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

October 27, 2015

Mr. Bryan C. Hanson
Senior Vice President
Exelon Generation Company, LLC
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3 – RELIEF REQUEST TO USE AN ALTERNATIVE FROM THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS CODE REQUIREMENTS (CAC NOS. MF5089 AND MF5090)

Dear Mr. Hanson:

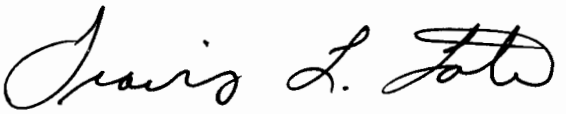
By letter dated October 7, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14281A059), Exelon Generating Company, LLC (EGC, the licensee) submitted a request to the U.S. Nuclear Regulatory Commission (NRC) for the use of an alternative to certain American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code) requirements for the fifth 10-year inservice testing interval at Dresden Nuclear Power Station (DNPS), Units 2 and 3.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(a)(3)(i) (retitled paragraph 50.55a(z)(1) by 79 FR 65776, dated November 5, 2014), EGC requested to use the proposed alternative on the basis that the alternative provides an acceptable level of quality and safety.

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(z)(1).

If you have any questions, please contact the NRC project manager, Eva Brown at (301) 415-2315 or via email at Eva.Brown@nrc.gov.

Sincerely,



Travis L. Tate, Chief
Plant Licensing III-2 and
Planning and Analysis Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-237 and 50-249

Enclosure:
Safety Evaluation

cc w/encl: Distribution via Listserv

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# SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

# RELIEF REQUEST RV-03

# REGARDING THE INSERVICE TESTING PROGRAM FIFTH 10-YEAR INTERVAL

# EXELON GENERATION COMPANY, LLC

# DRESDEN NUCLEAR POWER STATION, UNITS, 2 AND 3

# DOCKET NOS. 50-237 AND 50-249

## 1.0 INTRODUCTION

By letter dated October 7, 2014 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML14281A059), Exelon Generation Company, LLC (EGC, the licensee) requested relief from the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), 2004 Edition through 2006 Addenda, ISTC-3630, "Leakage Rate for Other Than Containment Isolation Valves," for the inservice testing (IST) programs at Dresden Nuclear Power Station (DNPS), Units 2 and 3. The proposed alternative is associated with the fifth 10-year IST program interval, which began on November 1, 2013, and is scheduled to end on October 31, 2023.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.55a(a)(3)(i) (retitled paragraph 50.55a(z)(1) by 79 FR 65776, dated November 5, 2014), EGC requested to use the proposed alternative on the basis that the alternative provides an acceptable level of quality and safety.

## 2.0 REGULATORY EVALUATION

Section 50.55a(f) of 10 CFR "Inservice Testing Requirements," requires, in part, that ISTs of certain ASME Code Class 1, 2, and 3 components must meet the requirements of the ASME OM Code and applicable addenda, except where alternatives have been authorized pursuant to paragraphs 10 CFR 50.55a(z)(1) or 10 CFR 50.55a(z)(2).

In proposing alternatives, a licensee must demonstrate that the alternatives provide an acceptable level of quality and safety in accordance with 10 CFR 50.55a(z)(1), or that compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety in accordance with 10 CFR 50.55a(z)(2).

ASME OM Code, ISTC-3630, "Leakage Rate for Other Than Containment Isolation Valve," states that "Category A valves with a leakage requirement not based on an owner's 10 CFR 50, Appendix J, program shall be tested to verify the seat leakages are within acceptable limits.

Valve closure before seat leakage testing shall be by using the valve operator with no additional closing force applied."

ASME OM Code, ISTC-3630(a), "Frequency," states that "Tests shall be conducted at least once every 2 years."

Based on the above, and subject to the following technical evaluation, the U.S. Nuclear Regulatory Commission (NRC) staff finds that regulatory authority exists for the licensee to request, and the Commission to authorize, the alternative requested by the licensee.

## 3.0 TECHNICAL EVALUATION

### 3.1 Licensee's Proposed Alternative

The licensee proposes to perform pressure isolation valve (PIV) testing at intervals ranging from every refueling outage to every third refueling outage. The specific interval for each valve would be a function of its performance and would be established in a manner consistent with the containment isolation valve (CIV) process under 10 CFR 50, Appendix J, Option B. A conservative control will be established such that if any valve fails either PIV test, the test interval for both tests will be reduced consistent with Appendix J, Option B, requirement until good performance is reestablished. The proposed alternative will apply to the remainder of the fifth 10-year IST interval at DNPS, which is currently scheduled to end on October 31, 2023.

Alternative testing is requested for the following valves associated with the low pressure coolant injection (LPCI) and core spray (CS) systems:

**Table 1**

| Valve ID | System | Category | Class |
|---|---|---|---|
| 2-1501-22A-MO | LPCI | A | 1 |
| 3-1501-22A-MO | LPCI | A | 1 |
| 2-1501-22B-MO | LPCI | A | 1 |
| 3-1501-22B-MO | LPCI | A | 1 |
| 2-1501-25A-MO | LPCI | A/C | 1 |
| 3-1501-25A-MO | LPCI | A/C | 1 |
| 2-1501-25B-MO | LPCI | A/C | 1 |
| 3-1501-25B-MO | LPCI | A/C | 1 |
| 2-1402-9A | CS | A/C | 1 |
| 3-1402-9A | CS | A/C | 1 |
| 2-1402-9B | CS | A/C | 1 |
| 3-1402-9B | CS | A/C | 1 |
| 2-1402-25A-MO | CS | A | 1 |
| 3-1402-25A-MO | CS | A | 1 |
| 2-1402-25B-MO | CS | A | 1 |
| 3-1402-25B-MO | CS | A | 1 |

3.2 Licensee's Basis for Proposed Alternative

Section ISTC-3630 of the ASME OM Code requires that leakage rate testing for PIVs be performed at least once every 2 years. The PIVs are not specifically included in the scope for performance-based testing as provided for in 10 CFR, Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B, "Performance-Based Requirements." The concept behind the Option B alternative for CIVs is that licensees should be allowed to adopt cost-effective methods for complying with regulatory requirements. The PIVs are, in some cases, CIVs but are not part of the Appendix J scope because the LPCI valves are considered water-sealed and the CS system is not exposed to containment atmosphere.

Additionally, Nuclear Energy Institute (NEI) 94-01, "Industry Guideline for Implementing Performance-Based 10 CFR Part 50, Appendix J," describes the risk-informed basis for the extended test intervals under Option B. That justification shows that for CIVs which have demonstrated good performance by passing their leak rate tests for two consecutive cycles, further failures appear to be governed by the random failure rate of the component. NEI 94-01 also presents the results of a comprehensive risk analysis, including the statement that "the risk impact associated with increasing [leak rate] test intervals is negligible (i.e., less than 0.1 percent of total risk)."

The licensee stated that the valves identified in this relief request (RV-03) are all in-water applications. Testing is performed with water pressurized to pressures lower than function maximum pressure differential; however, the observed leakage is adjusted to the function maximum pressure differential value in accordance with ISTC 3630(b)(4). Relief request RV-03 is intended to provide for a performance-based scheduling of PIV tests at DNPS.

NUREG-0933, "Resolution of Generic Safety Issues," Issue 105, "Interfacing Systems LOCA [loss-of-coolant accident] at LWRs [light-water reactors]," discussed the need for PIV leak rate testing based primarily on three pre-1980 historical failures of applicable valves industry-wide. These failures all involved human errors in either operations or maintenance. None of these failures involved inservice equipment degradation. The performance of PIV leak rate testing provides assurance of acceptable seat leakage with the valve in a closed condition. Typical PIV testing does not identify functional problems which may inhibit the valves ability to reposition from open to closed. For check valves, such functional testing is accomplished in accordance with ISTC-3520, "Exercising Requirements," and ISTC-3522, "Category C Check Valves."

Power-operated valves are routinely full-stroke tested in accordance with the ASME OM Code to ensure their functional capabilities. The functional testing of the PIV check valves will be monitored through a condition monitoring plan in accordance with ISTC-5222, "Condition-Monitoring Program," and Mandatory Appendix II, "Check Valve Condition Monitoring Program." Performance of the separate 2-year PIV leak rate testing does not contribute any additional assurance of functional capability; it only determines the seat tightness of the closed valves.

The licensee stated that the primary basis for the request for the proposed alternative is the historically good performance of the PIVs. The licensee provided historical leak rate test data for the LPCI and CS PIVs. None of the data provided showed any seat leakage failures of the PIVs.

The licensee also provided the following additional bases for the proposed alternative:

- Separate functional testing of motor-operated valve PIVs and condition monitoring of check valve PIVs are conducted per the ASME OM Code.
- There is a low likelihood of valve mispositioning during power operations due to procedures and interlocks.
- Relief valves in the low pressure piping may not provide intersystem loss-of-coolant accident (ISLOCA) mitigation for inadvertent PIV mispositioning, but their relief capacity can accommodate conservative PIV seat leakage rates.
- Operators are highly trained to recognize symptoms of a present ISLOCA and take appropriate actions.
- The review of recent historical data identified that PIV testing each refueling outage results in a total personnel dose of approximately 600 mrem assuming all of the PIVs remain classified as good performers. The proposed extended test intervals would provide for a savings of approximately 1.2 rem (roentgen equivalent man) over a 4-1/2 year period.

3.3 NRC Staff Evaluation

The licensee proposed an alternative to the requirements found in ASME OM Code 2004 Edition through 2006 Addenda, Section ISTC-3630(a) for a total of 16 PIVs at DNPS. Specifically, the licensee proposes to functionally test and verify the leakage rate of the 16 PIVs using 10 CFR 50, Appendix J, Option B, performance-based schedule. These valves would initially be tested at the required interval schedule, which is currently every refueling outage or 2 years as specified by ISTC-3630(a). Valves that have demonstrated good performance for two consecutive cycles may have their test interval extended to every third refueling outage. Any PIV leakage test failure would require the component to return to the initial interval of every refueling outage or 2 years until good performance can again be established.

The PIVs are defined as two valves in series within the reactor coolant pressure boundary that separate the high pressure reactor coolant system from an attached lower pressure system. Failure of a PIV could result in an over-pressurization event which could lead to a system rupture and possible release of fission products to the environment. This type of failure event was analyzed in NUREG/CR-5928 "Inter System Loss of Coolant Accident (ISLOCA) Research Program" (ADAMS Accession No. ML072430731). The purpose of NUREG/CR-5928 was to quantify the risk associated with an ISLOCA event. NUREG/CR-5928 analyzed a boiling-water reactor (BWR) and pressurized-water reactor designs. Since DNPS, Units 2 and 3, are BWRs; the conclusion of the analysis resulted in an ISLOCA not being a risk concern for BWR designs.

Appendix J, Option B, of 10 CFR is a performance-based leakage test program. Guidance for implementation of acceptable leakage rate test methods, procedures, and analyses is provided in Regulatory Guide (RG) 1.163, "Performance-Based Containment Leak-Test Program" (ADAMS Accession No. ML003740058). RG 1.163 endorses NEI 94-01, Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR 50, Appendix J," dated July 26, 1995, with the limitation that Type C component test intervals cannot extend greater than 60 months. The current version of NEI 94-01 is Revision 3-A, which allows Type C CIV test intervals to be extended to 75 months with a permissible extension for non-routine

emergent conditions of nine months (84 months total). The NRC staff finds the guidance in NEI 94-01 Revision 3-A, is acceptable (ADAMS Accession Nos. ML121030286 and ML12226A546), with the following conditions:

1) Extended interval for Type C LLRTs may be increased to 75 months with the requirement that a licensee's post outage report include the margin between Type B and Type C leakage rate summation and its regulatory limit. In addition, a corrective action plan shall be developed to restore the margin to an acceptable level. Extensions of up to nine months (total maximum interval of 84 months for Type C tests) are permissible only for non-routine emergent conditions. This provision (nine month extension) does not apply to valves that are restricted and/or limited to 30 month intervals in Section 10.2 (such as BWR MSIVs) or to valves held to the base interval (30 months) due to unsatisfactory LLRT performance.

2) When routinely scheduling any LLRT valve interval beyond 60-months and up to 75-months, the primary containment leakage rate testing program trending or monitoring must include an estimate of the amount of understatement in the Type B & C total and must be included in a licensee's post-outage report. The report must include the reasoning and determination of the acceptability of the extension, demonstrating that the LLRT totals calculated represent the actual leakage potential of the penetrations.

According to data provided by the licensee, the valves identified in Table 1 have maintained a history of good performance. In addition, the licensee routinely tests the PIVs in accordance with the ASME OM Code to ensure their functional capabilities. Extending the leakage test interval based on good performance and the low risk factor as noted in NUREG/CR-5928 is a logical progression to a performance-based program, and provides an acceptable level of safety.

## 4.0 CONCLUSION

As set forth above, the NRC staff determined that the proposed alternative test plan provides an acceptable level of quality and safety for the valves listed in Table 1. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, on the basis of the above determinations, the NRC authorizes the licensee to use the alternative, as proposed in relief request RV-03 for the remainder of the fifth 10-year IST interval at DNPS, which is currently scheduled to end on October 31, 2023.

All other ASME OM Code requirements for which relief was not specifically requested and approved remain applicable.

Principle Contributor: Michael Farnan, NRR

Date of issuance: October 27, 2015

If you have any questions, please contact the NRC project manager, Eva Brown at (301) 415-2315 or via email at Eva.Brown@nrc.gov.

Sincerely,

*/RA/*
Travis L. Tate, Chief
Plant Licensing III-2 and
Planning and Analysis Branch
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-237 and 50-249

Enclosure:
Safety Evaluation

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