



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

May 30, 2018

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: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 – SAFETY
EVALUATION OF RELIEF REQUEST GVRR-2 REGARDING THE FIFTH
10-YEAR INTERVAL OF THE INSERVICE TESTING PROGRAM
(EPID NO. L-2017-LLR-0094)

Dear Mr. Hanson:

By letter dated September 29, 2017, Exelon Generation Company, LLC (Exelon, the licensee) submitted Relief Request GVRR-2 to the U.S. Nuclear Regulatory Commission (NRC). Exelon proposed an alternative to certain inservice testing (IST) requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code) for the Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(z)(1), Exelon requested to extend the test interval for certain pressure isolation valves on the basis that the proposed alternative provides an acceptable level of quality and safety. The subject relief request is for the fifth 10-year interval of the IST program at PBAPS, Units 2 and 3, which will begin on August 15, 2018, and is currently scheduled to end on August 14, 2028.

The NRC staff has completed its review of the subject relief request as documented in the enclosed safety evaluation (SE). Our SE concludes that the proposed alternative will provide an acceptable 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(z)(1). Therefore, the NRC staff authorizes the proposed alternative for the fifth 10-year IST interval at PBAPS, Units 2 and 3.

By letter dated October 13, 2017 (ADAMS Accession No. ML17286A083), Exelon withdrew Relief Request 01A-VRR-2. By letter dated December 7, 2017 (ADAMS Accession No. ML17332A019), the NRC authorized the proposed alternative for Relief Request 01A-VRR-4. By letter dated February 7, 2018 (ADAMS Accession No. ML18036A156), the NRC authorized the proposed alternative for Relief Request 01A-VRR-3.

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

B. Hanson

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If you have any questions concerning this matter, please contact the PBAPS Project Manager, Ms. Jennifer Tobin, at (301) 415-2328 or by e-mail at Jennifer.Tobin@nrc.gov.

Sincerely,

A handwritten signature in cursive script that reads "James G. Danna".

James G. Danna, Chief
Plant Licensing Branch I
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-277 and 50-278

Enclosure:
Safety Evaluation

cc: Listserv



UNITED STATES
NUCLEAR REGULATORY COMMISSION
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION
RELATED TO RELIEF REQUEST GVRR-2 FOR THE
FIFTH 10-YEAR INTERVAL OF THE INSERVICE TESTING PROGRAM
EXELON GENERATION COMPANY, LLC
PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3
DOCKET NOS. 50-277 AND 50-278

1.0 INTRODUCTION

By letter dated September 29, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17275A061), Exelon Generation Company, LLC (Exelon, the licensee) submitted Relief Request GVRR-2 to the U.S. Nuclear Regulatory Commission (NRC or the Commission). Exelon proposed an alternative to certain inservice testing (IST) requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), for the Peach Bottom Atomic Power Station (PBAPS), Units 2 and 3. Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(z)(1), Exelon proposed an alternative to the requirements in Section ISTC-3630, "Leakage Rate for Other Than Containment Isolation Valves," of the OM Code, 2012 Edition with no Addenda. The relief request would extend the test interval for certain valves on the basis that the proposed alternative provides an acceptable level of quality and safety.

The subject relief request is for the fifth 10-year interval of the IST program at PBAPS, Units 2 and 3, which will begin on August 15, 2018, and is currently scheduled to end on August 14, 2028.

2.0 REGULATORY EVALUATION

Section 50.55a(f), "Inservice testing requirements," of 10 CFR requires, in part, that IST of certain ASME Boiler and Pressure Vessel Code (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 by the NRC pursuant to paragraphs (z)(1) or (z)(2) of 10 CFR 50.55a.

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).

Based on the above, and subject to the following technical evaluation, the 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 Alternative Request GVRR-2

The licensee requested an alternative to the requirements in Section ISTC-3630, "Leakage Rate for Other Than Containment Isolation Valves," of the OM Code, 2012 Edition with no Addenda.

Components Affected

Alternative testing is requested for the following valves associated with the residual heat removal (RHR) and core spray (CS) systems:

Table 1

Valve ID	System	Code Class	Category
MO-2(3)-10-17	RHR	1	A
MO-2(3)-10-18	RHR	1	A
MO-2(3)-10-25A	RHR	1	A
MO-2(3)-10-25B	RHR	1	A
AO-2(3)-10-46A	RHR	1	A/C
AO-2(3)-10-46B	RHR	1	A/C
HV-2-10-23451A/B	RHR	1	A
HV-3-10-33451A/B	RHR	1	A
MO-2(3)-14-12A	CS	1	A
MO-2(3)-14-12B	CS	1	A
AO-2(3)-14-13A	CS	1	A/C
AO-2(3)-14-13B	CS	1	A/C
HV-2-14-29046A/B	CS	1	A
HV-3-14-39046A/B	CS	1	A

Applicable Code Edition/Addenda

The applicable ASME OM Code edition and addenda for PBAPS, Units 2 and 3, is the 2012 Edition with no Addenda.

Applicable Code Requirements

The ASME OM Code, ISTC-3630, "Leakage Rate for Other Than Containment Isolation Valves," states, in part, 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."

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

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 Part 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.

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 dose reduction and 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 RHR valves are considered water-sealed, and the CS system is not exposed to containment atmosphere.

Technical Specification (TS) 5.5.12, "Primary Containment Leakage Rate Testing Program," states, in part, "A program shall be established to implement the leakage rate testing of the containment as required by 10 CFR 50.54(0) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with the guidelines contained in NEI [Nuclear Energy Institute] 94-01, "Industry Guideline for Implementing Performance Based Option of 10 CFR Part 50, Appendix J," Revision 3-A, dated July 2012 ..."

Additionally, NEI 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," dated July 2012 (ADAMS Accession No. ML12221A202), describes the risk-informed basis for the extended test intervals under Option B. That justification shows that for CIVs that 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. Presented in NEI 94-01 is also 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 (GVRR-2) 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). Proposed relief request GVRR-2 is intended to provide for a performance-based scheduling of PIV tests at PBAPS, Units 2 and 3.

Discussed in NUREG-0933, "Resolution of Generic Safety Issues," Issue 105, "Interfacing Systems LOCA at LWRs," is the need for PIV leak-rate testing based primarily on three pre-1980 historical failures of applicable valves industrywide. 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 close.

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. 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 RHR 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 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.
- Alarms are provided that identify high pressure to low pressure leakage.
- 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 550 millirem, assuming all of the PIVs remain classified as good performers. The proposed extended test intervals would provide for a savings of approximately 1.1 Roentgen equivalent man (rem) over a 4-1/2 year period.

The licensee states that the primary basis for this proposed alternative is the historically good performance of the PIVs. The historical test data that demonstrate acceptable PIV performance for the RHR and CS systems was provided earlier in the previous proposed alternative for the PBAPS fourth 10-year IST Interval for PIV Leakage Testing Frequency, dated April 27, 2016 (ADAMS Accession No. ML16118A414).

Duration of Proposed Alternative

The proposed alternative would apply to the fifth 10-year IST interval at PBAPS, which is currently scheduled to begin on August 15, 2018 and end on August 14, 2028.

3.2 NRC Staff Evaluation

The licensee proposed an alternative to the requirements found in the ASME OM Code, 2012 Edition with no Addenda, Section ISTC-3630(a), for the PIVs listed above in Table 1.

Specifically, the licensee proposes to functionally test and verify the leakage rate of the PIVs using the 10 CFR Part 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 that 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, "ISLOCA Research Program." The purpose of NUREG/CR-5928 was to quantify the risk associated with an ISLOCA event. The boiling-water reactor (BWR) and the pressurized-water designs were analyzed in NUREG/CR-5928. For a BWR design, such as PBAPS, Units 2 and 3, the analysis determined that ISLOCA is not a risk concern.

Appendix J, Option B, of 10 CFR Part 50, 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," dated September 1995 (ADAMS Accession No. ML003740058). RG 1.163 endorses NEI 94-01, Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," dated July 26, 1995, with the limitation that Type C component test intervals cannot extend greater than 60 months. As discussed in Appendix J to 10 CFR Part 50, Type C tests are tests intended to measure CIV leakage rates. The current approved version of NEI 94-01 is Revision 3-A (ADAMS Accession No. ML12221A202), which allows Type C CIV test intervals to be extended to 75 months, with a permissible extension for non-routine emergent conditions of 9 months (84 months total). Section 4.0 of the NRC staff safety evaluation included in NEI 94-01, Revision 3-A, includes two conditions on use of NEI 94-01, Revision 3. The conditions state, in part, that:

1. The staff is allowing the extended interval for Type C LLRTs [local leak-rate tests] be increased to 75 months with the requirement that a licensee's post-outage report include the margin between the 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. The staff is also allowing the non-routine emergent extension out to 84-months as applied to Type C valves at a site, with some exceptions that must be detailed in NEI 94-01, Revision 3. At no time shall an extension be allowed for Type C valves that are restricted categorically (e.g. BWR MSIVs [main steam isolation valves]), and those valves with a history of leakage, or any valves held to either a less than maximum interval or to the base refueling cycle interval. Only non-routine emergent conditions allow an extension to 84 months.
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 above, 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. The NRC staff finds that 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 quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff has determined that the proposed alternative test plan provides an acceptable level of quality and safety for the valves listed in Table 1 above. 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 GVRR-2, for the fifth 10-year IST interval at PBAPS, Units 2 and 3, which is currently scheduled to begin August 15, 2018 and end on August 14, 2028.

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

Principal Contributor: G. Bedi

Date: May 30, 2018

SUBJECT: PEACH BOTTOM ATOMIC POWER STATION, UNITS 2 AND 3 – SAFETY EVALUATION OF RELIEF REQUEST GVRR-2 REGARDING THE FIFTH 10-YEAR INTERVAL OF THE INSERVICE TESTING PROGRAM (EPID NO. L-2017-LLR-0094) DATED MAY 30, 2018

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