January 16, 2007

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 EVALUATION OF INSERVICE INSPECTION PROGRAM RELIEF REQUESTS I3R-07 AND I2R-46 PERTAINING TO ESSENTIAL SERVICE WATER BURIED PIPING (TAC NOS. MD1757, MD1758, MD1759 AND MD1760)

Dear Mr. Crane:

By letter dated April 20, 2006, Exelon Generation Company, LLC (the licensee) submitted a request for relief from the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) Section XI, "Rules for Inservice Inspection [ISI] of Nuclear Power Plant Component," 2001 Edition through 2003 Addenda, for Byron Station, Unit Nos. 1 and 2 (Byron) for the third 10-year interval, and the 1989 Edition for Braidwood Station, Unit Nos. 1 and 2 (Braidwood) for the second 10-year interval. The licensee requested relief from the pressure testing requirements for the buried piping portions of the essential service water system.

The Nuclear Regulatory Commission staff concludes that the licensee's proposed alternative to test the buried portion of service water piping in conjunction with quarterly testing of service water pumps would detect significant through-wall leakage if present in the subject line and would provide reasonable assurance of structural integrity. Therefore, pursuant to Title 10 of the *Code of Federal Regulations* (CFR) Section 50.55a(a)(3)(ii) (10 CFR 50.55a(a)(3)(ii)), relief requests I3R-07 for Byron, and I2R-46 for Braidwood, are authorized on the basis that compliance with the ISI code of record would result in hardship or unusual difficulty without a

compensating increase in the level of quality and safety. The relief request is authorized for the third 10-year interval for Byron, and the second 10-year interval for Braidwood.

Sincerely,

/RA/
Michael L. Marshall, Jr., Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

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

Enclosure:
Safety Evaluation

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED RELIEF TO REQUEST I3R-07 AND I2R-46

PERTAINING TO ESSENTIAL SERVICE WATER

EXELON GENERATION COMPANY, LLC

BYRON STATION, UNIT NOS. 1 AND 2

BRAIDWOOD STATION, UNIT NOS. 1 AND 2

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

1.0 INTRODUCTION

By letter dated April 20, 2006, Exelon Generation Company, LLC (Exelon, the licensee), submitted relief request I3R-07 and I2R-46, related to the inservice inspection (ISI) program pertaining to system leakage tests during the third 10-year interval for the Byron Station, Unit Nos. 1 and 2 (Byron) and the second 10-year interval for the Braidwood Station, Unit Nos. 1 and 2 (Braidwood), respectively. In relief requests I3R-07 and I2R-46, the licensee requested relief from performing the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code) required pressure test of the buried portion of the essential service water (ESW) piping by measuring the rate of pressure loss or change in flow between the ends of the buried components. As an alternative, the licensee proposed a test that would confirm that flow during operation is not impaired. The integrity of the buried piping will be verified during quarterly pump testing under the inservice testing program for pumps and valves.

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(g) requires that ISI of ASME Code Class 1, 2, and 3 components be performed in accordance with Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Components," of the ASME Code and applicable addenda, except where specific written relief has been granted by the Nuclear Regulatory Commission (NRC, the Commission) pursuant to 10 CFR 50.55a(g)(6)(i). According to 10 CFR 50.55a(a)(3), alternatives to the requirements of paragraph 50.55a(g) may be used, when authorized by the NRC, if an applicant demonstrates that: (i) the proposed alternatives would provide an acceptable level of quality and safety or (ii) 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 to the extent practical within the limitations of design, geometry, and materials of construction of the components.

10 CFR 50.55a(a)(g)(4) requires that ISI 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) 12 months prior to the start of the 120-month interval, subject to the limitations and modifications listed therein. The ASME Code of record for the third 10-year interval at Byron is the 2001 Edition through the 2003 Addenda. The ASME Code of record for the second 10-year inspection interval at Braidwood is the 1989 Edition.

3.0 TECHNICAL EVALUATION

3.1 System/Component(s) for Which Relief is Requested

Buried Class 3 components in the ESW supply and return lines.

3.2 ASME Code Requirements

The 2001 Edition through the 2003 Addenda of ASME Code, the code of record for Byron, Section XI, Table IWD-2500-1, Examination Category D-B, Item No. D2.10 requires a system leakage test and a VT-2 visual examination. For buried components where a VT-2 visual examination cannot be performed, the examination requirement of item D2.10 is satisfied by the following:

> The system pressure test for buried components that are isolable by means of valves shall consist of a test that determines the rate of pressure loss. Alternatively, the test may determine the change in flow between the ends of the buried components. The acceptable rate of pressure loss or flow shall be established by the Owner.

The 1989 Edition of ASME Code, the code of record for Braidwood, Section XI, Table IWD-2500-1, Examination Category D-B, Item No. D2.10 requires a system pressure test and a VT-2 visual examination. Subsection IWA-5244(a) requires that nonredundant/isolable buried components that are isolable by means of valves be tested to determine the rate of pressure loss. Alternatively, the test may determine the change in flow between the ends of the buried components. However, the 1989 edition of the ASME Code has no provision for the pressure testing of redundant/isolable buried components such as those used at Braidwood. Therefore, the test requirement of Subsection IWA-5244(a) was applied.

3.3 Licensee's Request for Relief

Relief is requested from performing the system pressure test or the system leakage test for buried portions of the ESW piping that are isolable by means of valves. The proposed alternative would determine the rate of pressure loss or the change in flow between the ends of buried components.

3.3.1 Licensee's Basis for Requesting Relief

The ESW buried piping at Braidwood consists of six 30 inch (") diameter common supply headers that feed into two 48" diameter supply headers, including the suction piping that runs between the lake screen house and the turbine building. The buried return lines are two 48"

diameter return headers and piping that runs between the turbine building and the ESW cooling pond. At Byron, the ESW buried piping consists of two 48" common supply headers and two 48" return headers located between the ESW cooling towers and the auxiliary building. The remaining buried piping consists of two 36" pump supply lines in each unit and four 24" risers and two 24" hot water bypass lines that branch out from each 48" return header. There is no access to the buried sections of piping without excavation. Further, no annuluses were provided during original construction, which would allow for examination of these buried sections of piping.

The supply and return lines use butterfly valves for isolation. These valves are not suitable for performing a pressure isolation function since they were not designed to be leak tight. Extensive maintenance or system modification would be necessary to conduct a rate-of-pressure-loss test. The alternative test would be to determine the change in flow between the ends of buried components. However, the buried ESW supply and return headers were not designed with plant instrumentation and flow orifices on both sides of the buried sections of piping to determine the rates. Further, sufficient length of accessible straight pipe is not available to use an ultrasonic flow measuring device. Therefore, the configuration of the buried ESW system does not permit a determination of the change in flow between the ends of the buried components.

3.3.2 Licensee's Proposed Alternative

In lieu of performing a system pressure test in accordance with the requirements of the IWA-5244(b)(1) for Byron, and of the IWA-5244(a) for Braidwood, Exelon proposed as an alternative to use the provisions of IWA-5244(c) and IWA-5244(b)(2) of the 1989 Edition and the 2001 Edition through the 2003 Addenda of the ASME Section XI Code, respectively, to confirm that flow during operation is not impaired in non-isolable buried piping. The unimpaired flow in the buried piping will be verified during quarterly ESW pump testing. Byron and Braidwood will use the Owner-established minimum flow rate specified in the site inservice testing (IST) surveillance, 23,520 and 24,000 gallons per minute, respectively, for all ESW pumps as the acceptance criteria for IWA-5244 pressure testing of ESW buried piping. If, during an IST surveillance, the minimum flow could not be achieved and the cause of the deviation is not attributed to the test instruments being used, the pump would be declared inoperable and an issue report would be generated in accordance with the Exelon corrective action program as required by the existing IST surveillance. Further corrective actions (e.g., maintenance on the pump and system walk-downs) would be initiated as necessary to restore the pump and/or the system to an operable status. In addition, Exelon would monitor pressure drop across each pump at the reference flow rate to assess any leakage through the buried piping, assuming no degradation of the pump.

3.4 NRC Staff Evaluation

The ASME Code of record requires a system pressure test for the buried portion of ESW piping to determine either a rate of pressure loss or a change in flow at the ends of the buried piping. The buried service water piping at Byron and Braidwood uses butterfly valves at the ends that were not designed for pressure isolation, and therefore, are unsuitable for determining a meaningful rate of pressure loss. Similarly, change in flow cannot be determined both because of the limitations of the current system configuration and because one end of the buried piping

is not instrumented for flow measurement. Consequently, the ASME Code-required tests cannot be performed without significant system modification, including excavation. For nonisolable buried components ASME Code compliance can be accomplished by confirming that flow during operation is not impaired. The NRC staff finds the licensee's approach, by which unimpaired flow in the buried piping can be qualitatively assessed during quarterly IST surveillance of the ESW pumps, to be acceptable. By using the flow instrument downstream from the pump discharge, a reference flow rate can be established that would correspond to a target pump head. A decrease in pump head may indicate increase in flow due to any through-wall leakage in the buried piping. An assessment can be made of the integrity of the buried piping, from the trending of head loss (pressure drop) during a pump test at the reference flow. However, pump head loss may also be caused by the deterioration of the pump rather than the leakage in the buried pipe. As the pump deteriorates, the developed head decreases at the reference flow. Therefore, the licensee has stated that if during an IST surveillance, the minimum flow could not be achieved and the cause of the deviation could not be attributed to the test instruments being used, the pump would be declared inoperable and an Issue Report would be generated in accordance with the Exelon corrective action program as required by the existing IST surveillance. Further corrective actions (e.g., maintenance on the pump and system walk-downs) would be initiated as necessary to restore the pump and/or the system to an operable status.

Based on its independent review, the NRC staff has determined that the licensee's proposed alternative to test the buried portion of service water piping in conjunction with quarterly testing of service water pumps would detect significant through-wall leakage if present in the subject line and would provide reasonable assurance of structural integrity. In light of this proposed alternative, and because performance of the ASME Code-required tests would require installation of an additional flow measuring device at the inlet end of the buried piping, compliance with the ASME Code requirement would result in hardship without a compensating increase in the level of quality and safety.

4.0 CONCLUSION

The NRC staff concludes that for the buried portion of service water piping, compliance with the ASME Code requirement to perform a test that determines the rate of pressure loss or the change in flow would result in hardship to the licensee without a compensating increase in the level of quality and safety. By providing for detection of any degradation in the buried portion of service water piping, the licensee's proposed alternative provides reasonable assurance of structural integrity. Therefore, pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee's proposed alternative in relief requests I3R-07 and I2R-46 is authorized for the third 10-year ISI interval for Byron and the second 10-year ISI interval for Braidwood. All other requirements of the ASME Code, Section XI for which relief has not been specifically requested remain applicable, including a third party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: P. Patnaik

Date: January 16, 2007