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

August 15, 2013

Mr. Michael J. Pacilio
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: THREE MILE ISLAND NUCLEAR STATION, UNIT 1 - RELIEF REQUESTS PR-01, PR-02, AND VR-02, ASSOCIATED WITH THE FIFTH 10-YEAR INSERVICE TEST INTERVAL (TAC NOS. MF0046, MF0047 AND MF0048)

Dear Mr. Pacilio:

By letter dated November 7, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12313A344), supplemented by letter dated April 17, 2013 (ADAMS Accession No. ML13108A003), Exelon Generation Company, LLC (the licensee) submitted proposed alternative requests PR-01, PR-02, and VR-02, associated with the fifth 10-year inservice test (IST) interval, at Three Mile Island, Unit 1 (TMI-1). These proposed alternatives apply to certain requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code). PR-01 relates to a proposed alternative method for flow measurement during testing of the Nuclear Services Closed Cooling Water Pumps, submitted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 55a(a)(3)(i). PR-02 requests approval for the use of ASME OM Code Case OMN-18, "Alternate Testing Requirements for Pumps Tested Quarterly Within ±20 percent of Design Flow," for various pumps in the TMI-1 IST program, also submitted pursuant to 10 CFR 50.55a(a)(3)(i). OMN-18 would allow the licensee to not perform the Comprehensive Pump Test under certain conditions, and for certain pumps, as specified in the request. VR-02 requests approval for the licensee to utilize a tolerance band (grace period) for the intervals specified in the ASME OM Code, similar to the tolerance band allowed for surveillances in the plant technical specifications. This request was submitted pursuant to 10 CFR 50.55a(a)(3)(ii).

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the proposed alternatives as discussed in the enclosed safety evaluation. The NRC staff review concludes that for alternative requests PR-01 and PR-02, the proposed alternatives provide an acceptable level of quality and safety. For proposed alternative VR-02, the proposed alternative provides reasonable assurance that the components are operationally ready. Therefore, the NRC staff authorizes proposed alternative requests PR-01, PR-02 and VR-02, as proposed, at TMI-1, for the fifth 10-year IST program interval, which begins on October 15, 2013, and is scheduled to end on October 14, 2023.

If you have any questions, please contact the TMI-1 Project Manager, Mr. Peter J. Bamford, at 301-415-2833.

Sincerely,

Veronica Rodriguez, Acting Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-289

Enclosure:
Safety Evaluation

cc w/encl: Distribution via ListServ

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

REGARDING RELIEF REQUESTS PR-01, PR-02, AND VR-02

ASSOCIATED WITH THE FIFTH 10-YEAR INSERVICE TEST INTERVAL

EXELON GENERATION COMPANY, LLC

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

DOCKET NO. 50-289

1.0 INTRODUCTION

By letter dated November 7, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12313A344), as supplemented by letter dated April 17, 2013 (ADAMS Accession No. ML13108A003), Exelon Generation Company, LLC (the licensee) submitted proposed alternative requests PR-01, PR-02, and VR-02 to the U.S. Nuclear Regulatory Commission (NRC). The licensee proposed alternatives 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 IST program at the Three Mile Island Nuclear Station, Unit 1 (TMI-1), for the fifth 10-year IST program interval.

Specifically, PR-01 relates to a proposed alternative method for flow measurement during testing of the Nuclear Services Closed Cooling Water (NSCCW) Pumps. PR-02 requests approval for the use of ASME OM Code Case OMN-18, "Alternate Testing Requirements for Pumps Tested Quarterly within ±20 Percent of Design Flow," for various pumps in the TMI-1 IST program. OMN-18 would allow the licensee to not perform the Comprehensive Pump Test (CPT) under certain conditions, applicable to certain pumps, as specified in the request. VR-02 would allow the licensee to utilize a tolerance band (grace period) to the intervals specified in the ASME OM Code, similar to the tolerance band allowed for surveillances in the plant technical specifications. Pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(a)(3)(i), the licensee proposed the use of the alternatives in PR-01 and PR-02 on the basis that the alternatives provide an acceptable level of quality and safety. Pursuant to 10 CFR 50.55a(a)(3)(ii), the licensee proposed the use of the alternative in VR-02, on the basis that the ASME OM Code requirement presents an undue hardship without a compensating increase in the level of quality or safety.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(f), "Inservice Testing Requirements," IST of certain ASME Code Class 1, 2, and 3 components must meet the requirements of the ASME OM Code and applicable addenda.

Pursuant to 10 CFR 50.55a(a)(3), alternatives to ASME Code requirements may be authorized by the NRC if the licensee demonstrates that: (i) the proposed alternatives provide an acceptable level of quality and safety, or (ii) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Based on the above, and subject to the NRC's findings with respect to authorizing the proposed alternatives to the ASME OM Code given below, the NRC staff finds that regulatory authority exists for the licensee to request, and the NRC staff to authorize, the alternatives requested by the licensee.

The Code of Record for the TMI-1 fifth 10-year IST program is the ASME OM Code, 2004 Edition with Addenda through OMb-2006. The TMI-1 fifth 10-year IST interval begins on October 15, 2013, and is currently scheduled to end on October 14, 2023.

3.0 TECHNICAL EVALUATION

3.1 Alternative Request PR-01, Nuclear Service Closed Cooling Water Flow Rate Measurement During Group A Tests

In this alternative, the licensee proposed the use of a modified quarterly Group A test for the IST of the NSCCW pumps. The NSCCW pumps have plant identification designators NS-P-1A, NS-P-1B, and NS-P-1C.

3.1.1 The Licensee's Proposed Alternative

The ASME OM Code, Section ISTB-5121, "Group A Test Procedure," (b), states that "The resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to the reference flow rate value."

According to the licensee, it is not practical to reduce the number of pumps in service to one to allow for single-pump testing during power operation due to the system design and plant operating requirements. The licensee also states that individual pump flow rates cannot be measured during the Group A test because the flow instrumentation for this system is located in the common discharge header for all three of the subject pumps. Further, according to the licensee, the piping configuration does not contain, nor would the system design permit, the installation of accurate individual pump flow measuring devices due to the turbulence caused by the valve and elbow configuration on the discharge of the pumps.

As an alternative to meeting the ASME OM Code requirements, the licensee proposes:

a. TMI, Unit 1 will continue to perform quarterly testing using a modified Group A test procedure as described above [in the application dated November 7, 2012, supplemented on April 17, 2013]. With two paired-pumps in service, the required Group A test parameters will be measured except for individual pump flow rate. Individual pump flow rates will be calculated and compared against calculated individual pump flow rate reference values. During this test, the differential pressure will be throttled to the reference value.

b. Vibration measurements will be recorded and compared to their reference values. Deviations from the reference value will be compared with the ranges specified in Table ISTB-5121-1 for Group A tests. Corrective actions will be taken in accordance with ISTB-6200.

c. During testing of the subject pumps (quarterly and refueling), TMI, Unit 1 will perform full spectrum vibration analysis, which is done above Code required vibration testing.

d. The pumps will continue to be tested individually in accordance ISTB-5123, "Comprehensive Test Procedure," during refueling outages.

3.1.2 NRC Staff Evaluation

The ASME OM Code, Table ISTB-3400-1, notes that Group A and Group B tests shall be performed quarterly, and CPTs shall be performed biennially. ISTB-5121(b) requires that for Group A tests, the resistance of the system shall be varied until the flow rate equals the reference point. The differential pressure shall then be determined and compared to its reference value. Alternatively, the flow rate shall be varied until the differential pressure equals the reference point and the flow rate determined and compared to its reference value.

The three NSCCW pumps are centrifugal pumps. The flow instrumentation for this system is located in the common discharge header for all three of the subject pumps. Due to the system design and plant operating requirements, it is not practical to reduce the number of pumps in service to one to allow for single-pump testing during power operation. The licensee states that the piping configuration does not contain, nor would the system design permit the installation of, accurate individual pump flow measuring devices due to the turbulence caused by the valve and elbow locations in the piping configuration on the discharge of the pumps. Compliance with the OM Code requirement to measure individual pump flow rate would require installation of new piping or certain system modifications. As such, the licensee requests an alternative to the quarterly requirements of individual flow measurement, and proposes to calculate the individual pump flow rate from the combined flow measurements of three paired-pump tests (A-B, B-C, and A-C). The calculated individual pump flow rates will be compared against individual pump flow rate calculated reference values. The pump will continue to be tested individually in accordance with ISTB-5123 for CPTs during refueling outages. In addition, for the quarterly Group A tests and CPTs, TMI-1 will also perform a full spectrum vibration analysis for the affected pumps.

The NRC staff finds that the method of calculating individual flow rate from three-paired pump tests (A-B, B-C, and A-C) provides similar and equally acceptable flow rates for each affected pump, as opposed to individually measured flow rates. On the basis that direct measurements of individual pump flow rate is not available, and that the modified quarterly Group A test provides similar and equally acceptable results, the NRC concludes that the proposed alternative provides an acceptable level of quality and safety for testing the NSCCW pumps.

3.2 Alternative Request PR-02, Use of Code Case OMN-18

In this alternative, the licensee proposed the use of ASME OM Code Case OMN-18, "Alternate Testing Requirements for Pumps Tested Quarterly within ±20% [percent] of Design Flow," for the following pumps:

Pump	Description	Category
AH-P-3A	Control Building Chilled Water Supply Pump A	Group A
AH-P-3B	Control Building Chilled Water Supply Pump B	Group A
BS-P-1A	Reactor Building Spray Pump A	Group AB
BS-P-1B	Reactor Building Spray Pump B	Group AB
DC-P-1A	Decay Heat Closed Cooling Water Pump A	Group A
DC-P-1B	Decay Heat Closed Cooling Water Pump B	Group A
DR-P-1A	Decay Heat River Water Pump A	Group A
DR-P-1B	Decay Heat River Water Pump B	Group A
SF-P-1A	Spent Fuel Cooling Pump A	Group A
SF-P-1B	Spent Fuel Cooling Pump B	Group A

The ASME OM Code Committee has approved Code Case OMN-18, which allows licensees to perform a Group A test in lieu of the biennial CPT if the Group A tests are conducted at ±20 percent of the design flow rate and pressure instruments that meet the CPT accuracy requirement of ±1/2 percent are used. This Code Case was not reviewed for approval in Regulatory Guide (RG) 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," dated June 2003.

3.2.1 The Licensee's Proposed Alternative

The licensee proposes that in lieu of the CPT requirements of the ASME OM Code, Table ISTB-3400-1, Group A tests will be performed quarterly within ±20 percent of the pump design flow rate, with pressure measuring instrumentation meeting the (±1/2 percent) instrument accuracy requirements of Table ISTB-3510-1 specified for the biennial CPT. In addition, the licensee has elected to restrict the upper limit for acceptable range to 106 percent of the reference value (flow rate or differential pressure), which is more conservative than the 110 percent upper limit established in Tables ISTB-5121-1 and ISTB-5221-1 for Group A tests.

Vibration testing will continue to be performed under the proposed modified Group A test and the acceptance criteria for vibration will be the same as required for Group A tests as shown in Tables ISTB-5121-1 and ISTB-5221-1.

The licensee states that using the provisions of the request as an alternative to the requirements specified in ISTB-3400 and Tables ISTB-3400-1, ISTB-5121-1, and ISTB-5221-1, will provide a reasonable alternative to the ASME OM Code requirements based on the determination that the proposed alternative will provide adequate indication of pump performance, permit consistent detection of component degradation, and continue to provide an acceptable level of quality and safety.

3.2.2 NRC Staff Evaluation

The licensee is proposing to perform a quarterly IST for all the pumps listed above in accordance with a modified Group A test procedure, in lieu of a quarterly Group A test and a biennial CPT.

The ASME OM Code requires that for Group A pumps, a Group A test be performed every quarter, and a CPT be performed biennially. The Group A test is performed within ±20 percent of the pump design flow rate and the pressure instrument accuracy is ±2 percent. The upper limit

for the "Acceptable Range" for flow rate and differential pressure is 110 percent of the reference values, and the high value for the "Required Action Range" for flow rate and differential pressure is greater than 110 percent of the reference values. The CPT is performed within ±20 percent of the pump design flow rate, the pressure instrument accuracy is ±1/2 percent, and the upper limit of the "Acceptable Range" and the high value for the "Required Action Range" for flow rate and differential pressure is 103 percent of the reference values. Vibration monitoring is performed during both the Group A tests and the CPTs.

The licensee proposes that for the pumps covered by this proposed alternative, a modified Group A quarterly test will be performed using ASME OM Code Case OMN-18, with modified "Acceptable" and "Required Action" ranges, and the biennial CPT will not be performed. The modified Group A quarterly test would be performed within ±20 percent of the pump design flow rate, using more accurate pressure instrumentation that is required for a CPT (±1/2 percent instead of ±2 percent). The licensee will use a more limiting upper bound of 106 percent of the reference value for the "Acceptable Range" for flow rate and differential pressure, in lieu of 110 percent of the reference value that is normally required by the ASME OM Code for Group A tests. However, this upper bound of 106 percent is greater than the upper bound value of 103 percent for the biennial CPT. Using more accurate pressure gauges and a more limiting "Acceptable Range" (compared to the Group A test "Acceptable Range") during every modified quarterly Group A test compensates for the elimination of the CPT with its more limiting "Acceptable Range" upper bound value of 103 percent.

OMN-18 was published in the 2009 Edition of ASME OM Code. This edition of the ASME OM Code has not been incorporated by reference into 10 CFR 50.55a, and OMN-18 has not been incorporated into RG 1.192. However, the NRC staff has reviewed OMN-18, and currently has no concerns with its use, providing that the upper end values of the Group A test "Acceptable Ranges" for flow and differential pressure are 106 percent of the respective reference values, and the high values of the "Required Action Ranges" for flow and differential pressure are greater than 106 percent of the respective reference values. The NRC staff considers the proposed alternative acceptable because all of the tests will be performed with pressure gauges with ±1/2 percent accuracy. The elimination of the CPT, with its more limiting "Acceptable Range" upper bound of 103 percent of the reference value, is compensated for by using more accurate pressure instrumentation on every quarterly test. Regular testing with more accurate instrumentation and tighter acceptance criteria will provide for better trending of pump performance. Therefore, the NRC finds that the proposed alternative provides an acceptable level of quality and safety for testing and acceptance criteria for the pumps specified in this proposed alternative.

3.3 Alternative Request VR-02, ASME OM Code Test Frequencies

This request applies to the frequency specifications of the ASME OM Code. The frequencies for tests are provided in various sections of the ASME OM Code, but do not include a tolerance band.

3.3.1 The Licensee's Proposed Alternative

According to the licensee:

> ASME OM Code Section IST establishes the inservice test frequency for all components within the scope of the Code. The frequencies (e.g., quarterly) have always been interpreted as "nominal" frequencies (generally as defined in the Table 3.2 of NUREG-1482, Revision 1) and Owners routinely applied the

surveillance extension time period (i.e., grace period) contained in the plant Technical Specifications (TS) Surveillance Requirements (SRs). The TS typically allow for a less than or equal to 25% extension of the surveillance test interval to accommodate plant conditions that may not be suitable for conducting the surveillance. However, regulatory issues have been raised concerning the applicability of the TS "Grace Period" to ASME OM Code required inservice test frequencies.

The lack of a tolerance band (grace period) on the ASME OM Code inservice test frequency restricts operational flexibility. There may be a conflict where a surveillance test could be required (i.e., its Frequency could expire), but where it is not possible or not desired that it be performed until sometime after a plant condition or associated Technical Specification is applicable. Therefore, to avoid this conflict, the IST should be performed when it can be and should be performed.

The NRC recognized this potential issue in the TS by allowing a frequency tolerance as described in the TMI Unit 1 TS SR 4.0.1. The lack of a similar tolerance applied to the OM Code testing places an unusual hardship on the plant to adequately schedule work tasks without operational flexibility.

Thus, just as with TS required surveillance testing, some tolerance is needed to allow adjusting ASME OM Code testing intervals to suit the plant conditions and other maintenance and testing activities. This assures operational flexibility when scheduling surveillance tests that minimize the conflicts between the need to complete the surveillance and plant conditions.

The licensee's alternative proposes to adopt wording equivalent to the ASME Board of Nuclear Codes and Standards (BNCS)-approved OM Code Case OMN-20, for determining acceptable tolerances for pump and valve test frequencies. This Code Case was approved by the ASME OM Code Standards Committee in February 2012. The proposed alternative applies to the various frequency specifications of the ASME OM Code for all pumps and valves contained within the IST Program scope.

The licensee's proposal states:

ASME OM Code establishes component test frequencies that are based either on elapsed time periods (e.g., quarterly, 2 years, etc.) or on the occurrence of plant conditions or events (e.g., cold shutdown, refueling outage, upon detection of a sample failure, following maintenance, etc.).

a. Components whose test frequencies are based on elapsed time periods shall be tested at the frequencies specified in ASME OM Code Section IST with a specified time period between tests as shown in the table below and as defined in TMI, Unit 1 TS Section 1.25.

b. The specified time period between tests may be reduced or extended as follows:

   1) For periods specified as less than 2 years, the period may be extended by up to 25% for any given test. This is consistent with TMI, Unit 1 TS Section 1.25, "FREQUENCY NOTATION."

2) For periods specified as greater than or equal to 2 years, the period may be extended by up to 6 months for any given test.

3) All periods specified may be reduced at the discretion of the owner (i.e., there is no minimum period requirement).

4) Period extensions may also be applied to accelerated test frequencies (e.g., pumps in Alert Range).

Frequency	Specified Time Period Between Tests (all values are 'not to exceed'; no minimum periods are specified)
Quarterly (or every 3 months)	92 days
Semiannually (or every 6 months)	184 days
Annually (or every year)	366 days
x Years	x calendar years where 'x' is a whole number of years ≥ 2

c. Components whose test frequencies are based on the occurrence of plant conditions or events (e.g., cold shutdown, refueling outage, upon detection of a sample failure, following maintenance, etc.) may not have their period between tests extended except as allowed by the ASME OM Code.

Period extension is to facilitate test scheduling and considers plant operating conditions that may not be suitable for performance of the required testing (e.g., performance of the test would cause an unacceptable increase in the plant risk profile due to transient conditions or other ongoing surveillance test or maintenance activities). Period extensions are not intended to be used repeatedly merely as an operational convenience to extend test intervals beyond those specified. This request is not applicable to frequencies in Subsection ISTD.

3.3.2 NRC Staff Evaluation

Historically, licensees have applied, and the NRC staff has accepted, the standard TS definitions for IST intervals (including allowable interval extensions) to ASME OM Code required testing (Reference NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," Revision 1, Section 3.1.3). Recently, the NRC staff reconsidered the allowance of the TS testing intervals and interval extensions, for IST not associated with TS SRs. As noted in Regulatory Issue Summary (RIS) 2012-10, "NRC Staff Position on Applying Surveillance Requirements 3.0.2 and 3.0.3 to Administrative Controls Program Tests," the NRC determined that programmatic test frequencies can't be extended in accordance with the Improved Standard TS SR 3.0.2. This includes all IST described in the ASME OM Code not specifically required by the TS SRs.

Following this development, the NRC staff sponsored and co-authored an ASME OM Code inquiry and Code Case to modify the ASME OM Code to include TS-like test interval definitions and interval extension criteria. The resultant BNCS-approved Code Case OMN-20, was

approved by the ASME Operation and Maintenance Standards Committee on February 15, 2012, with the NRC representative voting in the affirmative on this proposed Code Case. The licensee proposed to adopt language equivalent to the BNCS-approved Code Case OMN-20.

The NRC staff finds that requiring the licensee to meet the ASME OM Code requirements, without an allowance for defined frequency and frequency extensions for IST of pumps and valves, results in a hardship without a compensating increase in the level of quality and safety. Based on the prior acceptance by the NRC staff of the similar TS test interval definitions and interval extension criteria, the staff finds that implementation of the test interval definitions and interval extension criteria contained in the ASME BNCS-approved OM Code Case OMN-20 is acceptable. Allowing usage of an alternative equivalent to Code Case OMN-20 provides reasonable assurance of operational readiness of pumps and valves subject to the ASME OM Code IST.

4.0 CONCLUSION

As set forth above, the NRC staff has determined that for alternative requests PR-01 and PR-02, the proposed alternatives provide an acceptable level of quality and safety. For alternative VR-02, the proposed alternative provides reasonable assurance that the 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(a)(3)(i) for requests PR-01 and PR-02. The NRC staff also concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(3)(ii) for request VR-02. All other ASME OM Code requirements for which relief was not specifically requested and approved remain applicable. Therefore, the NRC staff authorizes alternative requests PR-01, PR-02 and VR-02, as proposed, at TMI-1, for the fifth 10-year IST program interval, which begins on October 15, 2013, and is scheduled to end on October 14, 2023.

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Date: August 15, 2013

If you have any questions, please contact the TMI-1 Project Manager, Mr. Peter J. Bamford, at 301-415-2833.

Sincerely,

/ra/
Veronica Rodriguez, Acting Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-289

Enclosure:
Safety Evaluation

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