



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO THE SECOND 10-YEAR INTERVAL INSERVICE

INSPECTION RELIEF REQUEST

COMMONWEALTH EDISON COMPANY

BYRON STATION, UNITS 1 AND 2

DOCKET NOS. STN 50-454 AND STN 50-455

1.0 INTRODUCTION

Inservice inspection of the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Class 1, 2, and 3 components shall be performed in accordance with Section XI of the ASME Code and applicable addenda as required by 10 CFR 50.55a(g), except where specific written relief has been granted by the Commission pursuant to 10 CFR 50.55a(g)(6)(i). 10 CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Pursuant to 10 CFR 50.55a(g)(4), ASME Code Class 1, 2, and 3 components (including supports) shall meet the requirements, except the design and access provisions and the pre-service examination requirements, set forth in the ASME Code, Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," to the extent practical within the limitations of design, geometry, and materials of construction of the components. The regulations require that inservice examination of components and system pressure tests conducted during the first 10-year interval and subsequent intervals comply with the requirements in the latest edition and addenda of the Section XI of the ASME Code incorporated by reference in the 10 CFR 50.55a(b) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The applicable edition of Section XI of the ASME Code for Byron Station, Units 1 and 2, is the 1989 Edition of Section XI of the ASME Code.

By letter dated July 29, 1998, Commonwealth Edison Company (ComEd, the licensee), submitted to the NRC its alternative to the Code requirements in Relief Request I2R-11,

Revision 2, for the pressure testing of Class 1, 2, and 3 insulated bolted connections specified in Section IWA-5242(a) for Byron Station, Units 1 and 2. The licensee's proposed alternative to conduct VT-2 examination without removing insulation at normal operating pressure and VT-2 examination with insulation removed and system depressurized, would provide an acceptable level of quality and safety. The NRC staff has reviewed and evaluated the licensee's proposed alternative and the supporting information, pursuant to 10 CFR 50.55a(a)(3)(i) for Byron Station, Units 1 and 2.

## 2.0 EVALUATION

The staff, with technical assistance from its contractor the Idaho National Engineering and Environmental Laboratory (INEEL), has evaluated the information provided by the licensee in support of its request for alternative to the Code-requirements during the second 10-year inservice inspection interval. Based on the results of the review, the staff adopts the contractor's conclusions and recommendations presented in the attached Technical Letter Report (TLR).

**Request for Relief I2R-11 (Revision 2):** This request for relief involves the use of Alternative Requirements to Visual Examination, VT-2, of Class 1, 2, and 3 Insulated Pressure Retaining Bolted Connections, Section XI, Division 1, under Paragraph IWA-5242(a).

Section IWA-5242(a), Insulated Components, requires removal of all insulation from pressure retaining bolted connections in systems bolated for the purpose of controlling reactivity when performing VT-2 visual examinations during system pressure tests. In accordance with 10 CFR 50.55a(a)(3)(i), the licensee proposed to conduct the Code-required VT-2 examination without removal of the insulation, augmented by a minimum 4-hour hold time prior to examination to allow for leakage propagation, if any. In addition, the licensee proposes to remove the insulation and perform a VT-2 examination while the system is depressurized to determine if leakage had occurred at bolted connections by noting evidence of residues at the connection. The examination frequencies for class 2 and 3 bolted connections will also be increased to 36 months, which coincides with refueling outages, that exceeds the current Code-required examination frequencies. If there is leakage at the connection or evidence of leakage at the connection, the connection shall be evaluated in accordance with IWA-5250, as modified for Byron Station in the staff safety evaluation for Relief Request IR-12, dated July 22, 1996.

The proposed alternative by the licensee is similar to Code Case N-533, which has been previously authorized by the staff on an individual basis and is currently under consideration for incorporation into Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability." Code Case N-533 has been determined previously to provide a reasonable approach for ensuring the leak tight integrity of insulated bolted connections in Class 1 systems bolated for the purpose of controlling reactivity. The licensee's proposed alternative to conduct the VT-2 examination with the insulation in place, after a 4 hour hold time at normal system operating pressure, should provide a means of detecting significant leakage. In addition, the removal of insulation for a visual exam each refueling outage for Class 1 bolted connections, and at approximately 36 month intervals for Class 2 and 3 bolted connections, should provide for detection of minor leakage by noting the presence of residues.

This approach meets the intent of IWA-5242(a) to assure that structural integrity of bolted connections in borated systems will be maintained. Therefore, the staff concludes that the proposed alternative provides an acceptable level of quality and safety.

### 3.0 CONCLUSION

The staff has completed its review of the information provided by the licensee and concludes that for request for relief I2R-11, Revision 2, the proposed alternative will provide an acceptable level of quality and safety. Therefore, the licensee's proposed alternative in request for relief I2R-11, Revision 2, is authorized pursuant to 10 CFR 50.55a(a)(3)(i) for the current interval.

Attachment: Technical Letter Report

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Dated: March 19, 1999

TECHNICAL LETTER REPORT  
ON SECOND 10-YEAR INTERVAL INSERVICE INSPECTION  
RELIEF REQUEST I2R-11, REVISION 2  
FOR  
COMMONWEALTH EDISON COMPANY  
BYRON NUCLEAR POWER STATION, UNITS 1 AND 2  
DOCKET NUMBERS: 50-454 and 50-455

1. INTRODUCTION

By letter dated July 29, 1998, the licensee, Commonwealth Edison Company, submitted Relief Request I2R-11, Revision 2, seeking relief from the requirements of the ASME Code, Section XI, for the Byron Nuclear Power Station, Units 1 and 2, second 10-year inservice inspection (ISI) interval. The Idaho National Engineering and Environmental Laboratory (INEEL) staff's evaluation of the subject request for relief is in the following section.

2. EVALUATION

The information provided by Commonwealth Edison Company in support of the request for relief from Code requirements has been evaluated and the basis for disposition is documented below. The Code of record for the Byron Nuclear Power Station, Units 1 and 2, second 10-year ISI interval, which began September 1, 1996, for Unit 1, and August 16, 1998, for Unit 2, is the 1989 Edition of Section XI of the ASME Boiler and Pressure Vessel Code.

Request for Relief No. I2R-11 (Revision 2), Paragraph IWA-5242(a), VT-2 Visual Examination of Insulated Bolted Components

Code Requirement: IWA-5242(a) requires that insulation be removed from pressure-retaining bolted connections for VT-2 visual examination in systems borted for the purpose of controlling reactivity.

ATTACHMENT

Licensee's Proposed Alternative: Pursuant to 10 CFR 50.55a(a)(3)(i), the licensee has proposed the following alternative to the Code requirement to remove insulation at bolted connections for VT-2 examination during system pressure testing.

The licensee stated:

"For ASME Class 1 systems bolated for the purpose of controlling reactivity, a system inservice leakage test shall be performed in accordance with the frequency required in Table IWB-2500 without the removal of insulation from the bolted connections. The requirements for inservice leak tests shall be augmented with a minimum 4-hour hold time at system normal operating pressure prior to the VT-2 visual examination to allow for leakage propagation from the insulation. Additionally, the insulation shall be removed from insulated Class 1 bolted connections and a VT-2 examination shall be conducted, with the system depressurized. The frequency for these depressurized VT-2 inspections shall be in accordance with the system examination frequencies specified in Tables IWB-2500, Category B-P (each refueling outage). The proposed alternative is consistent with the requirements of Code Case N-533. These inspections shall be implemented through the application of the Byron Station predefined surveillance program to assure they are performed within the prescribed time periods.

"For ASME Class 2 and 3 systems bolated for the purpose of controlling reactivity, a system pressure test shall be performed in accordance with the frequency required in Tables IWC-2500 or IWD-2500, as applicable, without the removal of insulation from the bolted connections. The requirements for system pressure tests shall be augmented with a minimum 4-hour hold time at system normal operating pressure prior to the VT-2 visual examination to allow for leakage propagation from the insulation. Additionally, the insulation shall be removed from individual insulated Class 2 and 3 bolted connections and a VT-2 examination shall be conducted, with the system depressurized at an increased frequency. VT-2 examinations on each component will be performed on approximately 36-month frequency, which coincides with plant refueling outages, not allowing the period between inspections on individual components to exceed 45 months. This increased frequency for individual components is more restrictive than the 'Periodic Frequency' prescribed by ASME Section XI for Class 2 and 3 systems described in Tables IWC-2500 or IWD-2500. These inspections shall be implemented through the application of the Byron Station predefined surveillance program (EWCS) to assure they are performed within the prescribed time periods.

"Regardless of whether a component is scheduled for examination or not, any evidence of leakage, either while insulated or while deinsulated, will result in evaluations for corrective measures in accordance with IWA-5250 (as modified for Byron Station by approved Relief Request I2R-12<sup>1</sup>)."

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<sup>1</sup> Evaluated in NRC Safety Evaluation Report dated July 22, 1996.

Licensee's Basis for Proposed Alternative (as stated):

"Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative would provide an acceptable level of quality and safety. Specifically, relief is requested from the requirement to remove insulation at bolted connections for VT-2 examination coincident with system pressure testing at normal operating pressure.

"The following Byron Station material control and procedure control programs, in conjunction with the Proposed Alternate Provisions, provide an acceptable level of quality and safety for bolted connections in systems borated for the purpose of controlling reactivity.

- "In response to NRC Generic Letter 88-05, Byron Station has established a program for Engineering to inspect all boric acid leaks discovered in the containment building and to evaluate the impact of those leaks on carbon steel or low alloy steel components. Any evidence of leakage, including dry boric acid crystals or residue, is inspected and evaluated regardless of ASME Class, location or whether the leak was discovered at power or during an outage. Issues such as the following are considered in the inspection and evaluation:
  - - 1) "Evidence of corrosion or metal degradation,
    - 2) Effect the leak may have on the pressure boundary,
    - 3) Possibility of boric acid traveling along the inside of insulation on piping, and
    - 4) Possibility of dripping or spraying on other components. Based on this evaluation, Byron Engineering initiates appropriate corrective actions to prevent recurrence of the leak and to repair, if necessary, any degraded materials or components.

"These evaluations ensure issues related to leakage on borated systems are addressed, including corrective actions necessary to eliminate the source of leakage.

- "The ASME Section XI Code, 1989 Edition, Tables IWC 2500-1 and IWD 2500-1, presently prescribe the performance of ASME Class 2 and 3 pressure tests (visual, VT-2) on a frequency of once per ISI inspection period. Byron Station maintains a work control program (Electronic Work Control System-EWCS) that controls the implementation of examinations to prescribed time limits. Using the EWCS system, predefines will be assigned to examinations of borated system bolted connections at a 36 month frequency. The EWCS predefines provide a level of quality and safety that exceeds that of the ASME Section Code for ASME Class 2 and 3 bolted connections interval since the examinations will be completed on a more consistent frequency.

- "The ASME Section XI Code, 1989 Edition, Table IWB 2500-1, presently prescribes the performance of ASME Class 1 pressure tests (visual, VT-2) on a frequency of once per ISI refuel cycle. Byron Station will perform the examination of borated system bolted connections at this frequency, thereby maintaining a consistent level of quality and safety as that prescribed by the ASME Section XI Code.

"The following information is not directly related to the basis for relief, however it represents hardship with performing the VT-2 examinations of borated system bolted connections coincident the systems at normal operating pressure. The issues are provided with this relief request as additional supporting information.

- "Code Class 1, 2 and 3 systems borated for the purpose of controlling reactivity are extensive and large systems covering many areas and elevations. Scaffolding is required to access many of the bolted connections. In addition, many of the bolted connections are located in difficult to access areas and in medium to high-level radiation areas. Insulation removal combined with scaffolding requirements will increase refuel outage duration, financial costs, personnel exposure, and generation of radwaste associated with performance of VT-2 examinations.
- "The VT-2 examinations of Class 1 systems, primarily the Reactor Coolant System (RCS) piping and component that are located inside containment, are performed at plant Mode 3. As required by IWB-5221, the RCS is at a normal operating pressure of 2235 psig. At Mode 3, the RCS temperature is approximately 557 °F. A significant portion of the Class 2 and 3 piping systems is also located in the containment and is VT-2 examined coincident with the Class 1 piping systems at plant Mode 3. Removal/reinstallation of insulation for Class 1, 2, and 3 systems poses significant radiological considerations.
- "Performance of VT-2 examination, removal/reinstallation of insulation, and assembly/disassembly of scaffolding at bolted connections under these operating conditions also present significant personnel safety considerations. At Byron Station, the Class 1 VT-2 examination, coincident with Class 2 and 3 examinations, is a refuel outage critical path activity with duration in the Byron refuel outage schedule of 4 hours. The activities associated with erecting scaffold to all of the bolted connection components and inspecting at operating pressure can add 4 to 5 days to this critical path activity. Therefore, in addition to the personnel safety and radiological considerations, insulation removal/installation and scaffolding assembly/disassembly will have considerable impact on the refuel outage duration and subsequent return to service of the unit."

Evaluation: The Code requires the removal of all insulation from pressure-retaining bolted connections in systems borated for the purpose of controlling reactivity when performing VT-2 visual examinations during system pressure tests. As an alternative, the licensee has proposed to perform a system pressure test and associated VT-2 visual examination without removal of insulation from bolted connections on Class 1, 2, and 3 systems. The system pressure tests will be augmented with a minimum 4-hour hold time prior to the VT-2 visual examination. The frequency of examinations will be in accordance with the requirements in Table IWB-2500-1 for Class 1 systems (each refueling outage) and Tables IWC-2500-1 and IWD-2500-2 for Class 2 and 3 systems (each period). In addition, with the systems depressurized, insulation will be removed from the bolted connections for direct visual examination each refueling outage for Class 1 systems, and at approximately 36 month intervals (which coincide with plant refueling outages), but not exceeding 45 months for any component, for Class 2 and 3 systems.

The licensee's proposed alternative is essentially equivalent to Code Case N-533, *Alternative Requirements for VT-2 Visual Examination of Class 1 Insulated Pressure-Retaining Bolted Connections, Section XI, Division 1*, except the proposed alternative was extended to address Code Class 2 and 3 bolted connections. Code Case N-533 is currently under review by the NRC staff and has not yet been approved for use by incorporation into Regulatory Guide 1.147, *Inservice Inspection Code Case Acceptability*.

For Class 1, 2, and 3 systems, the licensee's proposed alternative provides a thorough approach to ensuring the leak-tight integrity of systems borated for the purpose of controlling reactivity. First, the 4-hour hold time should allow potential leakage to penetrate the insulation, thus providing a means of detecting significant leakage with the insulation in place. Further, by subsequently removing the insulation each refueling outage for Class 1 bolted connections, and at approximately 36 month intervals (but not greater than 45 months) for Class 2 and 3 bolted connections, the licensee will be able to detect minor leakage indicated by the presence of boric acid residue. Therefore, it is concluded that this two-phased approach will provide an acceptable level of quality and safety for bolted connections in borated systems.

3. CONCLUSION

The INEEL staff has reviewed the licensee's submittal and concludes that for Request for Relief No. I2R-11, Revision 2, the licensee's proposed alternative will provide an acceptable level of quality and safety. Therefore, it is recommended that this proposed alternative be authorized for the second interval pursuant to 10 CFR 50.55a(a)(3)(i).