

September 22, 2006

Mr. Christopher M. Crane, President  
and Chief Nuclear Officer  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: BYRON STATION, UNIT NOS. 1 AND 2, AND BRAIDWOOD STATION,  
UNIT NOS. 1 AND 2 - ENVIRONMENTAL ASSESSMENT AND FINDING OF  
NO SIGNIFICANT IMPACT RELATED TO EXEMPTION FROM  
REQUIREMENTS OF 10 CFR 50.60(a) AND 10 CFR PART 50, APPENDIX G  
(TAC NOS. MC8697, MC8698, MC8699, AND MC8700)

Dear Mr. Crane:

Enclosed is a copy of the Environmental Assessment and Finding of No Significant Impact related to your application for exemption dated October 3, 2005. The proposed exemption would allow the use of WCAP-16143, "Reactor Vessel Closure Head /Vessel Flange Requirements Evaluation for Byron/Braidwood Units 1 and 2," dated November 2003 in calculating the reactor pressure vessel pressure-temperature limits for Byron Station, Unit Nos. 1 and 2, and Braidwood Station, Unit Nos. 1 and 2, in lieu of Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Appendix G, "Fracture Toughness Requirements," paragraph IV.A.2.c as required by 10 CFR 50.60(a).

The assessment is being forwarded to the Office of the Federal Register for publication.

Sincerely,

**/RA/**

Robert F. Kuntz, Project Manager  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-454, 50-455, 50-456, and 50-457

Enclosure:  
Environmental Assessment

cc w/encl: See next page

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Docket Nos. 50-454, 50-455, 50-456, and 50-457

Enclosure:

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## Byron/Braidwood Stations

cc:

Dwain W. Alexander, Project Manager  
Westinghouse Electric Corporation  
Energy Systems Business Unit  
Post Office Box 355  
Pittsburgh, PA 15230-0355

Howard A. Learner  
Environmental Law and Policy  
Center of the Midwest  
35 East Wacker Dr., Suite 1300  
Chicago, IL 60601-2110

U.S. Nuclear Regulatory Commission  
Byron Resident Inspectors Office  
4448 N. German Church Road  
Byron, IL 61010-9750

Regional Administrator, Region III  
U.S. Nuclear Regulatory Commission  
Suite 210  
2443 Warrenville Road  
Lisle, IL 60532-4351

Ms. Lorraine Creek  
RR 1, Box 182  
Manteno, IL 60950

Chairman, Ogle County Board  
Post Office Box 357  
Oregon, IL 61061

Mrs. Phillip B. Johnson  
1907 Stratford Lane  
Rockford, IL 61107

Attorney General  
500 S. Second Street  
Springfield, IL 62701

Illinois Emergency Management  
Agency  
Division of Disaster Assistance &  
Preparedness  
110 East Adams Street  
Springfield, IL 62701-1109

Plant Manager - Byron Station  
Exelon Generation Company, LLC  
4450 N. German Church Road  
Byron, IL 61010-9794

Site Vice President - Byron  
Exelon Generation Company, LLC  
4450 N. German Church Road  
Byron, IL 61010-9794

U.S. Nuclear Regulatory Commission  
Braidwood Resident Inspectors Office  
35100 S. Rt. 53, Suite 79  
Braceville, IL 60407

County Executive  
Will County Office Building  
302 N. Chicago Street  
Joliet, IL 60432

Plant Manager - Braidwood Station  
Exelon Generation Company, LLC  
35100 S. Rt. 53, Suite 84  
Braceville, IL 60407-9619

Ms. Bridget Little Rorem  
Appleseed Coordinator  
117 N. Linden Street  
Essex, IL 60935

Document Control Desk - Licensing  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

Site Vice President - Braidwood  
Exelon Generation Company, LLC  
35100 S. Rt. 53, Suite 84  
Braceville, IL 60407-9619

Senior Vice President - Operations Support  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

Director - Licensing and Regulatory  
Affairs  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

Senior Vice President - Midwest Operations  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

Manager Regulatory Assurance - Braidwood  
Exelon Generation Company, LLC  
35100 S. Rt. 53, Suite 84  
Braceville, IL 60407-9619

Manager Regulatory Assurance - Byron  
Exelon Generation Company, LLC  
4450 N. German Church Road  
Byron, IL 61010-9794

Assistant General Counsel  
Exelon Generation Company, LLC  
200 Exelon Way  
Kennett Square, PA 19348

Vice President - Regulatory & Legal Affairs  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

Manager Licensing - Braidwood/Byron  
Exelon Generation Company, LLC  
4300 Winfield Road  
Warrenville, IL 60555

UNITED STATES NUCLEAR REGULATORY COMMISSION

EXELON GENERATION COMPANY, LLC

DOCKET NOS. STN 50-454, STN 50-455, STN 50-456 AND STN 50-457

BYRON STATION, UNIT NOS. 1 AND 2

BRAIDWOOD STATION, UNIT NOS. 1 AND 2

ENVIRONMENTAL ASSESSMENT AND FINDING OF

NO SIGNIFICANT IMPACT

The U.S. Nuclear Regulatory Commission (NRC) is considering issuance of an exemption from the requirements of Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.60(a), for Facility Operating License Nos. NPF-37, NPF-66, NPF-72 and NPF-77, issued to Exelon Generation Company, LLC (the licensee), for operation of the Byron Station, Unit Nos. 1 and 2 (Byron), and Braidwood Station, Unit Nos. 1 and 2 (Braidwood), located in Ogle County, Illinois and Will County, Illinois, respectively. Therefore, as required by 10 CFR 51.21, the NRC is issuing this environmental assessment and finding of no significant impact.

ENVIRONMENTAL ASSESSMENT

Identification of the Proposed Action:

The proposed action would allow the use of the methods described in Westinghouse Commercial Atomic Power Report (WCAP)-16143, "Reactor Vessel Closure Head/Vessel Flange Requirements Evaluation for Byron/Braidwood Units 1 and 2," dated November 2003, in calculating the reactor pressure vessel (RPV) pressure-temperature (P-T) limits for Byron and Braidwood, in lieu of 10 CFR Part 50, Appendix G, "Fracture Toughness Requirements," paragraph IV.A.2.c as required by 10 CFR 50.60(a).

The proposed action is in accordance with the licensee's application for exemption dated October 3, 2005.

The Need for the Proposed Action:

The proposed action is needed because utilization of WCAP-16143 will enhance overall plant safety by widening the P-T operating window, especially in the region of low temperature operations. The primary two safety benefits that would be realized are the following: (1) a reduction in the potential challenges to the low-temperature overpressure protection system and resultant inadvertent opening of a power operated relief valve, and (2) a reduction in the risk of damaging the reactor coolant pump seals due to pump operation under conditions in which it is difficult to maintain adequate seal differential pressure to ensure proper pump operation.

Appendix G to 10 CFR Part 50 contains requirements for P-T limits for the primary system and requirements for metal temperature of the closure head flange and vessel flange regions. The P-T limits are to be determined using the methodology of American Society of Mechanical Engineers *Boiler and Pressure Vessel Code* (ASME Code), Section XI, Appendix G, but the flange temperature requirements are specified in 10 CFR Part 50, Appendix G. This regulation (Table 1 of 10 CFR Part 50, Appendix G) states that the metal temperature at the closure flange regions must exceed the material unirradiated nil-ductility transition reference temperature ( $RT_{NDT}$ ) by at least 120 °F for normal operation when the pressure exceeds 20 percent of the pre-service hydrostatic test pressure.

This requirement was originally based on concerns about the fracture margin in the closure flange region. During the boltup process, outside surface stresses in this region typically reach over 70 percent of the steady state stress, without being at steady state temperature. The margin of 120 °F and the pressure limitation of 20 percent of hydrostatic pressure were developed in the mid-1970s using the ASME Code lower bound crack

arrest/dynamic test fracture toughness ( $K_{Ia}$ ) to ensure that appropriate margins would be maintained.

Improved knowledge of fracture toughness and other issues that affect the integrity of the reactor vessel have led to the recent change to allow the use of the ASME Code lower bound static crack initiation fracture toughness ( $K_{Ic}$ ) in the development of P-T curves, as contained in ASME Code Case N-640, "Alternative Reference Fracture Toughness for Development of P-T Limit Curves for Section XI, Division 1." ASME Code Case N-640 has been approved for use without conditions by the NRC staff in Regulatory Guide 1.147, "Inservice Inspection Code Case Acceptability, ASME Section XI, Division 1," published in August 2005.

However, P-T limit curves can still produce operational constraints by limiting the operational range available to the operator during heatup and cooldown of the plant, especially when considering requirements in the closure head flange and the vessel flange regions. Implementing the P-T curves that use  $K_{Ic}$  material fracture toughness without exempting the flange requirement of 10 CFR Part 50, Appendix G, would place a restricted operating window in the temperature range associated with the closure head flange and reactor vessel flange, without a commensurate increase in plant safety.

#### Environmental Impacts of the Proposed Action:

The NRC has completed its evaluation of the proposed action and concludes that the more conservative minimum temperature requirements related to footnote (2) to Table 1 of 10 CFR Part 50, Appendix G are not necessary to meet the underlying intent of 10 CFR Part 50 Appendix G, to protect the Byron and Braidwood RPVs from brittle fracture during normal operation under both core critical and core non-critical conditions and RPV hydrostatic and leak test conditions.

The details of the NRC staff's safety evaluation will be provided in the exemption that will be issued as part of the letter to the licensee approving the exemption to the regulation.

The proposed action will not significantly increase the probability or consequences of accidents. No changes are being made in the types of effluents that may be released off site. There is no significant increase in the amount of any effluent released off site. There is no significant increase in occupational or public radiation exposure. Therefore, there are no significant radiological environmental impacts associated with the proposed action.

With regard to potential non-radiological impacts, the proposed action does not have a potential to affect any historic sites. It does not affect non-radiological plant effluents and has no other environmental impact. Therefore, there are no significant non-radiological environmental impacts associated with the proposed action.

Accordingly, the NRC concludes that there are no significant environmental impacts associated with the proposed action.

#### Environmental Impacts of the Alternatives to the Proposed Action:

As an alternative to the proposed action, the NRC staff considered denial of the proposed action (i.e., the "no-action" alternative). Denial of the application would result in no change in current environmental impacts. The environmental impacts of the proposed action and the alternative action are similar.

#### Alternative Use of Resources:

The action does not involve the use of any different resources than those previously considered in the Final Environmental Statement for the Byron and Braidwood stations, NUREG-0848 dated April 1982, and NUREG-1026 dated June 1984, respectively.

#### Agencies and Persons Consulted:

In accordance with its stated policy, on June 19, 2006, the NRC staff consulted with the Illinois State official, Mr. Frank Niziolek of the Illinois Emergency Management Agency,



regarding the environmental impact of the proposed action. The State official had no comments.

#### FINDING OF NO SIGNIFICANT IMPACT

On the basis of the environmental assessment, the NRC concludes that the proposed action will not have a significant effect on the quality of the human environment. Accordingly, the NRC has determined not to prepare an environmental impact statement for the proposed action.

For further details with respect to the proposed action, see the licensee's letter dated October 3, 2005. Documents may be examined, and/or copied for a fee, at the NRC's Public Document Room (PDR), located at One White Flint North, Public File Area O1 F21, 11555 Rockville Pike (first floor), Rockville, Maryland. Publicly available records will be accessible electronically from the Agencywide Documents Access and Management System (ADAMS) Public Electronic Reading Room on the Internet at the NRC Web site, <http://www.nrc.gov/reading-rm/adams.html>. Persons who do not have access to ADAMS or who encounter problems in accessing the documents located in ADAMS should contact the NRC PDR Reference staff by telephone at 1-800-397-4209 or 301-415-4737, or send an e-mail to [pdr@nrc.gov](mailto:pdr@nrc.gov).

Dated at Rockville, Maryland, this 22nd day of September 2006.

FOR THE NUCLEAR REGULATORY COMMISSION

**/RA/**

Robert F. Kuntz, Project Manager  
Plant Licensing Branch III-2  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation