



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

August 28, 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 REQUEST  
VR-01, PROPOSED ALTERNATIVE TESTING OF THE PRESSURIZER PILOT  
OPERATED RELIEF VALVE (TAC NO. ME9819)

Dear Mr. Pacilio:

By letter dated October 18, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12292A585), supplemented by letter dated March 15, 2013 (ADAMS Accession No. ML13074A700), Exelon Generation Company, LLC (the licensee) submitted proposed alternative request VR-01, associated with the fifth 10-year inservice test (IST) interval at Three Mile Island, Unit 1 (TMI-1). This proposed alternative applies to certain requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code). VR-01 proposes an alternative method for testing of the Pressurizer Pilot Operated Relief Valve (PORV), submitted pursuant to Title 10 of the *Code of Federal Regulations*, Part 50, Section 55a(a)(3)(i).

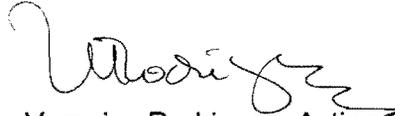
The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of the proposed alternative, as discussed in the enclosed safety evaluation. The NRC staff review concludes that alternative request VR-01 provides an acceptable level of quality and safety, and that it provides reasonable assurance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

M. Pacilio

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

Sincerely,

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

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  
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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REGARDING RELIEF REQUEST VR-01

PROPOSED ALTERNATIVE TESTING OF THE PRESSURIZER

PILOT OPERATED RELIEF VALVE

EXELON GENERATION COMPANY, LLC

THREE MILE ISLAND NUCLEAR STATION, UNIT 1

DOCKET NO. 50-289

1.0 INTRODUCTION

By letter dated October 18, 2012 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML12292A585), supplemented by letter dated March 15, 2013 (ADAMS Accession No. ML13074A700), Exelon Generation Company, LLC (the licensee) submitted proposed alternative request VR-01, associated with the fifth 10-year inservice test (IST) interval, at Three Mile Island, Unit 1 (TMI-1). The proposed alternative applies to certain requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code). VR-01 relates to a proposed alternative method for testing of the Pressurizer Pilot Operated Relief Valve (PORV), submitted pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Part 50, Section 55a(a)(3)(i). Specifically, the proposed alternative would utilize a bench testing protocol for the PORV in lieu of certain provisions of the ASME OM Code that require in-situ testing.

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 alternative 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 alternative requested by the licensee.

Enclosure

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 Licensee's Alternative Request

The ASME OM Code requirements that apply to the TMI-1 PORV (1-RC-RV-2), applicable to this request, include requirements to exercise the valve after replacement, and requirements to perform exercise testing of the valve once per fuel cycle.

Currently, the licensee satisfies these requirements by manually stroking the valve once every operating cycle. This is performed during plant startup following a refueling outage. The valve must also be stroke-timed during this exercise test. The licensee is proposing an alternative to this required in-situ testing for several reasons, stated as follows in the submittal dated October 18, 2012:

There are several disadvantages to the in-situ testing of the PORV. The PORV is a 2.5 inch Dresser Electromatic, solenoid actuated, pilot operated relief valve. Operation of the pilot valve vents the chamber under the main valve disc which causes the main valve to open. The PORV requires steam pressure for the main disc to open. Stroke testing the PORV during cold shutdown conditions does not exercise the main valve disc which, therefore, does not satisfy the subject ASME OM Code requirements. To test the PORV in-place, the RCS [reactor coolant system] must be pressurized to supply the necessary fluid (steam) pressure to open the main valve disc.

Also, since the PORV design does not provide direct obturator position indication, the valve disc position must be inferred from alternate indications (tailpipe  $\Delta T$ , acoustic monitoring, RCS pressure decrease, or quench tank pressure or level rise).

In-situ testing of the PORV also results in an in-surge of cooler water from the RCS hot leg into the pressurizer. The resulting thermal cycle on the pressurizer surge line is a thermal stress concern, as described in NRC Bulletin 88-08 ("Thermal Stresses in Piping Connected to Reactor Coolant Systems") and should be avoided.

Requiring that the PORV be tested in-place prevents plant personnel from verifying proper reseating of the main valve disc because the discharge is not visible as it is during bench testing. Minor leakage would not be readily evident before it would cause damage to the main valve disc/seat. Excessive leakage from the pilot valve can lead to inadvertent opening of the main valve and impair its ability to re-close.

The proposed alternative will allow testing of the PORV that is appropriate to demonstrate functionality without cycling the valve in place using reactor steam pressure. This is consistent with NUREG-0737, "Clarification of TMI Action Plan Requirements," Item II.K.3.16, "Reduction of Challenges and Failures of Relief

Valves," which recommended that the number of relief valve openings be reduced as much as possible and that unnecessary challenges should be avoided.

The licensee proposes the following alternatives to the requirements regarding stroking following replacement, and once per refueling cycle, for the fifth IST interval at TMI-1:

- 1) Bench testing of the PORV to satisfy valve exercise and stroke time requirements is performed at the vendor test facility prior to installation. Exercising of the valve at both the normal power operation set point and the Low Temperature Overpressure Protection (LTOP) set point (as provided in Technical Specification 3.1.12, "Pressurizer Power Operated Relief Valve (PORV), Block Valve, and Low Temperature Overpressure Protection (LTOP)") will be verified during this testing. Measured stroke time will be based on the pressure response indication of main disc opening.
- 2) The installed valve will be removed and replaced each refueling outage, with a spare valve that has been previously bench tested.
- 3) The removed valve will be bench tested within one year of removal from the system.
- 4) In-situ exercising of the PORV will be performed only as necessary to reestablish operational readiness after maintenance on an installed valve.

In the application, the licensee provided a detailed justification for the use of bench testing in lieu of in-situ testing. Included in this justification was a table showing bench test stroke time history between August 31, 2000, and November 4, 2011, for both the LTOP function and the normal reactor coolant system pressure function of the PORV. According to the licensee, these results consistently show that the valve opens well within the 2-second limiting stroke time allowed by ISTC-5114(c) for rapid acting valves.

### 3.2 NRC Staff Evaluation

The licensee has categorized the Pressurizer PORV, 1-RC-RV-2, as OM Code category B/C and, therefore, the valve is subject to the applicable test requirements of both ASME OM Code Subsection ISTC for power-operated valves and Mandatory Appendix I for pressure relief devices.

The requirements of Mandatory Appendix I allow the valve to be removed from the system for testing and do not specifically require that the valve be exercised when it is returned to the system. However, paragraphs ISTC-3310 and ISTC-3510 could be interpreted to require in-situ exercising of the valve following replacement (ISTC-3310) or routinely at a once per fuel cycle frequency (ISTC-3510).

The licensee has determined that exercising the PORV in-situ is undesirable for a number of reasons. The NRC staff finds that exercising the PORV in-situ at normal steam pressures does present undesirable circumstances. There is some precedent in ASME OM Code itself for not exercising relief devices following reinstallation after testing. For Boiling Water Reactor (BWR) Class 1 Main Steam Pressure Relief Valves with Auxiliary Actuating Devices, Mandatory Appendix I-3410(d) allows that after removal and reinstallation for testing, the electrical and

pneumatic connections may be verified by inspection in lieu of test, and that valve main disk movement (i.e., exercise) is not required. While this ASME OM Code example is not specifically applicable to Pressurized Water Reactor PORVs, it is analogous.

There is further precedent in a number of prior licensing actions wherein the NRC staff has approved technical specification changes for various licensees to remove routine in-situ exercise requirements for BWR Class 1 safety/relief valves for the same and similar reasons as presented by this licensee.

The licensee has proposed alternatives, which include a series of verifications and controls to demonstrate the operational readiness of the valve:

- Multiple bench test verifications performed in the same orientation as the plant installation and using test conditions similar to those in the plant installation, including ambient temperature, valve insulation, and steam conditions:
  - exercising the pilot and main valve disk as a unit
  - set point verification
  - obturator movement verification
  - stroke time testing
  - seat leakage verification
  - refurbishment, as needed

The licensee indicates, and the NRC staff agrees, that performing some of these tests on the bench is actually preferred over in-situ testing because they can be performed more precisely.

Additional steps taken by the licensee to ensure operational readiness of the PORV are:

- Receipt inspection and storage in accordance with quality procedures to ensure protection against physical damage and moisture upon return to the plant site
- Pre-installation inspection for foreign material and damage
- Installation and connection in accordance with quality maintenance procedures
- Operation of the solenoid-actuated pilot valve (which controls the actuation of the valve main disk) in-situ to verify electrical power and control connections

The licensee has further stated that if maintenance is ever required on an installed valve, in-situ exercising will be performed to reestablish operational readiness.

The NRC staff has reviewed the licensee's proposed alternative and concludes that implementation of these alternatives will continue to meet the fundamental intent of ASME OM Code to assure the PORV operational readiness and to permit detection of PORV degradation. The proposed alternative demonstrates proper PORV operation without the need for in-situ testing with reactor steam, and therefore provides an acceptable level of quality and safety.

#### 4.0 CONCLUSION

As set forth above, the NRC staff determines that for alternative request VR-01, the proposed alternative provides an acceptable level of quality and safety and also provides reasonable assurance that the PORV is 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). All other ASME OM Code requirements for which relief was not specifically requested and approved remain applicable. Therefore, the NRC staff authorizes alternative request VR-01, to be implemented at TMI-1 for the fifth 10-year IST program interval, which is scheduled to begin on October 15, 2013, and conclude on October 14, 2023.

Principle Contributor: John Billerbeck, NRR

Date: August 28, 2013

M. Pacilio

- 2 -

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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