Code Case N-641 analysis methodology for setting the LTOP enable temperature by using a plant specific determination such that bounding protection of ASME Section XI, Appendix G limits is provided. This proposed alternative is acceptable because the proposed methodology establishes LTOP setpoints that retain an acceptable margin of safety, maintains adequate operational margins for reactor coolant pump operation at low temperatures and pressures, and minimizes the potential for an undesired LTOP actuation.

In aggregate, these proposed alternatives are acceptable because the Code Case maintains the relative margin of safety commensurate with that which existed at the time ASME XI,

Appendix G, was approved in 1974. Therefore, application of Code Case N-641 for PBNP will ensure an acceptable margin of safety. The approach is justified by consideration of the overpressurization design basis events and the resulting margin to reactor vessel failure.

Restrictions on allowable operating conditions and equipment operability requirements have been established to ensure that operating conditions are consistent with the assumptions of the accident analysis. Specifically, RCS pressure and temperature must be maintained within the heatup and cooldown rate dependent pressure-temperature limits specified in the proposed PTLR. Therefore, this exemption does not present an undue risk to the public health and safety.