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June 19, 1997

ComEd

U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Attn: Document Control Desk

Subject: Braidwood Nuclear Power Station, Units 1 and 2
NRC Docket Numbers: 50-456 and 50-457

Byron Nuclear Power Station, Units 1 and 2
NRC Docket Numbers: 50-454 and 50-455

Supplement to Request for Exemption From the Requirements of 10CFR50.60, "Acceptance Criteria for Fracture Prevention Measures for Lightwater Nuclear Power Reactors for Normal Operation" to Use the 1996 Addenda of ASME Section XI, Appendix G, Article G-2000 "Vessels"

References:
1. J. Hosmer letter to the Nuclear Regulatory Commission dated April 3, 1997, transmitting Request for Exemption From the Requirements of 10CFR50.60

2. Teleconference dated May 21, 1997, between the Commonwealth Edison Company and the Nuclear Regulatory Commission Pertaining to the 50.12 Exemption Request

In the referenced letter, Commonwealth Edison Company (ComEd) requested an exemption in accordance with 10CFR50.12 from the requirements of 10CFR50.60 "Acceptance Criteria for Fracture Prevention Measures for Lightwater Nuclear Power Reactors for Normal Operation" to use the 1996 Addenda of ASME Section XI, Appendix G, Article G-2000 "Vessels" in lieu of the 1989 Edition in the determination of allowable pressure-temperature (P-T) limits for Byron Nuclear Station Units 1 and 2 (Byron) and Braidwood Nuclear Station Units 1 and 2 (Braidwood). This exemption requested relief under 10CFR50.12(a)(2)(iii), "Compliance would result in undue hardship..." During the reference teleconference the Nuclear Regulatory Commission (NRC) and ComEd discussed the feasibility of supplementing the exemption request to ask that the Commission grant the exemption under the circumstances described in 10CFR50.12(a)(2)(ii) in lieu of 10CFR50.12(a)(2)(iii). As stated in 10CFR50.12(a)(2)(ii) the commission can consider granting an exemption if special circumstances are present; specifically, "Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule."

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The Attachment discusses how the requested exemption, use of the 1996 Addendum of ASME Section XI, Appendix G, Article G-2000 meets the underlying intent of 10CFR50, Appendix G and therefore meets the special circumstances required by 10CFR50.12(a)(2)(ii).

The 1989 Edition of ASME Section XI, Appendix G is the most recent Edition permitted for use by 10CFR50.55a. However, the 1996 Addenda to ASME Section XI, Appendix G, Article G-2000 incorporated the most recent elastic solutions for the Mode I stress intensity factor ($K_I$) due to pressure and radial thermal gradients. Use of the most recent elastic solutions will provide relief from the restrictions associated with reactor operation at relatively low temperature. Adoption of the 1996 Addenda in lieu of the 1989 Edition maintains current ASME Section XI safety margins and has been determined to provide an acceptable level of quality and safety. The underlying purpose of the rule, to protect the reactor coolant pressure boundary against nonductile failure, will still be achieved.

ComEd intends to use the 1996 Addenda to ASME Section XI, Appendix G, Article G-2000 once approval is received from the Staff in the development of all future P-T limits for Byron and Braidwood. ComEd requests that this exemption be approved as soon as possible.

If there are any questions concerning this submittal, please contact this office.

Sincerely,

John B Hosmer

John B. Hosmer
Engineering Vice President

Attachment

cc: G. Dick, Byron/Braidwood, Project Manager - NRR
C. Phillips, Senior Resident Inspector - Braidwood
S. Burgess, Senior Resident Inspector - Byron
A.B. Beach, Regional Administrator
Office of Nuclear Facility Safety - IDNS

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## ATTACHMENT

Discussion of How the Requested Exemption Meets the Special Circumstances as Required Per 10CFR50.12(a)(2)(ii)

**Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.**

The 1989 Edition of ASME Section XI, Appendix G is the most recent Edition permitted for use by 10 CFR 50.55a. However, the 1996 Addenda to ASME Section XI, Appendix G, Article G-2000 was approved by ASME on December 31, 1996. Section XI, Appendix G, Article G-2000 provides a procedure for obtaining the allowable loadings for ferritic pressure retaining materials in vessels, which are expressed in the form of P-T limits. With the 1996 Addenda, Article G-2000 was revised to incorporate the most recent elastic solutions for the Mode I stress intensity factor ($K_I$) due to pressure and radial thermal gradients. These new solutions better characterize the conditions for irradiated vessels in the low temperature region where the thermal stresses and allowable pressure are low. Using the most recent elastic solutions will provide some relief from the restrictions associated with reactor operation at relatively low temperature. Although the relief is relatively small in terms of absolute allowable pressure, the benefits are substantial; even a small increase in the allowable pressure can be a significant percentage increase in the operating window at relatively low temperature.

ComEd has reviewed the 1996 Addenda to ASME Section XI, Appendix G, Article G-2000, and determined that its use would provide an acceptable level of quality and safety. There are many conservatisms incorporated into the P-T limits calculated using the current methodology of ASME Section XI, Appendix G, Article G-2000 including:

- An assumed flaw in the wall of the reactor vessel has a depth equal to 1/4 of the thickness of the vessel wall and a length equal to 1-1/2 times the vessel wall thickness,
- A factor of 2 is applied to the membrane stress intensity factor,
- The limiting toughness is based upon a reference value, which is a lower bound of the dynamic crack initiation or arrest toughnesses, and
- 2-sigma margins are applied in determining the adjusted reference temperature (ART) in accordance with Regulatory Guide 1.99, Revision 2.

None of these conservatisms are compromised by this change. Use of the 1996 Addenda to ASME Section XI, Appendix G, Article G-2000 will not result in any design changes or plant modifications. Protection from nonductile failure will still be assured, which is the underlying purpose of the rule.