

April 3, 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

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"

Commonwealth Edison Company (ComEd) requests 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 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). 10CFR50.12(a)(1) allows the Commission to grant exemptions if the exemption, "... will not present an undue risk to the public health and safety, and are consistent with the common defense and security." Also 10CFR50.12(a)(2)(iii) allows an exemption if, "Compliance would result in undue hardship..."

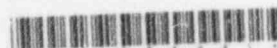
10CFR50.60 requires licensees to, "... meet the fracture toughness and material surveillance program requirements for the reactor coolant pressure boundary set forth in Appendices G and H to this part." 10CFR50 Appendix G, section I, instructs use of sections, editions and Addenda of the ASME Boiler and Pressure Vessel Code specified in 10CFR50.55a. The current edition of 10CFR50.55a states, "... references to Section XI of the ASME Boiler and Pressure Vessel Code refer to Section XI, Division 1, and include addenda through the 1988 Addenda and editions through the 1989 Edition..."

10CFR50 Appendix G, paragraph IV.A.2.b requires that the P-T limits for the reactor pressure vessel, "... must be at least as conservative as limits obtained by following the methods of analysis and the margins of safety of Appendix G of Section XI of the ASME Code."

ComEd requests use of the alternative rules of the 1996 Addenda to ASME Section XI, Appendix G, Article G-2000 in the development of all future P-T limits for Byron and Braidwood.

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ComEd believes that compliance with the current requirements for the determination of allowable P-T limits included in 10CFR50 Appendix G will result in future hardship for Byron and Braidwood without a concurrent increase in the level of safety. The hardship involves the operating window between the maximum Reactor Coolant pressure allowed by the P-T limits and the minimum Reactor Coolant System (RCS) pressure required by Reactor Coolant Pump (RCP) operation. The operating window is significantly restricted as operating time and resulting predicted reactor vessel embrittlement increases. A restricted operating window significantly reduces operator flexibility in maneuvering RCS pressure at the lower end of the operating temperature range where maneuvering is most difficult. Also, compliance with Appendix G results in an additional hardship when the operating window between the maximum allowed RCS pressure for Low Temperature Overpressure Protection System (LTOPS) and the minimum RCS pressure required for RCP operation is significantly restricted under certain conditions. As operating time increases, maintaining the current restriction will increase the likelihood of LTOPS actuation and potential damage to RCP seals. 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 this Addenda maintains current ASME Section XI safety margins and has been determined to provide an acceptable level of quality and safety.

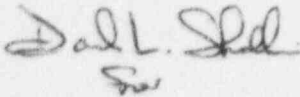
ComEd intends to implement the 1996 Addenda to ASME Section XI, Appendix G, Article G-2000 once approval is received from the Staff. This addenda along with surveillance data integration required by 10CFR50.61 will be used to revise the P-T limits which are being submitted via separate correspondence. This will ensure that the reactor pressure vessel is protected from nonductile failure, and at the same time, will allow for improved operational flexibility between the maximum allowed P-T and LTOPS pressures and the minimum RCS pressure required for RCP operation.

Approval of this exemption request to use the 1996 Addenda to ASME Section XI, Appendix G, Article G-2000 in the development of all future P-T limits for Byron and Braidwood is requested by June, 1997.

April 3, 1997

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

Sincerely,

A handwritten signature in dark ink, appearing to read "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

ATTACHMENT

JUSTIFICATION FOR EXEMPTION FROM THE REQUIREMENTS OF 10CFR50.60

EXEMPTION

Pursuant to 10CFR50.12(a), ComEd requests an exemption from the requirements of 10CFR50.60 which requires licensees to, "... meet the fracture toughness and material surveillance program requirements for the reactor coolant pressure boundary set forth in Appendices G and H to this part." 10CFR 50 Appendix G, section I instructs use of sections, editions and Addenda of the ASME Boiler and Pressure Vessel Code specified in 10CFR50.55a. The current edition of 10CFR50.55a states, "references to Section XI of the ASME Boiler and Pressure Vessel Code refer to Section XI, Division 1, and include addenda through the 1988 Addenda and editions through the 1989 Edition ..."

10CFR50 Appendix G, paragraph IV.A.2.b requires that the pressure-temperature (P-T) limits for the reactor pressure vessel, "... must be at least as conservative as limits obtained by following the methods of analysis and the margins of safety of Appendix G of Section XI of the ASME Code."

ComEd request use of the alternative rules of the 1996 Addenda to ASME Section XI, Appendix G, Article G-2000 in the development of all future P-T limits for Byron and Braidwood.

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BASIS

A. Criteria for Granting Exemptions Are Met per 10CFR50.12(a)(1)

1. The Requested Exemptions and the Activities Which Would be Allowed Thereunder Are Authorized by Law

If the criteria established in 10CFR50.12(a) are satisfied, as they are in this case, and if no other prohibition of law exists to preclude the activities which would be authorized by the requested exemption, and there are no such prohibitions, the Commission is authorized by law to grant this exemption request.

2. The Requested Exemption Will Not Present Undue Risk to the Public Health and Safety

The proposed exemption request has no impact on the safe operation of the facility. Exemption from the requirements of 10CFR50.60 would allow for the use of the 1996 Addenda to ASME Section XI Appendix G. This Addenda allows for a more accurate characterization of the stress conditions of the material without impacting ASME Section XI safety margins. As such, the requested exemption will not present undue risk to the public health and safety.

3. The Requested Exemption is Consistent with the Common Defense and Security

The proposed exemption request from 10CFR50.60 involves adoption of the most recent Addenda to ASME Section XI Appendix G. It will not affect the safe operation of the facility. As such, the common defense and security are unaffected by the proposed exemption request.

B. At Least One of the Special Circumstances Are Present Per 10CFR50.12(a)(2)(iii)

1. **The Requested Exemptions Will Avoid Undue Hardship or Costs**

10CFR50.60 requires a fracture toughness program which follows the requirements set forth in Appendix G. Compliance with the current requirements for determination of allowable P-T limits included in 10CFR50 Appendix G will result in future hardship for Byron and Braidwood without a concurrent increase in the level of quality and safety. The hardship involves the operating window between the maximum RCS pressure allowed by the P-T limits and the minimum RCS pressure required for reactor coolant pump (RCP) operation. The operating window is significantly restricted as operating time and resulting predicted reactor vessel beltline irradiation embrittlement increase. A restricted operating window significantly reduces operator flexibility in maneuvering RCS pressure at the lower end of the operating temperature range where maneuvering is most difficult. An additional hardship is that the operating window between the maximum allowed RCS pressure for Low Temperature Overpressure Protection System (LTOPS), which uses the steady state P-T limit as a fundamental input, and the minimum RCS pressure required for RCP operation is significantly restricted when physical conditions such as Power Operated Relief Valve (PORV) overshoot, flow effects on RCS pressure indication, instrument uncertainty, and static head corrections are taken into account in the setpoint determination. As operating time increases, maintaining the current restrictions will unnecessarily increase the likelihood of LTOPS actuation at lower setpoints. This has the potential to damage the RCP seals since the pressure undershoot conditions experienced during a LTOPS actuation event may be below the recommended RCS minimum pressure which ensures RCP seal integrity.

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, and protection from nonductile failure will still be assured.