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

April 13, 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: JAMES A. FITZPATRICK NUCLEAR POWER PLANT – ISSUANCE OF RELIEF REQUESTS FOR ALTERNATIVES TO CERTAIN ASME OM CODE REQUIREMENTS (CAC NOS. MG0052, MG0053, MG0054, MG0055, MG0056, MG0057, MG0058, AND MG0061; EPID L-2017-LLR-0067, L-2017-LLR-0068, L-2017-LLR-0069, L-2017-LLR-0070, L-2017-LLR-0071, L-2017-LLR-0072, L-2017-LLR-0073, AND L-2017-LLR-0074)

Dear Mr. Hanson:

By letter dated August 3, 2017, as supplemented by letter dated October 26, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML17219A123 and ML17299A560, respectively), Exelon Generation Company, LLC (Exelon or the licensee) submitted eight relief requests to the U.S. Nuclear Regulatory Commission (NRC) for relief from certain requirements of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code), 2004 Edition with Addenda through Omb-2006, at the James A. FitzPatrick Nuclear Power Plant (FitzPatrick) associated with the fifth 10-year inservice testing interval.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternative on the basis that the alternative provides an acceptable level of quality and safety for Relief Requests PRR-01, PRR-02, PRR-04, VRR-02, VRR-03, and VRR-04. Pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternative 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 for Relief Requests PRR-03 and VRR-01

The NRC staff has reviewed the subject requests and concludes, as set forth in the enclosed safety evaluations, that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1) and 10 CFR 50.55a(z)(2).

The NRC staff has determined that for requests PRR-01, PRR-02, PRR-04, VRR-02, VRR-03, and VRR-04, the proposed alternatives 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) for these proposed alternatives. Therefore, the NRC staff authorizes the use of the proposed alternatives for requests PRR-01,

PRR-02, PRR-04, VRR-02, VRR-03, and VRR-04 for FitzPatrick for the fifth 10-year inservice testing interval at FitzPatrick, which is scheduled to begin on June 1, 2018, and end on September 30, 2027.

The NRC staff has determined that for requests PRR-03 and VRR-01, the proposed alternatives provide reasonable assurance that the affected components are operationally ready. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2) for these requests. Therefore, the NRC staff authorizes the use of the proposed alternatives for requests PRR-03 and VRR-01 for FitzPatrick for the fifth 10-year inservice testing interval at FitzPatrick, which is scheduled to begin on June 1, 2018, and end on September 30, 2027.

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

If you have any questions, please contact Tanya Hood at 301-415-1387 or Tanya.Hood@nrc.gov.

Sincerely,

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

Docket No. 50-333

Enclosures:
1. Safety Evaluation for PRR-01 and PRR-04
2. Safety Evaluation for PRR-02 and PRR-03
3. Safety Evaluation for VRR-03
4. Safety Evaluation for VRR-01, VRR-02, and VRR-04

cc: Listserv

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUESTS PRR-01, REVISION 0, AND PRR-04, REVISION 0

FIFTH 10-YEAR INTERVAL INSERVICE TESTING PROGRAM

EXELON GENERATING COMPANY, LLC

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DOCKET NO. 50-333

1.0 INTRODUCTION

By letter dated August 3, 2017, as supplemented by letter dated October 26, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML17219A123 and ML17299A560, respectively), Exelon Generation Company, LLC (Exelon or the licensee) submitted Relief Requests PRR-01, Revision 0, and PRR-04, Revision 0, to the U.S. Nuclear Regulatory Commission (NRC or the Commission). The licensee requested alternative tests in lieu of 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 IST program at the James A. FitzPatrick Nuclear Power Plant (FitzPatrick) during the fifth 10-year IST program interval, which is scheduled to begin on June 1, 2018, and end on September 30, 2027. Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternative in Relief Requests PRR-01 and PRR-04 on the basis that the alternative provides an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Section 50.55a(f), "Preservice and Inservice testing requirements," of 10 CFR requires, in part, that IST 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).

Section 50.55a(z) of 10 CFR requires that alternatives to the requirements of paragraphs (b) through (h) of 10 CFR 50.55a, or portions thereof, must be submitted and authorized by the NRC prior to implementation. The applicant or licensee must demonstrate that: (1) the proposed alternative would provide an acceptable level of quality and safety, or (2) compliance with the specified requirements would result in hardship or unusual difficulty, without a compensating increase in the level of quality and safety. Section 50.55a of 10 CFR allows the NRC to authorize alternatives and to grant relief from ASME Code requirements upon making the necessary findings.

The guidance that the NRC staff considered in its review is NUREG-1482, Revision 2, "Guidelines for Inservice Testing at Nuclear Power Plants," October 2013 (ADAMS Accession No. ML13295A020), which provides acceptable guidance to licensees to establish a basic understanding of the regulatory basis for pump and valve IST programs.

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

The applicable ASME OM Code edition and addenda for FitzPatrick during the fifth 10-year IST program interval is the 2004 Edition through the 2006 Addenda.

3.1 Licensee's Relief Request PRR-01, Revision 0

Applicable Code Requirements

Subsection ISTB-3510(a), "Accuracy," states, in part, "Instrument accuracy shall be within the limits of Table ISTB-3510-1."

Subsection ISTB-3510(b), "Range," (1) states, "The full-scale range of each analog instrument shall be not greater than three times the reference value."

Table ISTB-3510-1, "Required Instrument Accuracy," requires pressure and differential pressure accuracy to be ± 2 percent for pump Group A and Group B tests.

Components for Which Relief is Requested

Core Spray Pump 14P-1A
Core Spray Pump 14P-1B

Reason for Alternative Request

The differential pressure for each core spray pump is calculated using the installed suction and discharge pressure gauges. The suction pressure gauge is designed to provide adequate suction pressure indication during all expected operating conditions. The suction pressure gauge full-scale range, 72.28 pounds per square inch gauge (psig), is sufficient for a post-accident condition when the torus is at the maximum accident pressure. This range exceeds the range limit of 15 psig for the suction pressure under the test condition (approximately 5 psig).

The installed suction pressure gauge and discharge pressure instrumentation loop are calibrated to within ± 2 percent of full scale. However, the installed suction pressure instrument loop is calibrated to within ± 2.4 percent full-scale accuracy. The full-scale range of the pump discharge pressure instrumentation loop is 500 psig. Pump discharge pressure during testing is typically 280 psig. The maximum variation due to inaccuracy in measured suction pressure is ± 1.7 psi. The maximum variation due to inaccuracy in measured discharge pressure is ± 10 psi. Thus, the differential pressure (typical [P_{disch} - P_{suct}]) would be 280 – 5, which is 275 ± 11.7 psi, for an inaccuracy of 4.3 percent. If the full-scale range of the suction pressure gauge is within the ASME OM Code allowable value of three times the reference value

(15 psig), the maximum variation due to inaccuracy in measured suction pressure would be ± 0.3 psi, and the resulting differential pressure measurement would be 275 ± 10.3 psi, or an inaccuracy of 3.7 percent.

The decrease in inaccuracy of 0.6 percent by using the ASME OM Code-compliant gauge is insignificant and does not warrant manpower and exposure to change the suction pressure quarterly for test purposes.

In addition, the ASME OM Code would allow a full-scale range for the discharge pressure measurement of 840 psig for the typical 280 psig discharge pressure. This would translate into a differential pressure measurement of 275 ± 17.1 psig, or an inaccuracy of 6.2 percent, if the installed instrument met the ASME OM Code requirements of 0 - 15 psig for suction pressure gauge and 0 - 840 psig for the discharge pressure gauge. The existing measurement is significantly better than the maximum ASME OM Code allowable inaccuracy.

Proposed Alternative Testing

The licensee stated that the existing installed plant suction pressure and discharge gauges will be used to determine the pump differential pressure for the core spray pumps 14P-1A and 14P-1B Group B pump tests. The comprehensive tests are performed using measuring and test equipment.

NRC Staff Evaluation

The NRC staff reviewed the information in Relief Request PRR-01, Revision 0, including the supplemental information in the October 26, 2017, submittal. For Group A and Group B tests, the ASME OM Code requires instrument accuracy to be within ± 2 percent of full scale and the full scale range of each instrument be no greater than three times the reference value. The combination of these two requirements results in an effective accuracy requirement of approximately ±6 percent of the reference value.

Based on its review, the NRC staff finds that the maximum inaccuracy of the installed suction and discharge pressure instruments combined is ± 7.3 psig [(± 1.73 psig) + (± 5.6 psig)]. The accuracies of the installed core spray pump suction and discharge instruments yield differential pressure readings that are more accurate than the readings achieved from instruments that meet the ASME OM Code requirements [(± 16.8 psig) + (± 0.3 psig), or ± 17.1 psig] and, thus, provide an acceptable level of quality and safety.

The use of the existing pressure instrument is supported by NUREG-1482, Revision 2, paragraph 5.5.1, which states that that the NRC staff may authorize an alternative when the combination of range and accuracy yields a reading at least equivalent to the reading achieved from the instrument that meets the ASME OM Code requirements. Therefore, the NRC staff concludes that the proposed alternative provides an acceptable level of quality and safety.

3.2 Licensee's Relief Request PRR-04

Applicable Code Requirements

Subsection ISTB-5121, "Group A Test Procedure," (b) states, in part, "The resistance of the system shall be varied until the flow rate equals the reference point. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point..."

Subsection ISTB-5122, "Group B Test Procedure," (c), states, "System resistance may be varied as necessary to achieve the reference point."

Subsection ISTB-5123, "Comprehensive Test Procedure," (b), states, in part, "the resistance of the system shall be varied until the flow rate equals the reference point. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point..."

Subsection ISTB-5221, "Group A Test Procedure," (b), states, in part, "The resistance of the system shall be varied until the flow rate equals the reference point. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point..."

Subsection ISTB-5222, "Group B Test Procedure," (c), states, "System resistance may be varied as necessary to achieve the reference point."

Subsection ISTB-5223, "Comprehensive Test Procedure," paragraph ISTB-5123(b) states, in part, "The resistance of the system shall be varied until the flow rate equals the reference point. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point..."

Components for Which Relief is Requested

Table 1

Pump ID	Pump Description	Pump Type	Code Class	OM Code Category
11P-2A 11P-2B	Standby Liquid Control Pumps	Positive Displacement	2	Group B
14P-1A 14P-1B	Core Spray Pumps	Centrifugal	2	Group B
10P-3A 10P-3B 10P-3C 10P-3D	Residual Heat Removal (RHR)/Low Pressure Coolant Injection (LPCI) Pumps	Centrifugal	2	Group A
23P-1M	High Pressure Coolant Injection (HPCI) Main Pump	Centrifugal	2	Group B
23P-1B	HPCI Booster Pump	Centrifugal	2	Group B
10P-1A 10P-1B 10P-1C 10P-1D	RHR Service Water Pump	Vertical Line Shaft Centrifugal	3	Group A
46P-2A 46P-2B	Emergency Service Water Pumps	Vertical Line Shaft Centrifugal	3	Group B

Reason for Alternative Request

For pump testing, there is difficulty adjusting system throttle valves with sufficient precision to achieve an exact flow rate, differential pressure, or discharge pressure during subsequent IST tests. Subsection ISTB of the ASME OM Code does not allow for variance from a fixed

reference value for pump testing. However, NUREG-1482, Revision 2, Section 5.3, acknowledges that certain pump system designs do not allow for the licensee to set the flow at an exact value because of limitations in the instruments and controls for maintaining steady flow.

The ASME OM Code Case OMN-21, "Alternative Requirements for Adjusting Hydraulic Parameters to Specified Reference Points," provides guidance for adjusting reference flow, differential pressure (ΔP), or discharge pressure to within a specified tolerance during pump inservice testing. The ASME OM Code Case OMN-21 states, in part:

> It is the opinion of the Committee that when it is impractical to operate a pump at a specified reference point and adjust the resistance of the system to a specified reference point for flow rate, differential pressure or discharge pressure, the pump may be operated as close as practical to the specified reference point with the following requirements: The Owner shall adjust the system resistance to as close as practical to the specified reference point where the variance from the reference point does not exceed +2% or -1% of the reference point when the reference point is flow rate, or +1% or -2% of the reference point when the reference point is differential pressure or discharge pressure.

Proposed Alternative Testing

The licensee seeks to perform future inservice pump testing in a manner consistent with the requirements as stated in ASME OM Code Case OMN-21. Specifically, testing of all pumps identified in Table 1 above will be performed such that the flow rate is adjusted as close as practical to the reference value and within proceduralized limits of +2 percent or -1 percent of the reference flow rate, or alternatively, the differential pressure or discharge pressure is adjusted as close as practical to the reference value and within proceduralized limits of +1 percent or -2 percent of the reference discharge pressure or differential pressure.

The FitzPatrick plant operators will continue to strive to achieve the exact test reference values (flow, differential pressure, or discharge pressure) during testing. Typical test guidance will be to adjust the reference parameter (i.e., flow, differential pressure, or discharge pressure) to the specific reference value with additional guidance that if the reference value cannot be achieved with reasonable effort, the test will be considered valid if the steady-state flow rate is within the proceduralized limits of +2 percent or -1 percent of the reference value, or the steady-state discharge pressure or differential pressure is within the proceduralized limits of +1 percent or -2 percent of the reference value.

NRC Staff Evaluation

The NRC staff reviewed the information in Relief Request PRR-04, Revision 0. The ASME OM Code Case OMN-21 was developed to provide guidance on alternatives when it is impractical to operate a pump at a specified reference point for either flow rate, differential pressure, or discharge pressure. The pump may be operated as close as practical to the specified reference point with the following requirements.

Code Case OMN-21 was approved by the ASME Operation and Maintenance Standards Committee on April 20, 2012, with the NRC representative voting in the affirmative. The licensee proposed to adopt ASME OM Code Case OMN-21. The applicability of Code Case OMN-21 is the ASME OM Code, 1995 Edition through the 2011 Addenda. The NRC staff notes

that the language from ASME OM Code Case OMN-21 has subsequently been included in the ASME OM Code, 2012 Edition, 2015 Edition, and 2017 Edition.

Based on its review, the NRC staff notes that in certain situations, it is not possible to operate a pump at a precise reference point. The NRC staff has reviewed the alternatives proposed in ASME OM Code Case OMN-21 and found that the proposed alternatives are reasonable and appropriate when a pump cannot be operated at a specified reference point. Operation within the tolerance bands specified in ASME OM Code Case OMN-21 provides reasonable assurance that licensees will be able to utilize the data collected to detect degradation of the pumps. Based on the NRC staff's review of ASME OM Code Case OMN-21, and the licensee's commitment to use the bands specified in ASME OM Code Case OMN-21 for flow rate, the NRC staff concludes that implementation of the alternatives contained in ASME OM Code Case OMN-21 is acceptable for the pumps listed above. Therefore, the NRC staff concludes that the licensee's proposed alternative provides an acceptable level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff determines that for Relief Requests PRR-01 and PRR-04, the proposed alternatives 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) for Relief Requests PRR-01 and PRR-04. Therefore, the NRC staff authorizes the use of the alternative requests for FitzPatrick for the fifth 10-year IST program interval, which is scheduled to begin on June 1, 2018, and end on September 30, 2027.

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

Principal Contributor: Gurjendra Bedi

Date: April 13, 2018.

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUESTS PRR-02, REVISION 0, AND PRR-03, REVISION 0

FIFTH 10-YEAR INTERVAL INSERVICE TESTING PROGRAM

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-333

1.0 INTRODUCTION

By letter dated August 3, 2017, as supplemented by letter dated October 26, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML17219A123 and ML17299A560, respectively), Exelon Generation Company, LLC (Exelon or the licensee) submitted Relief Requests PRR-02, Revision 0, and PRR-03, Revision 0, to the U.S. Nuclear Regulatory Commission (NRC or the Commission). The licensee requested alternative tests in lieu of 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 IST program at the James A. FitzPatrick Nuclear Power Plant (FitzPatrick) during the fifth 10-year IST program interval, which is scheduled to begin on June 1, 2018, and end on September 30, 2027.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternative in Relief Request PRR-02, Revision 0, on the basis that the alternative provides an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternative in Relief Request PRR-03, Revision 0, on the basis that the ASME OM Code requirements present an undue hardship, without a compensating increase in the level of quality or safety.

2.0 REGULATORY EVALUATION

Section 50.55a(f), "Preservice and Inservice testing requirements," of 10 CFR requires, in part, that IST 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).

Section 50.55a(z) of 10 CFR requires that alternatives to the requirements of paragraphs (b) through (h) of 10 CFR 50.55a, or portions thereof, must be submitted and authorized by the NRC prior to implementation. The applicant or licensee must demonstrate that: (1) the proposed alternative would provide an acceptable level of quality and safety, or (2) compliance with the specified requirements would result in hardship or unusual difficulty, without a

compensating increase in the level of quality and safety. Section 50.55a of 10 CFR allows the NRC to authorize alternatives and to grant relief from ASME Code requirements upon making the necessary findings.

The guidance that the NRC staff considered in its review is NUREG/CP-0152, "Proceedings of the Fourth NRC/ASME Symposium on Valve and Pump Testing," dated July 15-18, 1996 (ADAMS Accession No. ML18057B547), which provides acceptable guidance to licensees to address safety and technical issues related to valves and pumps.

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 alternatives requested by the licensee.

3.0 TECHNICAL EVALUATION

The applicable ASME OM Code edition and addenda for FitzPatrick during the fifth 10-year IST program interval is the 2004 Edition through the 2006 Addenda.

3.1 Licensee's Relief Request PRR-02, Revision 0

Applicable Code Requirements

Subsection ISTB-3300, "Reference Values," (a) states, "Initial reference values shall be determined from the results of testing meeting the requirements of ISTB-3100, Preservice Testing, or from the results of the first inservice test."

Components for Which Relief is Requested

Table 1

Pump ID	Pump Description	ASME Code Class	ASME OM Pump Group
10P-1A	Residual Heat Removal Service Water (RHRSW) Pump	3	A
10P-1B	RHRSW Pump	3	A
10P-1C	RHRSW Pump	3	A
10P-1D	RHRSW Pump	3	A

Reason for Alternative Request

The smooth running pumps listed in Table 1 have at least one vibration reference value (V_r) that is currently less than 0.05 inches per second (ips). A small value for V_r produces a small acceptable range for pump operation. The ASME OM Code acceptable range limit for pump vibrations from Table ISTB-5221-1, "Vertical Line Shaft Centrifugal Pumps Test Acceptance Criteria," for both the Group A test and Comprehensive test is $\leq 2.5\ V_r$. Based on a small acceptable range, a smooth running pump could be subject to unnecessary corrective action if it exceeds this limit.

Subsection ISTB-6200, "Corrective Action," (a), "Alert Range," states:

> If the measured test parameter values fall within the alert range of Table ISTB-5121-1, Table ISTB-5221-1, Table ISTB-5321-1, or Table ISTB-5321-2, as applicable, the frequency of testing specified in ISTB-3400 shall be doubled until the cause of the deviation is determined and the condition is corrected.

For very small vibration reference values, a significant portion of the vibration reading can be from flow variations, hydraulic noise, and instrument error, which can affect the repeatability of subsequent measurements. Also, experience gathered by the licensee's Predictive Maintenance (PdM) group has shown that changes in vibration levels in the range of 0.05 ips do not normally indicate significant degradation in pump performance.

Proposed Alternative Testing

The licensee seeks to apply a minimum value for V_r of 0.05 ips for the particular vibration measurement location. This minimum value would be applied to individual vibration locations for the residual heat removal service water (RHRSW) pumps listed in Table 1. The subsequent test results for that location will be compared to an alert range limit of 0.125 ips and a required action limit of 0.300 ips. These ranges, resulting from the proposed V_r of 0.05 ips and using the existing ASME OM Code multipliers, shall be applied to vibration test results during both Group A tests and Comprehensive tests.

In addition to the requirements of the ASME OM Code subsection ISTB for IST, the pumps in the FitzPatrick IST program are also included in the FitzPatrick PdM program. The FitzPatrick PdM program currently uses predictive monitoring techniques such as vibration monitoring and analysis beyond that required by subsection ISTB bearing temperature trending, oil sampling and analysis, and/or thermography and analysis, as applicable.

If the measured parameters are outside the normal operating range or are determined by analysis to be trending toward an unacceptable degraded state, appropriate actions are taken that may include the following: initiate an issue report, increase monitoring to establish a rate of change, review component-specific information to identify the cause, and remove the affected pump from service to perform maintenance.

The licensee stated that the pumps in the IST program will remain in the FitzPatrick PdM program, even if certain pumps have very low vibration readings and are considered to be smooth running pumps.

NRC Staff Evaluation

The NRC staff reviewed the information in Relief Request PRR-02, Revision 0. The ASME OM Code requires that the vibration of all pumps in a plant's IST program be measured. For centrifugal pumps, the measurements of each pump are taken in a plane approximately perpendicular to the rotating shaft in two orthogonal directions on each accessible pump-bearing housing. For vertical line shaft pumps, the vibration measurements are taken on the upper motor-bearing housing in three orthogonal directions, including the axial direction. The measurement is also taken in the axial direction on each accessible pump thrust-bearing housing. These measurements are to be compared with the ASME OM Code vibration acceptance criteria to determine if the measured values are acceptable.

Subsection ISTB requires that, if during an inservice test, a bearing vibration measurement exceeds 2.5 V_r, the pump is considered in the alert range. The frequency of testing is then doubled until the condition is corrected and the vibration level returns below the alert range. Pumps whose vibration is recorded to be 6 V_r are considered in the required action range and must be declared inoperable until the cause of the deviation has been determined and the condition corrected. The vibration reference values are required to be determined when the pump is in good operating condition.

For pumps whose absolute magnitude of vibration is an order of magnitude below the absolute vibration limits established in subsection ISTB, a relatively small increase in vibration magnitude may cause the pump to enter the alert or required action range. These instances may be attributed to variation in flow, instrument accuracy, or other noise sources that would not be associated with degradation of the pump. Pumps that operate in this region are typically referred to as smooth running pumps. Based on a small acceptable range, a smooth running pump could be subject to unnecessary corrective action and additional testing.

Based on its review, the NRC staff finds that the alert and required action limits specified in the alternative request sufficiently address the previously undetected acute pump problems, and the licensee's PdM program appears to be designed to detect problems involving the mechanical condition, even well in advance of when the pump reaches its overall vibration alert limit.

Based on the experience gathered by the FitzPatrick PdM group, the licensee has proposed to establish a reference value of 0.05 ips. The use of the suggested reference value of 0.05 ips will provide an alert range of 0.125 to 0.30 ips, and the licensee's PdM program has shown that changes in vibration levels below 0.05 ips do not normally indicate significant degradation in pump performance. The reference value of 0.05 ips is consistent with previous NRC staff safety evaluations of similar issues. This alternative request is not for relief from the requirement to establish reference values, but from the method of determining the reference value. Therefore, the NRC staff concludes that the licensee's proposed alternative will provide an acceptable level of quality and safety.

3.2 Licensee's Alternative Request PRR-03, Revision 0

Applicable Code Requirements

Table ISTB-5121-1, "Centrifugal Pump Test Acceptance Criteria," provides the vibration alert range low-end absolute limit of 0.325 ips for the Group A and Comprehensive tests.

Components for Which Relief is Requested

Table 2

Pump ID	Pump Description	ASME Code Class	ASME OM Pump Group
10P-3A	Residual Heat Removal (RHR) Pump	2	A
10P-3B	RHR Pump	2	A
10P-3C	RHR Pump	2	A
10P-3D	RHR Pump	2	A

Reason for Alternative Request

The increased periodicity of testing resulting from the 0.325 ips ASME OM Code requirement is also an increase to the licensee's operations staff, plant scheduling, and adds run time to all RHR pumps. This request is based on analysis of vibration and pump differential pressure data indicating that no pump degradation is taking place.

Proposed Alternative Testing

The licensee seeks to apply an alternative vibration alert range low-end absolute limit of 0.408 ips for the RHR pumps listed in Table 2. The required action level for vibration will remain unchanged (> 6 V_r). The RHR pumps listed in Table 2 are tested using a full-flow recirculation test line back to the suppression pool for each Group A test and comprehensive pump tests. Based on the full-flow test line configuration, this test methodology results in flow-induced, broadband vibration readings greater than 0.325 ips, but less than the required action limits.

The guidance in NUREG/CP-0152 presented four key components that should be addressed in an alternative request of this type to streamline the review process. These four key components are as follows:

I. The licensee should have sufficient vibration history from the inservice testing, which verifies that the pump has operated at the vibration level for a significant amount of time, with any "spikes" in the data justified.

II. The licensee should have consulted with the pump manufacturer or vibration expert about the level of vibration the pump is experiencing to determine if the pump operation is acceptable.

III. The licensee should describe attempts to lower the vibration below the defined ASME OM Code absolute levels through modifications to the pump.

IV. The licensee should perform a spectral analysis of the pump driver system to identify all contributors to the vibration levels.

The licensee provided a discussion of how it addressed these four key components in its submittal. Expert analyses and maintenance reviews have shown that this vibration has not resulted in degradation to the pump or motor. Data trends show that overall vibrations have remained steady since 1998.

The new Alert criterion value allows an alternative measure that still meets the intended function of monitoring the pump for degradation, while leaving the action levels as mandated by the ASME OM Code. The proposed criterion encompasses the previous values that exceeded the Alert level, which would eliminate the unnecessary actions associated with exceeding the ASME OM Code Alert limit when the pump is not seen as degrading. Any corrective actions triggered by vibrations between 0.408 ips to 0.7 ips will result in the same ASME OM Code actions as previously required when exceeding the Alert limit of 0.325 ips.

NRC Staff Evaluation

The NRC staff reviewed the information in Relief Request PRR-03, Revision 0. Subsection ISTB-6200, "Corrective Action," (a), "Alert Range," requires that if the measured test

parameter (in this case vibration) values fall within the alert range (greater than 0.325 ips through 0.7 ips) of ASME OM Code Table ISTB-5121-1, the frequency of testing specified in ISTB-3400 shall be doubled until the cause of the deviation is determined and the condition is corrected.

To accept pump vibration at a higher level than the ASME OM Code-required alert range absolute limits, NUREG/CP-0152 recommends evaluating four key elements: (1) vibration history to verify that pumps were operated at this level of vibration for a significant amount of time with justification of "spikes" in test data; (2) consulting with the pump manufacturer/vibration experts to verify that the vibration levels of the pumps are acceptable; (3) attempts to lower the vibration level through modifications to the pumps or the system and structures of the pumps; and (4) perform spectral analysis to identify all contributors to the vibration level. In its submittal, the licensee provided information to address each of these key elements. The licensee also included its evaluation of all of these four key elements for the RHR pumps.

The licensee stated that the pump vendor was contacted during the initial investigation of the cause for failed vibration acceptance criteria. The licensee also stated that the basis for the 0.408 inch/second (in/sec) alert limit comes from the Technical Associates of Charlotte recommendations for vertical pumps. The RHR pump vendor did not recommend a specific value regarding the increased vibration alert limit but stated that the pumps should not be adversely impacted, provided that no upward trend existed in the vibration measurement data.

Also, the data provided in the alternative request in PRR-03, Revision 0, shows that the ASME OM Code alert range value of 0.325 in/sec has been exceeded only on pumps 10P-3B and 10P-3C. When this same alternative request was submitted as PRR-05 for the fourth 10-year IST interval on February 21, 2014 (ADAMS Accession No. ML14057A553), the NRC staff asked the licensee to provide justification on why the alternative request is necessary for RHR pumps 10P-3A and 10P-3D. In its response dated July 31, 2014 (ADAMS Accession No. ML14213A115), the licensee stated that RHR pumps 10P-3A and 10P-3C are common to Train A, and RHR pumps 10P-3B and 10P-3D are common to Train B. The licensee further stated that the FitzPatrick IST program implementing procedures require increased frequency testing of both pumps in each particular train if the ASME OM Code alert range value is exceeded on one of the pumps.

Based on its review, the NRC staff found that the licensee has submitted sufficient vibration history to verify that the pumps have operated at this vibration level for a significant period of time with no adverse impacts on performance. Spike data has been justified by consultation with an independent pump expert. The licensee has described attempts to reduce vibration and has demonstrated that the cause of the vibration appears to be the vane pass frequency inherent to the pump design. Spectral analysis of the pump-driver system was performed to identify all contributors to vibration levels. Based on the evaluation of the provided historical pump vibration data, the NRC staff concluded that these are not indicative of degraded pump performance.

The licensee has proposed to raise the minimum vibration alert range for the four RHR pumps listed in Table 2 from 0.325 ips to 0.408 ips. The NRC staff reviewed the historical vibration information for the four RHR pumps and noted that the vibration parameters cited in the alternative request for RHR pumps 10-P3B and 10-P3C do occasionally exceed the ASME OM Code, Table ISTB-5121-1 minimum alert level of 0.325 ips alert limit. The analysis and evaluation that the licensee performed provide reasonable assurance of operational readiness. Additionally, the proposed alternative alert limit of 0.408 ips is below the required action limit of

0.700 ips, and the licensee has demonstrated that these pumps have a normal operational history at this vibration level with no adverse consequences.

Based on the NRC staff's review of the historical vibration data provided, the additional PdM activities proposed, and the identification of vane pass frequency as a primary contributor to vibration, the NRC staff finds that implementation of the proposed alternative is acceptable for the RHR pumps listed in Table 2. Therefore, the NRC staff concludes that compliance with the specified ASME OM Code requirement would result in hardship without a compensating increase in the level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff determined that for Relief Request PRR-02, Revision 0, the proposed alternative provides 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) for Relief Request PRR-02, Revision 0. Therefore, the NRC staff authorizes the use of the alternative request for FitzPatrick for the fifth 10-year IST program interval, which is scheduled to begin on June 1, 2018, and end on September 30, 2027.

In addition, as set forth above, the NRC staff determined that for Relief Request PRR-03, Revision 0, the proposed alternative provides reasonable assurance that the affected components are operationally ready. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2) for Relief Request PRR-03, Revision 0. Therefore, the NRC staff authorizes the use of the alternative request for FitzPatrick for the fifth 10-year IST program interval, which is scheduled to begin on June 1, 2018, and end on September 30, 2027.

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

Principal Contributor: Robert Wolfgang

Date: April 13, 2018.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

ALTERNATIVE REQUEST VRR-03, REVISION 0

FIFTH 10-YEAR INSERVICE TESTING INTERVAL

EXELON GENERATION COMPANY, LLC

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DOCKET NO. 50-333

1.0 INTRODUCTION

By letter dated August 3, 2017, as supplemented by letter dated October 26, 2017 (Agencywide Documents Access and Management System Accession Nos. ML17219A123 and ML17299A560, respectively), Exelon Generation Company, LLC (Exelon or the licensee) submitted Relief Request VRR-03, Revision 0, to the U.S. Nuclear Regulatory Commission (NRC or the Commission). The licensee requested alternative tests in lieu of 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 IST program at the James A. FitzPatrick Nuclear Power Plant (FitzPatrick) during the fifth 10-year IST program interval, which is scheduled to begin on June 1, 2018, and end on September 30, 2027. Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use the proposed alternatives in Relief Request VRR-03, Revision 0, on the basis that the alternative provides an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Section 50.55a(f), "Preservice and Inservice testing requirements," of 10 CFR requires, in part, that IST 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).

Section 50.55a(z) of 10 CFR states that alternatives to the requirements of paragraphs (b) through (h) of 10 CFR 50.55a, or portions thereof, must be submitted and authorized by the NRC prior to implementation. The applicant or licensee must demonstrate that: (1) the proposed alternative would provide an acceptable level of quality and safety, or (2) compliance with the specified requirements would result in hardship or unusual difficulty, without a compensating increase in the level of quality and safety. Section 50.55a of 10 CFR allows the NRC to authorize alternatives and to grant relief from ASME Code requirements upon making the necessary findings.

The guidance that the NRC staff considered in its review is Regulatory Guide 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," June 2003 (ADAMS Accession No. ML030730430), which provides approved for use as voluntary alternatives to the mandatory ASME OM Code provisions that are incorporated by reference 10 CFR Part 50.

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

The applicable ASME OM Code Edition and Addenda for FitzPatrick during the fifth 10-year IST program interval is the 2004 Edition through the 2006 Addenda.

3.1 Licensee's Relief Request VRR-03, Revision 0

Applicable Code Requirements

Mandatory Appendix I, paragraph I-1320, "Test Frequencies, Class 1 Pressure Relief Valves," states, in part, that "Class 1 pressure relief valves shall be tested at least once every 5 years, starting with initial electric power generation."

Components for Which Relief is Requested

Class 1, Target Rock pilot-operated main steam safety/relief valves (SRVs):

02RV-071A	02RV-071B	02RV-071C	02RV-071D
02RV-071E	02RV-071F	02RV-071G	02RV-071H
02RV-071J	02RV-071K	02RV-071L	

Reason for Alternative Request

The current 24-month operating cycle would require the removal and test of 50 percent of the SRVs every refueling outage (i.e., five or six of 11), such that all valves are removed and tested every two refueling outages. Approval of extending the test interval for the valves to 6 years with a grace period of 6 months, consistent with ASME OM Code Case OMN-17, "Alternative Rules for Testing ASME Class 1 Pressure Relief/Safety Valves," would reduce the minimum number of SRVs tested at FitzPatrick over three refueling outages.

Proposed Alternative Testing

As an alternative to the ASME OM Code required 5-year test interval, the licensee proposed that Class 1 pressure relief valves, 02RV-071A, B, C, D, E, F, G, H, J, K, and L, be tested at least once every three refueling cycles with a minimum of 20 percent of the valves tested within any 24-month interval. This 20 percent would consist of valves (complete assemblies) that have not been tested during the current 72-month interval, if they exist. The test interval for any individual valve would not exceed 72 months except that a 6-month grace period is allowed to coincide with refueling outages to

accommodate extended shutdown periods. The licensee proposed to continue testing all 11 installed pilot valves every refueling outage.

The relief valve testing and maintenance cycle at Fitzpatrick consists of an as-found inspection, seat leakage, and set pressure testing. After as-found set pressure testing, the valves shall be disassembled and inspected to verify that parts are free of defects resulting from time-related degradation or service-induced wear. As-left set pressure testing shall be performed following maintenance and prior to returning the valve to service.

3.2 NRC Staff Evaluation

The NRC staff reviewed the information in Relief Request VRR-03, Revision 0. The FitzPatrick SRVs are ASME Code Class 1 pressure relief valves that provide overpressure protection for the reactor coolant pressure boundary to prevent unacceptable radioactive release and exposure to plant personnel. Mandatory Appendix I of the ASME OM Code requires that Class 1 pressure relief valves be tested at least once every 5 years.

However, Mandatory Appendix I does not require that pressure relief valves be disassembled and inspected prior to the start of the 5-year test interval. In lieu of the 5-year test interval, the licensee proposed to implement ASME OM Code Case OMN-17, which allows a test interval of 6 years plus a 6-month grace period. The ASME Committee on OM developed Code Case OMN-17 and published it in the 2009 Edition of the ASME OM Code. ASME OM Code Case OMN-17 imposes a special maintenance requirement to disassemble and inspect each pressure relief/safety valve to verify that parts are free from defects resulting from time-related degradation or service-induced wear prior to the start of the extended test interval and at each required test during the interval.

Code Case OMN-17 has not yet been added to Regulatory Guide 1.192 or included in 10 CFR 50.55a by reference. However, the NRC has allowed licensees to use ASME OM Code Case OMN-17, provided all requirements in the code case are met. This maintenance will also help to reduce the potential for setpoint drift and increase the reliability of these SRVs to perform their design requirement functions.

Furthermore, ASME OM Code Case OMN-17 is performance-based in that it requires that the SRVs be tested more frequently if test failures occur. For example, ASME OM Code Case OMN-17 requires that two additional valves be tested when a valve in the initial test group exceeds the set pressure acceptance criteria. All remaining valves in the group are required to be tested if one of the additional valves tested exceeds its set pressure acceptance criteria.

Based on its review, the NRC staff finds that implementation of ASME OM Code Case OMN-17 for the testing of the FitzPatrick SRVs, in lieu of the requirements of the 2004 Edition through the 2006 Addenda, Mandatory Appendix I, paragraph I-1320, of the ASME OM Code, provides an acceptable level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff determines that for Relief Request VRR-03, Revision 0, the proposed alternative provides 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) for Relief Request VRR-03, Revision 0. Therefore, the NRC

staff authorizes the use of the alternative request for FitzPatrick for the fifth 10-year IST program interval, which is scheduled to begin on June 1, 2018, and end on September 30, 2027.

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

Principal Contributor: John Billerbeck

Date: April 13, 2018.

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUESTS VRR-01, REVISION 0; VRR-02, REVISION 0; AND VRR-04, REVISION 0

FIFTH 10-YEAR INTERVAL INSERVICE TESTING PROGRAM

EXELON GENERATION COMPANY, LLC

JAMES A. FITZPATRICK NUCLEAR POWER PLANT

DOCKET NO. 50-333

1.0 INTRODUCTION

By letter dated August 3, 2017, as supplemented by letter dated October 26, 2017 (Agencywide Documents Access and Management System Accession Nos. ML17219A123 and ML17299A560, respectively), Exelon Generation Company, LLC (Exelon or the licensee) submitted Relief Requests VRR-01, Revision 0; VRR-02, Revision 0; and VRR-04, Revision 0, to the U.S. Nuclear Regulatory Commission (NRC or the Commission). The licensee requested alternative tests in lieu of 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 IST program at the James A. FitzPatrick Nuclear Power Plant (FitzPatrick) during the fifth 10-year IST program interval, which is scheduled to begin on June 1, 2018, and end on September 30, 2027.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested to use proposed alternatives in Relief Request VRR-02, Revision 0, and Relief Request VRR-04, Revision 0, on the basis that the alternatives provide an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(z)(2), the licensee requested to use the proposed alternative in Relief Request VRR-01, Revision 0, on the basis that the ASME OM Code requirements present an undue hardship, without a compensating increase in the level of quality or safety.

2.0 REGULATORY EVALUATION

Section 50.55a(f), "Preservice and Inservice testing requirements," of 10 CFR requires, in part, that IST 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).

Section 50.55a(z) of 10 CFR states that alternatives to the requirements of paragraphs (b) through (h) of 10 CFR 50.55a, or portions thereof, must be submitted and authorized by the NRC prior to implementation. The applicant or licensee must demonstrate that: (1) the proposed alternative would provide an acceptable level of quality and safety, or (2) compliance

with the specified requirements would result in hardship or unusual difficulty, without a compensating increase in the level of quality and safety. Section 50.55a of 10 CFR allows the NRC to authorize alternatives and to grant relief from ASME Code requirements upon making the necessary findings.

The guidance that the NRC staff considered in its review include the following:

- NUREG-0933, "Resolution of Generic Safety Issues," Issue 105, "Interfacing Systems LOCA [Loss-of-Coolant Accident] at LWRs [Light-Water Reactors]," December 2011 (ADAMS Accession No. ML11353A382), which provides a single-source repository of all NRC generic safety issue reviews.

- NUREG-1482, Revision 2, "Guidelines for Inservice Testing at Nuclear Power Plants," October 2013 (ADAMS Accession No. ML13295A020), which provides acceptable guidance to licensees to establish a basic understanding of the regulatory basis for pump and valve IST programs.

- NUREG/CR-5928, "Final Report of the ISLOCA Research Program," August 2007 (ADAMS Accession No. ML072430731), which quantifies the risk associated with an interfacing system loss-of-coolant accident (ISLOCA) event.

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 alternatives requested by the licensee.

3.0 TECHNICAL EVALUATION

The applicable ASME OM Code Edition and Addenda for FitzPatrick during the fifth 10-year IST program interval is the 2004 Edition through the 2006 Addenda.

3.1 Licensee's Relief Request VRR-01, Revision 0

Applicable Code Requirements

Subsection ISTC-5151, "Valve Stroke Testing," (a), states that "Active valves shall have their stroke times measured when exercised in accordance with ISTC-3500."

Subsection ISTC-5151, "Valve Stroke Testing," (c), states that "Stroke time shall be measured to at least the nearest second."

Components for Which Relief is Requested

Table 1

Valve ID	Function	Category	Class
07SOV-104A	Traversing In-Core Probe (TIP) Containment Isolation Valve (CIV)	A	2
07SOV-104B	TIP CIV	A	2
07SOV-104C	TIP CIV	A	2

Reason for Alternative Request

The Category A containment isolation solenoid operated valves identified in this request have no safety function in the open direction as they open to allow the passage of the TIP assembly and drive cable for flux mapping operations. These valves have an active safety function in the closed direction in response to a primary containment isolation system signal to seal the TIP guide tubes. Therefore, an exercise test and subsequent stroke time test are only required in the closed direction.

The design of the TIP control system does not allow for measurement of the closure stroke times of valves 07SOV-104A, B, and C. Measuring the closure stroke times in accordance with the ASME OM Code would require a costly computer control system modification. Closure of valves 07SOV-104A, B, and C could also be accomplished by an alternative method, but this method would require manual extraction and retraction of the TIP from the shield block. This method of testing would be contrary to the principles of keeping radiation exposure as low as reasonably achievable because it would result in radiation exposure to personnel performing the test.

The proposed alternative test ensures the operation of valves 07SOV-104A, B, and C in both directions and provides an acceptable level of quality and safety. This method meets the desired outcome of monitoring valve stroke time for degradation since the computer controls the 10-second delay and the additional approximate 2 seconds for valve closure should indicate the actual stroke time.

Proposed Alternative Testing

As an alternative to the ASME OM Code required 5-year test interval, the licensee proposed to measure overall cycle time (opened and closed) for the TIP CIVs 07SOV104A, B, and C, in accordance with Subsection ISTC-5152. Exelon will time the opening (10-second delay time included) and closing cycle for valves 07SOV-104A, B, and C. The time from open initiation to receipt of the closed light for each valve will be monitored with a stop watch.

NRC Staff Evaluation

The NRC staff reviewed the information in Relief Request VRR-01, Revision 0. Subsection ISTC-5151 of ASME OM Code details the requirements for valve stroke testing of solenoid operated valves. In lieu of these requirements, the licensee proposed to full stroke exercise each valve noted in Table 1 and determine proper operation by using the computer control system for the TIP solenoid valves, which includes a provision for measuring valve cycle time (opened and closed). The computer control system opens the subject valve, maintains it energized for 10 seconds, and deenergizes the valve allowing the solenoid valve to stroke closed (< 2 seconds). The total computer control system test is ≤ 12 seconds. Exelon will apply Subsection ISTC-5152(a), which requires that each valve exhibit no more than ± 25 percent change in stroke time when compared to the reference value, except that the full-stroke limiting time for each valve will be truncated at 12 seconds.

Based on its review, the NRC staff finds that the proposed alternative is consistent with the guidance in NUREG-1482, Revision 2, paragraph 4.2.3. Therefore, the NRC staff concludes that the proposed alternative provides an acceptable level of quality and safety.

3.2. Licensee's Relief Request VRR-02, Revision 0

Applicable Code Requirements

Subsection ISTC-3510, "Exercising Test Frequency," states, in part, that "Active Category A, Category B, and Category C check valves shall be exercised nominally every 3 months, except as provided by ISTC-3520, ISTC-3540, ISTC-3550, ISTC-3570, ISTC-5221, and ISTC-5222."

Subsection ISTC-3522, "Category C Check Valves," (c), states that "If exercising is not practicable during operation at power and cold shutdowns, it shall be performed during refueling outages."

Subsection ISTC-3700, "Position Verification Testing," states, in part, that "Valves with remote position indicators shall be observed locally at least once every 2 years to verify that valve operation is accurately indicated."

Components for Which Relief is Requested

Table 2

Valve ID	System	Category	Class
02-2EFV-PS-128A	Reactor Water Recirculation (RWR) Excess Flow Check Valve (EFCV)	A/C	1
02-2EFV-PS-128B	RWR EFCV	A/C	1
02-2EFV-PT-24A	RWR EFCV	A/C	1
02-2EFV-PT-24B	RWR EFCV	A/C	1
02-2EFV-PT-25A	RWR EFCV	A/C	1
02-2EFV-PT-25B	RWR EFCV	A/C	1
02-2EFV1-DPT-111A	RWR EFCV	A/C	1
02-2EFV1-DPT-111B	RWR EFCV	A/C	1
02-2EFV1-FT-110A	RWR EFCV	A/C	1
02-2EFV1-FT-110C	RWR EFCV	A/C	1
02-2EFV1-FT-110E	RWR EFCV	A/C	1
02-2EFV1-FT-110G	RWR EFCV	A/C	1
02-2EFV2-DPT-111A	RWR EFCV	A/C	1
02-2EFV2-DPT-111B	RWR EFCV	A/C	1
02-2EFV2-FT-110A	RWR EFCV	A/C	1
02-2EFV2-FT-110C	RWR EFCV	A/C	1
02-2EFV2-FT-110E	RWR EFCV	A/C	1
02-2EFV2-FT-110G	RWR EFCV	A/C	1
02-3EFV-11	Nuclear Boiler (NB) EFCV	A/C	1
02-3EFV-13A	NB EFCV	A/C	1
02-3EFV-13B	NB EFCV	A/C	1
02-3EFV-15A	NB EFCV	A/C	1
02-3EFV-15B	NB EFCV	A/C	1

Valve ID	System	Category	Class
02-3EFV-15N	NB EFCV	A/C	1
02-3EFV-17A	NB EFCV	A/C	1
02-3EFV-17B	NB EFCV	A/C	1
02-3EFV-19A	NB EFCV	A/C	1
02-3EFV-19B	NB EFCV	A/C	1
02-3EFV-21A	NB EFCV	A/C	1
02-3EFV-21B	NB EFCV	A/C	1
02-3EFV-21C	NB EFCV	A/C	1
02-3EFV-21D	NB EFCV	A/C	1
02-3EFV-23A	NB EFCV	A/C	1
02-3EFV-23B	NB EFCV	A/C	1
02-3EFV-23C	NB EFCV	A/C	1
02-3EFV-23D	NB EFCV	A/C	1
02-3EFV-23	NB EFCV	A/C	1
02-3EFV-25	NB EFCV	A/C	1
02-3EFV-31A	NB EFCV	A/C	1
02-3EFV-31B	NB EFCV	A/C	1
02-3EFV-31C	NB EFCV	A/C	1
02-3EFV-31D	NB EFCV	A/C	1
02-3EFV-31E	NB EFCV	A/C	1
02-3EFV-31F	NB EFCV	A/C	1
02-3EFV-31G	NB EFCV	A/C	1
02-3EFV-31H	NB EFCV	A/C	1
02-3EFV-31J	NB EFCV	A/C	1
02-3EFV-31K	NB EFCV	A/C	1
02-3EFV-31L	NB EFCV	A/C	1
02-3EFV-31M	NB EFCV	A/C	1
02-3EFV-31N	NB EFCV	A/C	1
02-3EFV-31P	NB EFCV	A/C	1
02-3EFV-31R	NB EFCV	A/C	1
02-3EFV-31S	NB EFCV	A/C	1
02-3EFV-33	NB EFCV	A/C	1
13EFV-01A	NB EFCV	A/C	1
13EFV-01B	NB EFCV	A/C	1
13EFV-02A	NB EFCV	A/C	1
13EFV-02B	NB EFCV	A/C	1
14EFV-31A	NB EFCV	A/C	1
14EFV-31B	NB EFCV	A/C	1
23EFV-01A	High Pressure Coolant Injection (HPCI) EFCV	A/C	1

Valve ID	System	Category	Class
23EFV-01B	HPCI EFCV	A/C	1
23EFV-02A	HPCI EFCV	A/C	1
23EFV-02B	HPCI EFCV	A/C	1
29EFV-30A	Main Steam (MS) EFCV	A/C	1
29EFV-30B	MS EFCV	A/C	1
29EFV-30C	MS EFCV	A/C	1
29EFV-30D	MS EFCV	A/C	1
29EFV-34A	MS EFCV	A/C	1
29EFV-34B	MS EFCV	A/C	1
29EFV-34C	MS EFCV	A/C	1
29EFV-34D	MS EFCV	A/C	1
29EFV-53A	MS EFCV	A/C	1
29EFV-53B	MS EFCV	A/C	1
29EFV-53C	MS EFCV	A/C	1
29EFV-53D	MS EFCV	A/C	1
29EFV-54A	MS EFCV	A/C	1
29EFV-54B	MS EFCV	A/C	1
29EFV-54C	MS EFCV	A/C	1
29EFV-54D	MS EFCV	A/C	1

Reason for Alternative Request

The ASME OM Code requires check valves to be exercised quarterly during plant operation, or if valve exercising is not practicable during plant operation and cold shutdown, it shall be performed during refueling outages. Based on past experience, EFCV testing during in-service leakage testing can become the outage critical path and could possibly extend the outage if all EFCVs were to be tested during this time frame. The testing requires isolation of the instruments associated with each EFCV and opening of a drain valve to actuate the EFCV. Process fluid will be contaminated to some degree, requiring special measures to collect flow from the drain valve and also contributes to an increase in personnel radiation exposure.

Proposed Alternative Testing

The licensee proposed to exercise test, by full-stroke to the position required to fulfill its function, a representative sample of EFCVs every refuel outage. The representative sample is based on approximately 20 percent of the valves each cycle such that each valve is tested at least once every 10 years (nominal). Industry experience as documented in General Electric (GE) Topical Report NEDO-32977-A/B21-00658-01, "Excess Flow Check Valve Testing Relaxation, June 2000 (ADAMS Accession No. ML003729011), indicates that EFCVs have a very low failure rate.

The instrument lines at Fitzpatrick have a flow restricting orifice upstream of the EFCVs to limit reactor water leakage in the event of rupture. The Fitzpatrick Final Safety Analysis Report (FSAR), paragraph 7.1.6, "Supplemental NSSS Supplier Information," does not credit the EFCVs, but instead credits the installed orifice for limiting the release of reactor coolant

following an instrument line break. Thus, a failure of an EFCV, though not expected as a result of this request, is bounded by the FSAR analysis. The licensee's test experience is consistent with the findings in NEDO-32977-A. The NEDO-32977-A topical report indicates similarly that many reported test failures at other plants were related to test methodologies and not actual EFCV failures.

The EFCV failures will be documented in the Fitzpatrick's Corrective Action Program as an equipment and surveillance test failure. The failure will be evaluated and corrected to ensure EFCV performance remains consistent with the extended test interval, a minimum acceptance criteria of less than or equal to one failure per year on a 3-year rolling average will be required.

NRC Staff Evaluation

The EFCVs are installed on instrument lines to limit the release of fluid in the event of an instrument line break. The EFCVs are not required to close in response to a containment isolation signal and are not required to operate under post-LOCA conditions. The EFCVs are required to be tested in accordance ASME OM Code ISTC-3510. The proposed change revises the surveillance frequency by allowing a "representative sample" of EFCVs to be tested every refueling outage.

The NRC staff reviewed NEDO-32977-A and issued its safety evaluation on March 14, 2000 (ADAMS Accession No. ML003691722). In its safety evaluation, the NRC staff found that the test interval could be extended up to a maximum of 10 years. In conjunction with this finding, the NRC staff noted that each licensee that adopts the relaxed test interval program for EFCVs must have a failure feedback mechanism and corrective action program to ensure EFCV performance continues to be bounded by the topical report results. Also, each licensee is required to perform a plant-specific radiological dose assessment, EFCV failure analysis, and release frequency analysis to confirm that they are bounded by the generic analyses of the topical report.

The NRC staff reviewed the licensee's current proposal and a previous NRC-approved request for the fourth IST interval dated November 27, 2007 (ADAMS Accession No. ML072910422), for its applicability to GE Nuclear's topical report NEDO-32977-A, as well as conformance with the NRC staff's guidance regarding radiological dose assessment, EFCV failure rate, release frequency, and the proposed failure feedback mechanism and corrective action program.

Based on its review, the NRC staff concludes that the radiological consequences of an EFCV failure are sufficiently low and acceptable, and that the alternative testing in conjunction with the corrective action plan provides a high degree of valve reliability and operability. Therefore, the NRC staff finds that the licensee's proposed test alternative provides an acceptable level of quality and safety.

3.3. Licensee's Relief Request VRR-04, Revision 0

Applicable Code Requirements

Subsection 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 their seat leakages are within acceptable limits.

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

Components for Which Relief is Requested

Table 3

Valve ID	Function	Category	Class
10AOV-68A	Residual Heat Removal (RHR) A Low Pressure Coolant Injection (LPCI) Testable Check Valve	A/C	1
10AOV-68B	RHR A LPCI Testable Check Valve	A/C	1
10MOV-25A	RHR A LPCI Inboard Injection Valve	A	1
10MOV-25B	RHR B LPCI Inboard Injection Valve	A	1
14AOV-13A	CSP A Reactor Isolation Testable Check Valve	A/C	1
14AOV-13B	CSP B Reactor Isolation Testable Check Valve	A/C	1
14MOV-12A	Core Spray Loop A Inboard Isolation Valve	A	1
14MOV-12B	Core Spray Loop B Inboard Isolation Valve	A	1
10MOV-17	RHR Shutdown Cooling Outboard Isolation Valve	A	1
10MOV-18	RHR Shutdown Cooling Inboard Isolation Valve	A	1

Reason for Alternative Request

At FitzPatrick, pressure isolation valves (PIVs) are Category A or Category A/C valves within the scope of Subsection ISTC-3630 of the ASME OM Code. This alternative to allow for scheduling of leak tests for the valves identified in Table 3 to a performance-based frequency that is the same as 10 CFR Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors," Option B, "Performance-Based Requirements," testing, would provide an acceptable level of quality and safety.

Proposed Alternative Testing

The licensee proposed an alternative test frequency in lieu of the requirements found in Subsection ISTC-3630(a) for the ten applicable PIVs listed in Table 3. Appendix J to 10 CFR Part 50 was amended to improve the focus of the body of regulations by eliminating prescriptive requirements that are marginal to safety and to provide licensees greater flexibility for cost-effective implementation methods for meeting regulatory safety objectives.

Nuclear Energy Institute (NEI) 94-01, Revision 3A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," July 2012 (ADAMS Accession No. ML12221A202), describes the risk-informed basis for extended test intervals under Option B. That justification documents valves that have demonstrated good leakage rate performance over two consecutive cycles are subject to future failures predominantly governed by the random failure rate of the component. The NEI 94-01, Revision 3A guidance also presents the results of a comprehensive risk analysis, including the statement that "The risk impact associated with increasing test intervals is negligible (less than 0.1 percent of total risk)."

The guidance in NUREG-0933 discussed 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 leak-rate testing does not identify functional problems that may inhibit the valve's ability to reposition from open to close.

Fitzpatrick proposed to perform PIV testing at intervals specified in NEI 94-01. Program guidance will be established such that if any of the valves fail either the CIV test or PIV test, the test interval for both tests will be reduced to once every 30 months until they can be reclassified as good performers per the performance evaluation requirements of Appendix J, Option B. The test intervals for the valves identified in this request will be determined in the same manner as is done for CIV testing under Option B. The test interval may be extended upon completion of two consecutive periodic PIV tests with results within the prescribed acceptance criteria. Any PIV test failure will require a return to the initial interval until good performance can again be established.

The risks associated with extending the leakage test interval to a maximum of 75 months are extremely low. The basis for this alternative request is the historically good performance of the PIVs. This alternative will also provide significant reductions in radiation dose.

NRC Staff Evaluation

The NRC staff reviewed the information in Relief Request VRR-04, Revision 0. The licensee proposed to functionally test and verify the leakage rate of these PIVs using the 10 CFR Part 50, Appendix J, Option B performance-based schedule. Valves would initially be tested at the required interval schedule, which is currently every refueling outage, or 2 years, as specified by the ASME OM Code, Section ISTC-3630(a). Valves that have demonstrated good performance for two consecutive cycles may have their test interval extended to 75 months. 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.

Pressure isolation valves are defined as two valves in series within the reactor coolant pressure boundary, which 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 under the NUREG/CR-5928 ISLOCA research program. The NUREG/CR-5928 research program analyzed boiling-water reactor (BWR) and pressurized-water reactor designs. The conclusion of the analysis resulted in ISLOCA not being a risk concern for BWR design. FitzPatrick is a BWR design.

Appendix J, Option B to 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 1.163, "Performance-Based Containment Leak-Test Program," September 1995 (ADAMS Accession No. ML003740058). Regulatory Guide 1.163 endorses NEI 94-01, Revision 0, "Industry Guideline for Implementing Performance Based Option of 10 CFR 50, Appendix J," dated July 21, 1995 (ADAMS Accession No. ML11327A025), with the limitation that Type C components test interval cannot extend greater than 60 months. The current version of NEI 94-01 is Revision 3-A, which allows Type C containment isolation valves test intervals to be extended to 75 months, with a permissible extension for nonroutine emergent conditions of 9 months (84 months total). The NRC staff finds the guidance in NEI 94-01, Revision 3-A, acceptable (safety evaluation dated June 8, 2012, and approval letter

dated December 2, 2016; available at ADAMS Accession Nos. ML121030286 and ML12226A546, respectively), with the following conditions:

1. Extended interval for Type C local leakage-rate tests (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 9 months (total maximum interval of 84 months for Type C tests) are permissible only for nonroutine emergent conditions. This provision (9-month extension) does not apply to valves that are restricted and/or limited to 30-month intervals in NEI 94-01, Revision 3A, Section 10.2, "Type B and Type C Testing Frequencies" (such as BWR main steam isolation valves), 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 and Type 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.

Based on its review, the NRC staff finds that the proposed alternative was previously authorized for use at FitzPatrick for the fourth IST program interval under safety evaluation dated March 16, 2012 (ADAMS Accession No. ML12072A113). As noted in the licensee's proposed alternative, the valves have maintained a history of good performance. 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. Therefore, the NRC staff concludes that the licensee's proposed alternative provides an acceptable level of quality and safety.

4.0 CONCLUSION

As set forth above, the NRC staff determines that for Relief Request VRR-02, Revision 0, and Relief Request VRR-04, Revision 0, the proposed alternative provides 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) for Relief Request VRR-02, Revision 0, and Relief Request VRR-04, Revision 0. Therefore, the NRC staff authorizes the use of the alternative request for FitzPatrick for the fifth 10-year IST program interval, which is scheduled to begin on June 1, 2018, and end on September 30, 2027.

As set forth above, the NRC staff determines that for Relief Request VRR-01, Revision 0, the proposed alternative provides reasonable assurance that the affected components are operationally ready. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2) for Relief Request VRR-01, Revision 0. Therefore, the NRC staff authorizes the use of the alternative request for FitzPatrick for the fifth 10-year IST program interval, which is scheduled to begin on June 1, 2018, and end on September 30, 2027.

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

Principal Contributor: Michael Farnan

Date: April 13, 2018

SUBJECT: JAMES A. FITZPATRICK NUCLEAR POWER PLANT – ISSUANCE OF RELIEF REQUESTS FOR ALTERNATIVES TO CERTAIN ASME OM CODE REQUIREMENTS (CAC NOS. MG0052, MG0053, MG0054, MG0055, MG0056, MG0057, MG0058, AND MG0061; EPID L-2017-LLR-0067, L-2017-LLR-0068, L-2017-LLR-0069, L-2017-LLR-0070, L-2017-LLR-0071, L-2017-LLR-0072, L-2017-LLR-0073, AND L-2017-LLR-0074) DATED APRIL 13, 2018

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