



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

November 10, 2015

Mr. Bryan C. Hanson
President and Chief Nuclear Officer
Exelon Nuclear
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: SAFETY EVALUATION OF RELIEF REQUEST GPRR-6 FOR THE THIRD
10-YEAR INTERVAL OF THE INSERVICE TESTING PROGRAM FOR
LIMERICK GENERATING STATION, UNITS 1 AND 2 (CAC NOS. MF6094 AND
MF6095)

Dear Mr. Hanson:

By letter dated April 13, 2015, as supplemented by letter dated August 24, 2015, Exelon Generation Company, LLC (the licensee) requested an alternative to the requirements of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code), associated with pump inservice testing (IST) at Limerick Generating Station, Units 1 and 2 (Limerick). Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(z)(1), the licensee requested to use the proposed alternative in Relief Request GPRR-6 on the basis that the alternative provides an acceptable level of quality and safety. The subject relief request is for the third 10-year interval of the IST program at Limerick.

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the subject relief request as documented in the enclosed Safety Evaluation (SE). Our SE concludes that the proposed alternative will provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes the proposed alternative for the remainder of the Limerick third 10-year IST interval.

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

B. Hanson

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If you have any questions concerning this matter, please contact the Limerick Project Manager, Mr. Richard Ennis, at (301) 415-1420 or Richard.Ennis@nrc.gov.

Sincerely,

A handwritten signature in black ink, appearing to read "Douglas A. Broaddus", with a stylized flourish at the end.

Douglas A. Broaddus, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-352 and 50-353

Enclosure:
Safety Evaluation

cc w/enclosure: Distribution via Listserv



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO RELIEF REQUEST GPRR-6 FOR THE

THIRD 10-YEAR INTERVAL OF THE INSERVICE TESTING PROGRAM

EXELON GENERATION COMPANY, LLC

LIMERICK GENERATING STATION, UNITS 1 AND 2

DOCKET NOS. 50-352 AND 50-353

1.0 INTRODUCTION

By letter dated April 13, 2015, as supplemented by letter dated August 24, 2015 (Agencywide Documents Access and Management System Accession Nos. ML15104A531 and ML15236A033, respectively, Exelon Generation Company, LLC (the licensee) requested an alternative to the requirements of the American Society of Mechanical Engineers (ASME) *Code for Operation and Maintenance of Nuclear Power Plants* (OM Code), associated with pump inservice testing (IST) at Limerick Generation Station, Units 1 and 2 (Limerick). Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Section 50.55a(z)(1), the licensee requested to use the proposed alternative in Relief Request GPRR-6, Revision 0, on the basis that the alternative provides an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

The regulation in 10 CFR 50.55a(f), states, in part, that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with the specified ASME OM Code and applicable addenda incorporated by reference in the regulations.

The regulation in 10 CFR 50.55a(z) states that alternatives to the requirements of paragraph (f) of 10 CFR 50.55a may be used, when authorized by the U.S. Nuclear Regulatory Commission (NRC), if the licensee demonstrates (1) the proposed alternatives 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.

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 NRC to authorize, the alternative requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Alternative Request GPRR-6 Revision 0

ISTB-3300, "Reference Values," (e)(1) states that, "Reference values shall be established within $\pm 20\%$ of pump design flow rate for the comprehensive test."

ISTB-3300, "Reference Values," (e)(2) states, in part, that "Reference values shall be established within $\pm 20\%$ if pump design flow for the Group A and Group B tests, if applicable."

ISTB-3400, "Frequency of Inservice Tests," states that, "An inservice test shall be run on each pump as specified in Table ISTB-3400-1."

Table ISTB-3400-1, "Inservice Test Frequency," requires Group A and Group B tests to be performed quarterly and a comprehensive test to be performed biennially.

Table ISTB-3510-1, "Required Instrument Accuracy," specifies the instrument accuracies for Group A, Group B, comprehensive, and preservice tests.

Table ISTB-5121-1, "Centrifugal Pump Test Acceptance Criteria," defines the required acceptance criteria for Group A, Group B, and comprehensive tests for centrifugal pumps.

Table ISTB-5221-1, "Vertical Line Shaft and Centrifugal Pumps Test Acceptance Criteria," defines the required acceptance criteria for Group A, Group B, and comprehensive tests for vertical line shaft pumps.

Table ISTB-5321-2, "Reciprocating Positive Displacement Pump Test Acceptance Criteria," defines the required acceptance criteria for Group A, Group B, and comprehensive tests for centrifugal pumps.

ISTB-5123, "Comprehensive Test Procedure," provides the comprehensive pump test requirements for centrifugal pumps (except vertical line shaft centrifugal pumps).

ISTB-5223, "Comprehensive Test Procedure," provides the comprehensive pump test requirements for vertical line shaft centrifugal pumps.

ISTB-5323, "Comprehensive Test Procedure," provides the comprehensive pump test requirements for positive displacement pumps.

ASME OM Code Case OMN-18, "Alternative Testing Requirements for Pumps Tested Quarterly within $\pm 20\%$ of Design Flow," states, in part, that, "The Group A test maybe performed quarterly within $\pm 20\%$ of pump design flow rate, with instrumentation meeting the requirements of Table ISTB-3510-1 for the comprehensive and preservice tests, and no comprehensive test is required."

In its submittal, the licensee has requested an alternative to the Group A, Group B, and comprehensive pump testing requirements of ISTB-3300, ISTB-3400, ISTB-5123, ISTB-5223, ISTB-5323, and Tables ISTB-3400-1, ISTB-3510-1, ISTB-5121-1, ISTB-5221-1, and ISTB-5321-2. The components affected by this alternative request are listed in Table 1 below.

The Limerick third 10-year IST program interval began on February 18, 2010, and is scheduled to end on January 7, 2020. The applicable ASME OM Code edition and addenda for the Limerick third 10-year IST program interval is the 2004 Edition.

Table 1

Pump Number	Pump Name	ASME Code Class	Current ASME OM Code Group	Pump Type
0A-P162	Control Structure Chilled Water Pump	3	A	Centrifugal
0B-P162	Control Structure Chilled Water Pump	3	A	Centrifugal
0A-P548	Emergency Service Water Pump	3	A	Vertical Line Shaft
0B-P548	Emergency Service Water Pump	3	A	Vertical Line Shaft
0C-P548	Emergency Service Water Pump	3	A	Vertical Line Shaft
0D-P548	Emergency Service Water Pump	3	A	Vertical Line Shaft
0A-P506	Residual Heat Removal (RHR) Service Water (RHRSW) Pump	3	A	Vertical Line Shaft
0B-P506	RHRSW Pump	3	A	Vertical Line Shaft
0C-P506	RHRSW Pump	3	A	Vertical Line Shaft
0D-P506	RHRSW Pump	3	A	Vertical Line Shaft
1A-P206	Core Spray (CS) Pump	3	B	Vertical Line Shaft
1B-P206	CS Pump	3	B	Vertical Line Shaft
1C-P206	CS Pump	3	B	Vertical Line Shaft
1D-P206	CS Pump	3	B	Vertical Line Shaft
2A-P206	CS Pump	3	B	Vertical Line Shaft
2B-P206	CS Pump	3	B	Vertical Line Shaft
2C-P206	CS Pump	3	B	Vertical Line Shaft
2D-P206	CS Pump	3	B	Vertical Line Shaft
1A-P202	RHR Pump	2	A	Vertical Line Shaft
1B-P202	RHR Pump	2	A	Vertical Line Shaft
2A-P202	RHR Pump	2	A	Vertical Line Shaft
2B-P202	RHR Pump	2	A	Vertical Line Shaft
1C-P202	RHR Pump	2	B	Vertical Line Shaft

Pump Number	Pump Name	ASME Code Class	Current ASME OM Code Group	Pump Type
1D-P202	RHR Pump	2	B	Vertical Line Shaft
2C-P202	RHR Pump	2	B	Vertical Line Shaft
2D-P202	RHR Pump	2	B	Vertical Line Shaft
10-P204	High Pressure Coolant Injection (HPCI) Pump	2	B	Centrifugal
20-P204	HPCI Pump	2	B	Centrifugal
10-P203	Reactor Core Isolation Cooling (RCIC) Pump	2	B	Centrifugal
20-P203	RCIC Pump	2	B	Centrifugal
1A-P256	Safeguard Piping Fill Pump	2	B	Centrifugal
1B-P256	Safeguard Piping Fill Pump	2	B	Centrifugal
2A-P256	Safeguard Piping Fill Pump	2	B	Centrifugal
2B-P256	Safeguard Piping Fill Pump	2	B	Centrifugal
1A-P208	Standby Liquid Control (SLC) Pump	2	B	Reciprocating Positive Displacement
1B-P208	SLC Pump	2	B	Reciprocating Positive Displacement
1C-P208	SLC Pump	2	B	Reciprocating Positive Displacement
2A-P208	SLC Pump	2	B	Reciprocating Positive Displacement
2B-P208	SLC Pump	2	B	Reciprocating Positive Displacement
2C-P208	SLC Pump	2	B	Reciprocating Positive Displacement

Note: The licensee has stated that all pumps currently classified as Group B pumps will be reclassified as Group A pumps when ASME OM Code Case OMN-18 is invoked.

Reason for Request

In its letter dated April 13, 2015, the licensee stated:

The ASME Code committees have approved Code Case OMN-18, "Alternate Testing Requirements for Pumps Tested Quarterly within $\pm 20\%$ of Design Flow." This Code Case has not been approved for use in Regulatory Guide 1.192, Revision 1, "Operation and Maintenance Code Case Acceptability, ASME OM Code," August 2014.

This Code Case allows the Owner to not perform the Comprehensive Pump Test (CPT) with the associated acceptance criteria, if the quarterly test is performed at $\pm 20\%$ of design flow and the instrumentation meets the accuracy requirements of Table ISTB-3510-1 for the Comprehensive and Preservice Tests. The basis for the testing strategy in this Code Case is that a quarterly Group A pump test, performed at the CPT flow rate with more accurate instrumentation, is more effective in assessing a pump's operational readiness, through trending, than a standard Group A test in conjunction with a biennial CPT. The only exception to the accuracy requirements is contained in Relief Request No. 90-PRR-1 (Safety Evaluation Report dated November 17, 2009, ML093080382), which allows the use of analog flow instrumentation that does not meet the 2% accuracy requirement noted in Table ISTB-3510-1. This relief request only pertains to the Control Structure Chilled Water Pumps (0A-P162 & 0B-P162). In addition to the accuracy requirements in Table ISTB-3510-1, ISTB-3510 requires that the full scale range of each analog instrument shall be not greater than three times the reference value. The relief request demonstrates that when both the 2% accuracy requirement of full scale and the requirement that full scale be not greater than three times the reference value are considered, the installed instrumentation yields a permissible inaccuracy of $\pm 6\%$ of the reference value.

Additionally, ISTB allows the Owner to test a pump that otherwise meets the requirements of Group B, as a Group A pump, and test according to the provisions of Code Case OMN-18. In doing this, the Owner is obtaining additional data (vibration) quarterly, rather than once every two years.

As a result of the increased requirements on the parameters imposed by the proposed alternative during applicable quarterly tests, there is no added value in performing the biennial comprehensive test on the subject pumps.

Proposed Alternative

The licensee is proposing to use the provisions of Code Case OMN-18 and perform a modified Group A test quarterly and not perform the ASME OM Code-required CPT. The modified Group A test will be run quarterly at ± 20 percent of the pump's design flow rate using $\pm 1/2$ percent accurate gauges to determine the pump differential pressure for centrifugal and vertical line shaft and pump discharge pressure for reciprocating positive displacement pumps. Vibration tests will be performed, and the vibration acceptance criteria for the proposed alternative test will remain identical to the standard Group A test. Additionally, the licensee will utilize an Acceptable Range high limit of 106 percent or lower of the reference values for the

quarterly modified Group A testing, and all pumps currently classified as Group B pumps in Table 1 will be reclassified as Group A pumps when ASME OM Code Case OMN-18 is invoked.

The use of more accurate pressure gauges and a more limiting Acceptable Range during every modified quarterly Group A test compensates for the elimination of the CPT. Regular testing with more accurate instrumentation and tighter acceptance criteria will provide for better trending of pump performance. Instead of performing seven tests with pressure instruments with ± 2 percent accuracy and then performing the eighth test with pressure instruments with $\pm 1/2$ percent accuracy, all eight tests will be performed with the same $\pm 1/2$ percent accurate instruments. Due to the improved accuracy, consistent testing methodology, and the addition of quarterly vibration monitoring on the pumps currently classified as Group B pumps, deviations in actual pump performance indicative of impending degradation are more easily recognized during quarterly performance trending activities.

NRC Staff Evaluation

The licensee is proposing to perform a quarterly IST for all pumps listed in Table 1 in accordance with a modified Group A test procedure, in lieu of quarterly Group A tests and a CPT every 2 years. In its letter dated August 24, 2015, the licensee stated that the pumps listed in Table 1 that are currently classified as Group B pumps will be reclassified as Group A pumps when ASME OM Code Case OMN-18 is invoked.

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 (or discharge) pressure is 110 percent of the reference values, and the high value for the "Required Action Range" for flow rate and differential (or discharge) 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 $\pm 1/2$ percent, and the high value of "Required Action Range" is greater than 103 percent of the respective reference values. Vibration monitoring is performed during both the Group A tests and the CPTs.

The licensee proposes that for the pumps listed in Table 1 above, a modified Group A quarterly test will be performed using ASME OM Code Case OMN-18, with modified "Required Action" ranges, and the biennial comprehensive test 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 (i.e., instrument accuracy required for a CPT ($\pm 1/2$ percent instead of ± 2 percent)). The licensee will use a more limiting high value of 106 percent for the "Required Action Range" in lieu of 110 percent of the respective reference values that is normally required by the ASME OM Code for Group A tests. However, the high value of 106 percent of the respective reference values is greater than the high value of 103 percent of the respective reference values for the biennial CPT. Using more accurate pressure gauges and a more limiting "Required Action Range" (compared to the Group A test "Required Action Range") during every modified quarterly Group A test compensates for the elimination of the CPT with its more limiting "Required Action Range" high value of 103 percent of the respective reference values.

OMN-18 was published in the 2009 Edition of the 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 Regulatory Guide (RG) 1.192. However, the NRC staff has reviewed OMN-18 and currently has no concerns with its usage, providing that the high values of the Group A test "Required Action Range" for flow (Q) and differential (or discharge) pressure (P) 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 $\pm 1/2$ percent accuracy. The elimination of the CPT, with its more limiting "Required Action Range" of upper bound of 103 percent of the reference value, is compensated for by using more accurate pressure gauges 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 staff finds that the proposed alternative provides an acceptable level of quality and safety for testing the pumps listed in Section 1.0 above.

4.0 CONCLUSION

As set forth above, the NRC staff has determined that for alternative request GPRR-6, Revision 0, for Limerick, 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). Therefore, the NRC staff authorizes Relief Request GPRR-6 for the remainder of the Limerick third IST program interval, which began on February 18, 2010, and is scheduled to end on January 7, 2020.

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

Principal Contributor: R. Wolfgang

Date: November 10, 2015

B. Hanson

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If you have any questions concerning this matter, please contact the Limerick Project Manager, Mr. Richard Ennis, at (301) 415-1420 or Rick.Ennis@nrc.gov.

Sincerely,

/RA JLamb for/

Douglas A. Broaddus, Chief
Plant Licensing Branch I-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket Nos. 50-352 and 50-353

Enclosure:
Safety Evaluation

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