September 13, 2001

Mr. Oliver D. Kingsley, President
Exelon Nuclear
Exelon Generation Company, LLC
1400 Opus Place, Suite 500
Downers Grove, IL 60515

SUBJECT: DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3 - RELIEF REQUESTING ALTERNATIVE EXAMINATION REQUIREMENTS FOR REACTOR VESSEL CLOSURE HEAD NUTS AND PRESSURE RETAINING BOLTING OF CONTROL ROD DRIVE HOUSING (TAC NOS. MB0384 AND MB0385)

Dear Mr. Kingsley:

By letter dated October 18, 2000, Commonwealth Edison Company (ComEd) submitted two requests for relief concerning certain American Society of Mechanical Engineers (ASME) Code Section XI requirements for Dresden Nuclear Power Station, Units 2 and 3. Subsequent to the date of the relief request, ComEd was merged into Exelon Generation Company, LLC (Exelon or the licensee). By letter dated February 7, 2001, Exelon informed the Nuclear Regulatory Commission (NRC) that it assumed responsibility for all pending NRC actions that were requested by ComEd.

In accordance with 10 CFR 50.55a(a)(3)(i) the licensee proposed alternatives to existing ASME Code Section XI requirements. The alternatives proposed by the licensee are for visual examinations of the reactor vessel closure head nuts (Relief Request CR-13) and pressure retaining bolting of control rod drive housings (Relief Request CR-20).

The staff has reviewed the licensee's submittal and determined that the proposed alternatives contained in Relief Request CR-13 and Relief Request CR-20 would provide an acceptable level of quality and safety. Therefore, the licensee's proposed alternatives are authorized in accordance with 10 CFR 50.55a(a)(3)(i) for the licensee's third inservice inspection interval for Dresden Nuclear Power Station, Units 2 and 3.

The enclosed safety evaluation contains the basis for this determination. This completes the staff's effort for TAC Nos. MB0384 and MB0385.

Sincerely,

***/RA/***

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-237 and 50-249

Enclosure: Safety Evaluation

cc w/encl: See next page

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The enclosed safety evaluation contains the basis for this determination. This completes the staff's effort for TAC Nos. MB0384 and MB0385.

Sincerely,

***/RA/***

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*Concurred by Safety Evaluation dated 6/20/1, no significant changes made

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ALTERNATIVE EXAMINATION REQUIREMENTS FOR REACTOR VESSEL

CLOSURE HEAD NUTS AND PRESSURE RETAINING BOLTING OF

CONTROL ROD DRIVE HOUSING

EXELON GENERATION COMPANY

DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3

DOCKET NOS. 50-237 AND 50-249

## 1.0 INTRODUCTION

By letter dated October 18, 2000, Commonwealth Edison Company (ComEd) submitted two requests for relief from certain examination requirements of the American Society of Mechanical Engineers (ASME) Code, Section XI for Dresden Nuclear Power Station (DNPS), Units 2 and 3. Subsequent to the date of the relief request, ComEd was merged into Exelon Generation Company, LLC (Exelon or the licensee). By letter dated February 7, 2001, Exelon informed the Nuclear Regulatory Commission (NRC) that it assumed responsibility for all pending NRC actions that were requested by ComEd. The information provided by the licensee in support of the request for relief from Code requirements has been evaluated. The basis for disposition is documented below.

## 2.0 BACKGROUND

Inservice inspection of the ASME Code Class 1, 2 and 3 components is to be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel (B&PV) 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). 10CFR 50.55a(a)(3) states that alternatives to the requirements of paragraph (g) may be used, when authorized by the NRC, if the licensee demonstrates that (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 preservice 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 Section XI of the ASME Code incorporated by reference in 10 CFR 50.55a(b) twelve 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 the third 10-year inservice inspection (ISI) interval at Dresden Nuclear Power Station, Units 2 and 3, is the 1989 Edition.

## 3.0 LICENSEE'S RELIEF REQUESTS

### 3.1 Relief Request Number CR-13

3.1.1 The components for which relief is requested:

Reactor vessel closure head nuts, ASME Code Section XI, Table IWB-2500, examination category B-G-1, item number B6.10.

3.1.2 Code Requirement (as stated):

"ASME Code Section XI Paragraph IWB-2500 states that components shall be examined and tested as specified in ASME Code Section XI Table IWB-2500-1.

ASME Code Section XI Table IWB-2500-1 requires a surface examination to be performed on reactor vessel closure head nuts."

3.1.3 Licensee's Proposed Alternative Examination (as stated):

"As an alternative examination, DNPS will perform VT-1 visual examination of the surface of all reactor closure head nuts, utilizing the acceptance criteria of IWB-3517, as delineated in the 1989 Edition of ASME Section XI."

3.1.4 Licensee's Basis for Relief (as stated):

"Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative provides an acceptable level of quality and safety.

Table IWB-2500-1 of the 1989 Edition of ASME Code Section XI requires a surface examination to be performed on the reactor vessel closure head nuts. However, Table IWB-2500-1 does not provide the corresponding "Examination Requirements/Figure Number" and "Acceptance Standard." These provisions were still being developed at the time the 1989 Edition was approved.

The incomplete set of rules for the examination of reactor vessel closure head nuts does not allow DNPS to implement an inspection program to verify the integrity of the pressure retaining bolting.

The 1989 Edition of ASME Section XI, Category B-G-1, employs a VT-1 visual examination for nuts associated with Heat Exchangers, Piping, Pumps, and Valves (Item Numbers B6.140, B6.170, B6.200, and B6.230, respectively). These Category B-G-1 requirements also provide an Acceptance Standard, IWB-3517, for the VT-examinations. In addition, the 1989 Addenda incorporated an Acceptance Standard, IWB-3517, for the VT-1 examinations of Reactor Vessel Closure Head Nuts. In the latest version of 10 CFR 50.55a, the NRC has approved the 1989 Addenda through the 1995 Edition with the 1996 Addenda. Accordingly, these rules are deemed by DNPS as an acceptable and complete set of rules to assure the integrity of reactor vessel closure nuts.

Based on the above, DNPS requests relief from the requirements specified in Table IWB-2500-1 of the 1989 Edition of ASME Section XI for reactor vessel closure head nuts."

3.1.5 Staff Evaluation and Conclusion

The 1989 Code Edition requires 100 percent surface examination of the reactor pressure vessel (RPV) closure head nuts. The licensee proposes to perform a VT-1 visual examination of the reactor pressure vessel closure head nuts to the criteria of ASME Section XI, 1989 Edition in conjunction with the acceptance criteria as stated in article IWB-3000, specifically the criteria in subarticle IWB-3517.

Indications that would require corrective action on RPV closure head nuts are typically associated with degradation mechanisms such as boric acid attack, corrosion, or handling (such as galled threads and deformation). Typical surface examination procedures and techniques are not qualified to identify these forms of degradation.

In addition, the 1989 Edition of the Code, Item B6.10, does not provide acceptance criteria for surface examination of RPV closure head nuts. (At the time of the 1989 Edition, the acceptance criteria were in the course of preparation). Later editions of the Code from the 1989 Addenda through the 1995 Edition with the 1996 Addenda, requires licensees to perform a VT-1 examination on the RPV closure head nuts. These later editions of the Code have been approved for use in 10 CFR 50.55a, Industry Codes and Standards.

Article IWB-3000, Acceptance Standard, IWB-3517.1, Visual Examination, VT-1, describes conditions that require corrective action prior to continued service of bolting and associated nuts. IWB-3517.1 requires crack-like flaws to be compared to the flaw standards of IWB-3515. Because the VT-1 visual examination acceptance criteria include evaluation of crack-like indications and other relevant conditions requiring corrective action (i.e., deformed or sheared threads, localized corrosion, deformation of part, and other degradation mechanisms), the staff concludes that the VT-1 visual examination provides a comprehensive assessment of the condition of the closure head nuts. Therefore, the staff concludes the VT-1 visual examination with the associated acceptance standard provides an acceptable level of quality and safety. The licensee's proposed alternative is authorized pursuant to 10 CFR 50.55a(a)(3)(i).

3.2 Relief Request Number CR-20

3.2.1 The components for which relief is requested:

Control rod drive (CRD) housing bolting, 2 in. and less in diameter, ASME Code Section XI, Table IWB-2500-1, examination category B-G-2, item number B7.80.

3.2.2 Code Requirement:

ASME Code Section XI Paragraph IWB-2500 states that components shall be examined and tested as specified in Table IWB-2500-1. Table IWB-2500-1 requires a VT-1 visual examination to be performed on the CRD housing bolting, 2 in. and less in diameter, when disassembled.

3.2.3 Licensee's Proposed Alternative (as stated):

"As an alternative to the existing Section XI requirements, Dresden Station will adopt the provisions of Code Case N-547 and discontinue performing VT-1 examinations of CRD housing bolting. As an alternative provision, DNPS will continue to procure new cap screws that have received a surface examination that meets the acceptance criteria of the 1989 Edition of ASME Section III Paragraph NB-2545 from the supplier or original equipment manufacturer. Whenever a CRD is removed for maintenance, the existing cap screws shall be replaced with brand new cap screws and the existing cap screws discarded. If removed, CRD cap screws are to be reused; they shall first be cleaned and given a VT-1 examination in accordance with IWB-2500-1 along with the acceptance criteria in IWB-3517."

3.2.4 Licensee's Basis for Relief (as stated):

"Relief is requested for the use of Code Case N-547 with additional provisions in lieu of the aforementioned American Society of Mechanical Engineers (ASME) Section XI "Rules for Inservice Inspection of Nuclear Power Plant Components," requirements. Pursuant to 10 CFR 50.55a(a)(3)(i), relief is requested on the basis that the proposed alternative will provide an acceptable level of quality and safety.

ASME Section XI, Table IWB-2500-1 currently requires a VT-1 visual examination to be performed on surfaces of bolts, and nuts used in CRD housings when they are disassembled during the inspection interval. At Dresden Nuclear Power Station, cap screws are used for CRD housing bolting. Code Case N-547, which eliminates the requirement of VT-1 visual inspection of CRD housing bolting, was approved by the ASME Boiler and Pressure Vessel Code Committee on August 24, 1995. Code Case N-547 is not currently listed in the NRC approved ASME Code Cases provided in Revision 12 of Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability-ASME Section XI Division 1".

In March of 1989, General Electric issued Service Information Letter 483 that addressed crack indications and corrosion pitting found in the shank directly below the cap screw head of CRD bolting. At the time, the cause of cracking was attributed to a general corrosion cracking mechanism assisted by a crevice and discontinuity in the fillet region directly below the cap screw head. At the time, it was also believed that crack growth was aggravated by manganese sulfide inclusions in the cap screw material.

Subsequent evaluations performed on cap screws from other Boiling-Water Reactors (BWR) performed by Brookhaven National Laboratory as well as by Commonwealth Edison's System Materials Analysis Department Metallurgy Group, determined that there was no crack mechanism. No active stress corrosion cracking or fatigue mechanism had been observed. The linear indications discovered were resulting from corrosion of pre-existing manufacturing defects.

In order to preclude the potential for problems with BWR CRD housing bolting, ComEd revised the procurement standard for CRD cap screws in 1991. The procurement standard requires shot peening of the head-to-shank radius and a wet fluorescent magnetic particle examination in accordance with ASME Section III, Paragraph NB-2545 with acceptance criteria of NB-2583 of the 1989 Edition of ASME Code Section III. In addition, as CRD assemblies are removed for maintenance, all of the removed cap screws are replaced with brand new cap screws. The removed cap screws are given a VT-1 examination and then discarded. If existing cap screws are to be reinstalled, they must first be cleaned and given a VT-1 examination. Due to the excessive cost associated with cleaning and examining reused cap screws, DNPS has elected to continue the practice of replacement of the existing cap screws with brand new cap screws."

3.2.5 Staff Evaluation and Conclusion

The ASME Code requires a VT-1 visual examination of control rod drive bolting, studs, and nuts when the CRD housing is disassembled for maintenance. However, the licensee stated that performing examinations on bolting that will be replaced is costly and it exposes plant personnel to unnecessary radiation exposure.

The licensee proposes as an alternative to the existing Section XI requirements, Dresden Station will adopt the provisions of Code Case N-547 and discontinue performing VT-1 examinations of CRD housing bolting for cap screws that are not going to be reused. As an additional provision, DNPS will continue to procure new cap screws that have received a surface examination that meets the acceptance criteria of the 1989 Edition of ASME Section III, Paragraph NB-2545 from the supplier or original equipment manufacturer. Whenever a CRD is removed for maintenance, the existing cap screws shall be replaced with brand new cap screws and the existing cap screws discarded. If removed CRD cap screws are to be reused, they shall first be cleaned and given a VT-1 examination in accordance with IWB-2500-1 along with the acceptance criteria in IWB-3517.

The staff finds that performing the required VT-1 examinations on cap screws that are going to be discarded is unnecessary. Replacing the used cap screws with new cap screws that meet the Code acceptance criteria provides an acceptable level of quality and safety. In addition, if the licensee does intend to reuse any existing cap screws, the licensee will perform the required VT-1 examination and will determine if they are acceptable for continued operation prior to reusing any existing cap screws. Therefore, the licensee's proposed alternative is authorized in accordance with 10 CFR 50.55a(a)(3)(i).

## 4.0 CONCLUSION

The staff has reviewed the licensee's submittal and determined that the proposed alternatives contained in Relief Request CR-13 and Relief Request CR-20 provide an acceptable level of quality and safety. Therefore, the licensee's proposed alternatives are authorized in accordance with 10 CFR 50.55a(a)(3)(i) for the licensee's third ISI interval for Dresden Nuclear Power Station, Units 2 and 3.

Principal Contributor: A. Keim, EMCB

Date: September 13, 2001