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

April 18, 2013

Mr. Michael Pacilio
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Office
Exelon Nuclear
4300 Winfield Road
Warrenville, Illinois 60555

SUBJECT: CLINTON POWER STATION, UNIT NO. 1, RELIEF REQUEST I3R-09 ALTERNATIVE TO VT-2 VISUAL EXAMINATION OF COMBUSTIBLE GAS CONTROL SYSTEM PIPING (TAC NO. ME9428)

Dear Mr. Pacilio:

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated August 23, 2013, as supplemented by letter dated February 8, 2013, Exelon Generation Company, LLC, (the licensee), submitted relief request I3R-09 proposing an alternative to the American Society of Mechanical Engineers Boiler and Pressure Vessel Code, Section XI, Paragraph IWC-5220, system leakage test VT-2 visual examination requirements for the Clinton Power Station (CPS), Unit No. 1. Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii), the licensee requested to use an alternative to the visual examination on the basis that complying with the specified requirement would result in hardship or unusual difficulty.

The NRC staff has reviewed the subject request and concludes, as set forth in the enclosed safety evaluation, that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii) and therefore authorizes use of the proposed alternative at CPS, Unit No. 1, for the duration of the third 10-year inservice inspection interval, which is currently scheduled to end on June 30, 2020.

If you have any questions, please contact the Project Manager, Blake Purnell at 301-415-1380 or via e-mail at blake.purnell@nrc.gov.

Sincerely,

Jeremy S. Bowen, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosure:
Safety Evaluation

cc w/encl: ListServ

UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST NO. I3R-09 REGARDING ALTERNATIVE TO VT-2 VISUAL EXAMINATION

OF COMBUSTIBLE GAS CONTROL SYSTEM PIPING

EXELON GENERATION COMPANY, LLC

CLINTON POWER STATION, UNIT NO. 1

DOCKET NO. 50-461

1.0 INTRODUCTION

By letter to the U.S. Nuclear Regulatory Commission (NRC) dated August 23, 2012, as supplemented by letter dated February 8, 2013 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML12236A405 and ML13039A389, respectively), Exelon Generation Company, LLC, (the licensee), submitted relief request I3R-09, proposing an alternative to the American Society of Mechanical Engineers (ASME) Boiler and Pressure Vessel Code (Code), Section XI, Paragraph IWC-5220, system leakage test VT-2 visual examination requirements. Specifically, the licensee proposes to perform local leak rate testing of the combustible gas control (HG) system piping at Clinton Power Station (CPS), Unit No. 1, instead of the VT-2 visual examination required by Table IWC-2500-1, Examination Category C-H. The licensee requested authorization to use the proposed alternative pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(ii) on the basis that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

2.0 REGULATORY EVALUATION

Paragraph (g)(4) of 10 CFR 50.55a, "Codes and Standards," states that 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 [ISI] 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 inspection interval and subsequent 10-year inspection 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), "Standards Approved for Incorporation by Reference," 12 months prior to the start of the 10-year ISI interval, subject to the limitations and modifications listed therein.

Enclosure

Paragraph (a)(3) of 10 CFR 50.55a states, in part, that alternatives to the requirements of 10 CFR 50.55a(g), "Inservice Inspection Requirements," 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.

Based on review of the regulatory requirements, the staff finds that the NRC has the regulatory authority to authorize the licensee's proposed alternative on the basis that compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the staff has reviewed and evaluated the licensee's request pursuant to 10 CFR 50.55a(a)(3)(ii).

3.0 TECHNICAL EVALUATION

3.1 Licensee's Request for Alternative

The CPS code of record for the third 10-year ISI interval, which is currently scheduled to end on June 30, 2020, is the ASME Code, Section XI, 2004 Edition, with no addenda. ASME Code, Section XI, Paragraph IWC-2500, Table IWC-2500-1, Examination Category C-H, Item No. C7.10, requires that all pressure retaining components are subject to a system leakage test in accordance with IWC-5220 with a VT-2 visual examination once each inspection period. The system leakage test is performed at the pressure obtained while the subject portion of the system is performing its normal operating function or during a comparable test. In accordance with IWC-5222(a), the pressure retaining boundary includes the portion of the system required to operate or support the safety function up to and including the first normally closed valve.

The licensee stated that performing the system leakage test on the CPS hydrogen recombiners 0HG01SA and 0HG01SB, and associated piping and valves,[1] would result in hardship or unusual difficulty without a compensating increase in the level of quality or safety. The licensee's justification for this determination is as follows:

> Performance of the Code prescribed VT-2 visual examination of this piping would require applying a leak detection solution to the safety-related piping and components to locate evidence of leakage. Performing this examination would pose significant safety hazards, as most of this piping requires working at heights. Either a ladder, hi jacker, or scaffold

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[1] Hydrogen recombiner 0HG01SA
Associated lines: 1HG01A-2 inch, 1HG07A-¾ inch, 1HG01B-2½ inch, 1HG11A-¾ inch, 0HG03A-2 inch, 0HG03B-2 inch, 0HG04A-2 inch, 0HG04B-2 inch, 0HG02A-2½ inch, 1HG12A-¾ inch, 1HG02B-2 inch, and 1HG08A-¾ inch.
Associated valves: 1HG012-2 inch, 1HG016-¾ inch, 1HG001-2 inch, 1HG020-¾ inch, 1HG002-2 inch, 2HG002-2 inch, 2HG003-2 inch, 1HG003-2 inch, 1HG021-¾ inch, 1HG004-2 inch, 1HG017-¾ inch, and 1HG013-2 inch.

Hydrogen recombiner 0HG01SB
Associated lines: 1HG03A-2 inch, 1HG09A-¾ inch, 1HG03B-3 inch, 0HG01B-2 inch, 0HG01A-2 inch, 0HG02A-2 inch, 0HG02B-2 inch, 1HG04A-2½ inch, 1HG04B-2 inch, and 1HG010A-¾ inch.
Associated valves: 1HG014-2 inch, 1HG018-¾ inch, 1HG005-2 inch, 1HG006-2 inch, 2HG006-2 inch, 2HG007-2 inch, 1HG007-2 inch, 1HG008-2 inch, 1HG019-¾ inch, and 1HG015-2 inch.

> will be needed to reach this piping, and all piping is insulated. Based upon field walkdowns, the piping associated with Hydrogen Recombiner 0HG01SA is conservatively estimated at 550 linear feet and the piping associated with Hydrogen Recombiner 0HG01SB is conservatively estimated at 1050 feet in length.
>
> Examining the piping associated with 0HG01SB will also result in an estimated radiation exposure of 150 to 200 mrem. Performing this VT-2 examination would not be with As Low As Reasonably Achievable (ALARA) radiation exposure practices.

As an alternative to the examination requirements of Table IWC-2500-1, the licensee stated it will perform leak rate tests on the ISI Class 2 HG system piping associated with these hydrogen recombiners[1] in accordance with surveillance procedure CPS 9861.02, Datasheet D041, "Local Leak Rate Testing (LLRT) Data Sheet for 1MC071/1MC072 - H2 Recombiner 0HG01SA," and Datasheet D033, "LLRT Data Sheet for 1MC062/1MC166 - Hydrogen Recombiner 0HG01SB."

The licensee described these procedures as follows:

> LLRT procedure CPS 9861.02 Datasheets D033 and D041 determine the leakage rate from the components and piping associated with this relief request as well as leakage through affected boundary valve internals and mechanical connections. These datasheets perform three separate leak rate tests (i.e., Test Sets A, B and C) on each hydrogen recombiner train. The test pressure for each test is maintained between 9.1 psig [pounds per square inch gauge] and 9.9 psig and the elapsed test (i.e., hold) time is a minimum of 15 minutes from stabilization of test pressure. Stabilization can be declared when the measured flow rate is stable for a period of approximately five minutes. According to the piping design tables, the maximum operating pressure of this piping is nine (9) psig and the maximum design pressure is 15 psig. Test Set 'A' tests the piping and components between the HG return header opening inside containment and containment isolation valve 1HG008 or 1HG004. Test Set 'B' tests the piping and components between the HG inlet header opening inside containment and containment isolation valve 1HG005 or 1HG001. Test Set 'C' tests all of the piping and components between the HG inlet header opening inside containment and the HG return header inside containment. Administrative limits have been established for each train to prompt further examinations and/or evaluations. Train 'B' has an administrative limit of 500 standard cubic centimeters per minute (sccm) and Train 'A' has an administrative limit of 1000 sccm. Normal system flow is 50 standard cubic feet per minute (scfm).

3.2 NRC Staff Evaluations

The HG system maintains the hydrogen concentration in the drywell and containment below the ignition level during a loss-of-coolant accident. ASME Code, Section XI, Table IWC-2500-1, Examination Category C-H, requires a VT-2 visual examination of the pressure retaining boundary during a system leakage test in accordance with ASME Code, Section XI, IWC-5220. IWC-5220 specifies that the system leakage test be conducted each inspection period at the system pressure obtained while the system, or portion of the system, is in service performing its normal operating function or at the system pressure developed during a test conducted to verify system operability (e.g., to demonstrate system safety function or satisfy technical specification surveillance requirements). The licensee states that the maximum operating pressure of the

subject piping and components is 9 psig and the maximum design pressure is 15 psig. These values are consistent with Paragraph 6.2.1.1.3.1 of the CPS updated safety analysis report, which states that the containment design pressure is 15 psig and the calculated accident pressure is 6.97 psig, with a short-term pressure peak of 9.22 psig occurring in the wetwell region below the hydraulic control unit floor during pool swell.

As stated above, performance of the Code prescribed VT-2 visual examination of the subject piping and components would require application of a leak detection solution while the subject lines are pressurized to locate evidence of leakage. The licensee states that performance of the VT-2 visual examination of the subject piping would pose significant safety hazards as examination of most of this piping would require working at heights, with a combined estimate of 1600 linear feet of associated piping for hydrogen recombiners 0HG01SA and 0HG01SB. In addition, the licensee stated that examination of the piping associated with hydrogen recombiner 0HG01SB would result in an estimated radiation exposure of 150 to 200 mrem; contrary to ALARA radiation exposure practices. The NRC staff finds that erecting the scaffolding to perform a VT-2 visual examination of the subject HG system piping and the safety hazards associated with working on scaffolding at heights would present a hardship. In addition, the NRC staff finds the ALARA considerations contribute to the hardship.

In its supplemental response, the licensee stated that the proposed administrative limits for Train A and B for the local leak rate testing are based on engineering judgment. The licensee further stated: "these limits are considered appropriate screening criteria to initiate more detailed evaluations and/or troubleshooting, to identify potential through-wall leakage and to prevent the secondary containment bypass limit (i.e., 28,882 sccm) from being challenged." In addition, the licensee provided a copy of surveillance procedure CPS 9861.02, and a list of the troubleshooting actions to be taken to ensure that any source of leakage is correctly identified and dispositioned. Surveillance procedure CPS 9861.02 defines the pressure stability limits during the test as 9.1 psig and 9.9 psig, the accuracy of the pressure measuring instrumentation as ±0.15 psig, and the accuracy of the flow measuring instrumentation as ±2 percent of full scale.

The NRC staff has reviewed the steps in the surveillance procedure and the trouble shooting actions and finds that they are adequate to (1) detect leakage in the subject HG system piping, and (2) separate gasket and motor-operated containment isolation valve seat leakage from through-wall pressure boundary leakage. Therefore, the staff finds that the procedures in the proposed alternative are acceptable since they will effectively identify through-wall pressure boundary leakage. If through-wall pressure boundary leakage above the administrative limit is identified, the licensee will perform a VT-2 visual examination with a leak detection fluid on the entire piping run. The NRC staff finds this is acceptable because it would meet the requirements within the ASME Code section.

In its supplemental response, the licensee stated it reviewed the results from the 62 previous tests performed and found that four results were obtained that were above the current administrative limits of 1000 sccm for Train 'A' and 500 sccm for Train 'B':

- 1080 sccm on train 'B', test set B in 1998
- 1080 sccm on train 'B', test set B in 1999

- 552 sccm on train 'B', test set C in 1997
- 1250 sccm on train 'A', test set A in 1991

The licensee concluded that no degradation trend is identified from test results.

The licensee states that the piping is seamless carbon steel, American Society for Testing Materials A106, grade B, or ASME SA-106, grade B, and the 2-inch and smaller diameter piping is schedule 80 thickness and the 2 ½-inch diameter piping is schedule 40 thickness. The NRC staff finds that the operational pressures are not expected to challenge the structural integrity of the subject piping and components, and there is not a trend over the 62 previous measurements that would indicate degradation. Therefore, the NRC staff finds that there is reasonable assurance of structural integrity of the subject components and use of the alternative will continue to provide this assurance.

4.0 CONCLUSION

As set forth above, the NRC staff determines that the licensee's proposed alternative (I3R-09) to performing a VT-2 visual examination of the HG system piping, valves, and components specified in its submittal provides reasonable assurance of structural integrity and leak tightness of these items. In addition, the NRC staff finds that complying with the specified requirement would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii). Therefore, the NRC staff authorizes use of the proposed alternative at CPS for the duration of the third 10-year ISI interval, which is currently scheduled to end on June 30, 2020.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and approved, remain applicable, including a third-party review by the Authorized Nuclear Inservice Inspector.

Principal Contributor: Jay Wallace, NRR/DE/EPNB

Date of issuance: April 18, 2013

If you have any questions, please contact the Project Manager, Blake Purnell at 301-415-1380 or via e-mail at blake.purnell@nrc.gov.

Sincerely,

/ ***RA*** /

Jeremy S. Bowen, Chief
Plant Licensing Branch III-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosure:
Safety Evaluation

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