

May 28, 2003

Mr. John L. Skolds, President
Exelon Nuclear
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 - RELIEF
REQUEST RV-30E, INSERVICE TESTING PROGRAM RELIEF REGARDING
MAIN STEAM ELECTROMATIC RELIEF VALVES AND SAFETY/RELIEF
VALVES (TAC NO. MB8739)

Dear Mr. Skolds:

By letter dated May 1, 2003, as supplemented May 2 and May 15, 2003, Exelon Generation Company, LLC (the licensee) submitted a request for relief from the American Society of Mechanical Engineers/American National Standards Institute, Operation and Maintenance of Nuclear Power Plants, OM-1987, Part 1, requirements for the Quad Cities Nuclear Power Station (Quad Cities), Units 1 and 2. The Relief Request RV-30E proposed changes to Section 3.4.1.1(d) related to the remote actuation of main steam pressure relief devices with auxiliary actuating devices.

Based on the information provided in the Relief Request RV-30E, the Nuclear Regulatory Commission (NRC) staff concludes that the alternative proposed for the third 10-year inservice testing (IST) interval will provide an acceptable level of quality and safety. Therefore, pursuant to 10 CFR 50.55a(a)(3)(i), the NRC staff authorizes the IST program alternative proposed in Relief Request RV-30E for the third 10-year IST interval for Quad Cities Units 1 and 2, which is scheduled to conclude on February 18, 2004, and March 10, 2004, respectively.

The detailed results of the staff's review are provided in the enclosed safety evaluation. If you have any questions concerning this action, please call Mr. F. Lyon of my staff at (301) 415-2296.

Sincerely,

/RA/

Anthony J. Mendiola, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-254 and 265

Enclosure: Safety Evaluation

cc w/encl: See next page

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Docket Nos. 50-254 and 50-265
Enclosure: Safety Evaluation
cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

OF THE THIRD TEN-YEAR INTERVAL INSERVICE TESTING PROGRAM

REQUEST FOR RELIEF RV-30E

EXELON GENERATION COMPANY, LLC

QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-254 AND 50-265

1.0 INTRODUCTION

By letters dated May 1 and May 2, 2003, Exelon Generation Company, LLC, the licensee for Quad Cities Nuclear Power Station (Quad Cities), Units 1 and 2, submitted a request for relief from certain American Society of Mechanical Engineers (ASME) Code inservice testing (IST) requirements pertaining to testing of the Unit 1 main steam Electromatic relief valves (ERVs) and the Units 1 and 2 main steam safety/relief valves (S/RVs). In an additional letter dated May 15, 2003, the licensee supplemented its request with additional information. Specifically, the licensee's relief request RV-30E seeks relief from performing certain stroke testing of the ERVs and S/RVs. The affected components are the Quad Cities, Units 1 and 2 main steam relief valves listed below.

Equipment Piece Number	Description
1-0203-3A	Main Steam 3A Safety/Relief Valve
2-0203-3A	Main Steam 3A Safety/Relief Valve
1-0203-3B	Main Steam 3B Electromatic Relief Valve
1-0203-3C	Main Steam 3C Electromatic Relief Valve
1-0203-3D	Main Steam 3D Electromatic Relief Valve
1-0203-3E	Main Steam 3E Electromatic Relief Valve

2.0 REGULATORY EVALUATION

The Code of Federal Regulations, 10 CFR 50.55a, requires that IST of certain ASME Code Class 1, 2 and 3 pumps and valves be performed in accordance with Section XI of the ASME Boiler and Pressure Vessel Code and applicable addenda, except where relief has been requested and granted or proposed alternatives have been authorized by the Commission pursuant to 10 CFR 50.55a(f)(6)(i), (a)(3)(i), or (a)(3)(ii). In proposing alternatives or requesting relief, the licensee must demonstrate that: (1) conformance is impractical for its facility; (2) the proposed alternative provides an acceptable level of quality and safety; or (3) compliance would result in a hardship or unusual difficulty without a compensating increase in the level of quality and safety. Pursuant to 10 CFR 50.55a, the Commission may authorize alternatives or grant relief from ASME Code requirements upon making the necessary findings. Nuclear Regulatory Commission (NRC) guidance contained in Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," provides alternatives to the Code requirements that

are acceptable to the NRC staff. Further guidance is given in GL 89-04, Supplement 1, and NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants."

For Quad Cities, Units 1 and 2, the regulations in 10 CFR 50.55a require that the IST program meet the requirements of the 1989 Edition of the ASME Code, Section XI which references the Operation and Maintenance (OM) standards, OM-1987, Part 1 (OM-1). Specifically, for main steam pressure relief valves with auxiliary actuating devices, OM-1, Section 3.4.1.1(d), requires that each valve that has been maintained or refurbished in place, removed for maintenance and testing, or both, and reinstalled shall be remotely actuated at reduced system pressure to verify open and close capability of the valve prior to resumption of electric power generation. The licensee seeks relief from the OM-1, Section 3.4.1.1(d) requirement and requests approval of the proposed alternative for the duration of the third 10-year IST interval for Unit 1, which ends on February 18, 2003, and for Unit 2, which ends on March 10, 2004.

The licensee's requested alternative is consistent with similar alternatives authorized for other facilities.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Basis for Relief

In the May 1, 2003, submittal, the licensee provides the following basis for the requested relief:

"Experience in the industry and at Quad Cities has indicated that manual actuation of main steam relief valves during plant operation can lead to valve seat leakage. There are four Dresser model 1525VX ERVs on Quad Cities, Unit 1 (i.e., 3B, 3C, 3D, and 3E). Each unit also has a dual function Target Rock model 7367F S/RV (i.e., 3A) which can actuate by either the safety mode or the relief mode. The main steam ERVs and S/RVs consist of a main valve disc and seat and a pilot valve. The 3A S/RV and 3C and 3D ERVs are currently exhibiting elevated tailpipe temperatures. Based on previous testing and temperature trends, the most likely cause of the high tailpipe temperatures is leakage from the main valve disc and seat, rather than leakage from the pilot valve.

ERV leakage from either the main valve disc or pilot valve results in increased suppression pool temperature. Leakage from the main valve disc and seat has little safety significance, as long as suppression pool temperature is maintained within technical specification limits.

S/RV leakage from either the main valve disc or pilot valve also results in increased suppression pool temperature. Leakage from the main valve disc and seat has little safety significance, as long as the pilot valve retains its function and suppression pool temperature is maintained within technical specification limits. However, leakage from the S/RV pilot valve can lead to inadvertent opening of the main valve, and the subsequent inability to re-close the valve.

Because of the elevated tailpipe temperatures due to seat leakage, replacement of the 3A S/RV is planned. In addition, the 3C and 3D ERVs may also be replaced, pending results of additional testing during the planned outage. The relief request will allow the testing of the S/RVs and ERVs such that full functionality is demonstrated through overlapping tests, without cycling the valves. The use of an overlapping series of tests has been successfully applied at other stations.

Additionally, the Boiling Water Reactor Owners' Group Evaluation of NUREG-0737, "Clarification of TMI Action Plan Requirements," Item II.K.3.16, "Reduction of Challenges and Failures of Relief Valves," recommended that the number of safety relief valve openings be reduced as much as possible and unnecessary challenges should be avoided."

3.2 Licensee's Evaluation of ERV Operational Experience at Nine Mile Point Unit 1

As part of its review of the Quad Cities alternative testing method, the NRC staff requested that the licensee address concerns regarding recent operating experience with ERVs at the Nine Mile Point Nuclear Station, Unit 1, nuclear power facility. The licensee addressed the staff's concerns and provided additional information in a letter dated May 15, 2003. Specifically, it was found that during a recent event (NRC Event Notification Report 39779) on April 21, 2003, at Nine Mile Point 1, failure of an electrical connection in an ERV solenoid resulted in inadequate solenoid actuating force for opening the pilot valve. Also, the proposed testing of the ERVs at a steam testing facility use a slave solenoid, not the solenoids installed in the plant. Since there will be no steam pressure resisting the opening of the pilot valve during the proposed dry stroke second test, there is less solenoid force required to open the pilot valve during this test than for operational conditions with steam pressure. In addition, as a result of an event at Nine Mile Point 1 on October 2, 2000, there were potential problems identified regarding dry stroking (i.e., without system steam pressure) of the ERV pilot valves. The dry stroking issue is discussed in NRC Inspection Report 50-220 and 50-410/2000-008 (ADAMS Accession No. ML003780274), which describes the dry stroking as a possible cause of significant damage to the pilot valves. These issues directly relate to the licensee's above described "second" test for the ERVs, after they are reinstalled, since any degradation within the solenoid should be identified by the proposed testing and the proposed dry stroking of the pilot valves should not result in damage to the valves as identified by the Nine Mile Point 1 experience.

To address the issues regarding the verification of the solenoid capability, the licensee stated that the solenoid actuator is designed to operate the pilot valve under all design conditions. The actuator includes two coils. One coil can be considered a pull-in coil, and the second considered a hold-in coil. The pull-in coil provides sufficient force to actuate the pilot, and then the hold-in coil provides sufficient force to maintain the pilot in an open position. Contacts designated as cutout contacts control the energization of these coils during solenoid motion. The licensee states that during inspection of the solenoid operator prior to testing, specific attention is given to maintenance and testing of the cutout contacts. An as found contact resistance value is measured, the contacts are cleaned, the associated springs and mechanisms are inspected, and as-left contact resistances are verified to be less than one ohm (i.e., closed) and greater than one megohm (i.e., open). Resistance checks and meggar tests are then performed on both coils. Finally, during electrical actuation, operating voltages and currents are verified to be within acceptance criteria limits. The licensee states that these steps provide substantial indication that the solenoid operator is capable of functioning as designed. The licensee also states that operating experience indicates that a solenoid that is capable of actuating the pilot in cold conditions is capable of actuating the pilot under normal operating conditions. The licensee states that pilot actuation and verification of coil and contact performance provides additional assurance that the ERVs will actuate when required.

The Nine Mile Point event described in NRC Event Notification Report 39779 was a failure of an ERV to open when actuated. The failure was reportedly due to inadequate solenoid force caused by high resistance in the cutout switch, such that the output force was not adequate to

overcome the pilot spring force. The licensee states that the proposed testing for the Quad Cities ERVs will include manual actuation of the electrical circuitry, solenoid actuator, pilot operating lever, and pilot plunger after installation in the plant. However, since this test will be performed prior to establishing the reactor pressure needed to overcome main valve closure forces, the main valve will not stroke during the test. The licensee states that since the proposed testing for the Quad Cities ERVs includes a manual actuation of the solenoid and pilot valve, the test will demonstrate that the solenoid force is adequate to overcome the pilot spring force. Resistance checks of the cutout switch will assure the solenoid is capable of producing its full output force.

The above referenced NRC inspection report for Nine Mile Point 1 states that the spurious operation and sticking of valve ERV-111 most probably was caused by a bent stem and partial disk-stem separation, and that dry cycling of pilot valves can cause the partial disk-stem separation. To address the issue regarding potential damage to the ERV pilot valves due to dry stroking, the licensee reviewed the inspection report for Nine Mile Point 1 and held discussions with the Nine Mile Point 1 licensee and the ERV vendor (Dresser).

The licensee states that, although it proposes to dry cycle the ERV pilot valves at Quad Cities, the proposed testing alternative can detect partial disk-stem separation. In addition to the above described testing at a steam test facility, the post-installation testing includes manual dry cycling of the pilot valve to verify that the stem travel and lever arm adjusting screw gap are within limits. Following this verification, the ERV solenoid will be energized to manually stroke the pilot valve. The stem travel and lever arm adjusting screw gap will then be rechecked to verify that these parameters are within limits following the dry cycling. The licensee states that partial disk-stem separation caused by dry cycling of the pilot valve will be detected during this recheck. Discussions with the ERV manufacturer, Dresser, concluded that this recheck would detect partial disk-stem separation caused by dry cycling of the pilot valve. In addition, the licensee has performed dry cycling of the pilot valves at Quad Cities for many years, with no signs of partial or full disc detachment. Therefore, the licensee states that the proposed testing is adequate to detect the partial disk-stem separation experienced at Nine Mile Point 1 during the simulated bench test described in the NRC inspection report.

The licensee states that its maintenance procedures for the ERV pilot valves include appropriate inspections of the stem, pilot valve bushing, and disc to identify any nicks, gouges, or other damage that could impair free movement. The licensee's procedure checks the gap at the end of the stem that has the thinnest cross section. This is the area most likely to be bent if not properly handled. In addition, free movement of the stem in the bushing and of the disc-to-stem connection are checked. This check assures that the stem is straight, the pilot can travel freely, and the pilot disc can seat properly.

3.3 Proposed Alternative Testing

The Quad Cities, Unit 1, ERVs are solenoid operated with a single stage pilot. Operation of the pilot valve vents the chamber under the main valve, which causes it to open. The Units 1 and 2 S/RVs have two pilots; both pilots operate in the safety mode. In the relief mode, the second-stage disc is stroked by the air plunger. The licensee states that the proposed testing uses overlapping tests to verify these valves function properly at operating conditions and are capable of being opened when installed in the plant.

The licensee states that the proposed changes will allow testing of manual actuation of the S/RVs and ERVs in two overlapping tests. The licensee states that the first test will be performed at a steam test facility, where it will be installed on a steam header in the same orientation as the plant installation. The test conditions in the test facility will be similar to those in the plant installation, including ambient temperature, valve insulation, and steam conditions. The valve will then be leak tested, functionally tested to ensure the valve is capable of opening and closing, and leak tested a final time. The licensee further states that the valve will then be shipped to the plant without any disassembly or alteration of the valve components. A receipt inspection will be performed in accordance with the requirements of the licensee's Quality Assurance Program upon arrival of the valve at Quad Cities. The licensee states that the storage requirements in effect at Quad Cities ensure the valves are protected from exposure to the environment, airborne contamination, acceleration forces, and physical damage. The licensee states that, prior to installation, the valve will again be inspected for foreign material and damage. The valve will then be installed, insulated, and electrically connected. Proper electrical connections will be verified per procedure. Electrical power to the control panel and signals causing application of power to the S/RV and ERV solenoids will be verified to be present at the control panel per procedure. In addition, ERV limit switches will be tested.

For the relief mode of S/RVs, the licensee states that the second test will be performed after installation in the plant by energizing a solenoid that pneumatically actuates a plunger located within the main valve body. Actuation of the plunger allows pressure to be vented from the top of the main valve piston. This allows reactor pressure to lift the main valve piston, which opens the main valve. However, the licensee states that since this test will be performed prior to establishing the reactor pressure needed to overcome main valve closure forces, the main valve will not stroke during the test.

For the ERVs, the licensee states that the second test will be performed with the pilot valve actuator mounted in its normal position. This will allow testing of the manual actuation electrical circuitry, solenoid, actuator, pilot operating lever, and pilot plunger. However, the licensee states that since this test will be performed prior to establishing the reactor pressure needed to overcome main valve closure forces, the main valve will not stroke during the test.

3.4 Evaluation

The staff has reviewed the licensee's request for relief and finds that with the proposed alternative testing of the ERVs and S/RVs, the functional capability of the valves is verified. A manual actuation and valve leakage test will be performed at a certified test facility using test conditions similar to those for the installed valves in the plant, including valve orientation, ambient temperature, valve insulation, and steam conditions. Following ERV and S/RV installation, the licensee's proposed testing includes verifying proper electrical and pneumatic supply connections and actuator performance. It is noted that, although the tests of the ERVs at the steam test facility are not performed with the actual valve solenoids installed in the plant, the solenoids are adequately tested and verified by separate tests. In addition, the licensee has adequately considered the applicable Nine Mile Point 1 operational experience regarding the necessary verification and testing of the ERV solenoid capability and the prevention and detection of possible damage to the ERV pilot valves during the proposed dry stroke testing following installation. Therefore, all of the components necessary to manually actuate the ERVs and S/RVs will continue to be tested to demonstrate the functional capability of the valves, without the need to stroke test the valves on-line with system steam pressure.

conditions. The staff also finds that the current testing requirements could result in seat leakage of the ERVs and S/RVs during power operation. Excessive seat leakage could interfere with detection and monitoring of pilot valve leakage and could result in excessive suppression pool temperatures. Also, leakage through an S/RV pilot valve could eventually result in the inadvertent opening of the S/RV.

The staff finds that the proposed alternative testing of the ERVs and S/RVs and associated components provides reasonable assurance of adequate valve operation and readiness. Therefore, the staff finds that the proposed alternative testing method to that required by OM-1, Section 3.4.1.1(d), is acceptable.

4.0 CONCLUSION

Based on the above evaluation, the staff concludes that, pursuant to 10 CFR 50.55a(a)(3)(i), the proposed alternative is authorized for Quad Cities, Units 1 and 2, on the basis that the proposed alternative provides an acceptable level of quality and safety. This alternative is authorized for the remainder of the third 10-year inservice testing intervals for Quad Cities, Units 1 and 2, which end on February 18, 2004, on March 10, 2004, respectively. The licensee's proposed testing provides reasonable assurance that the plant ERVs and S/RVs will perform their intended safety function.

Principal Contributor: G. Hammer

Date: May 28, 2003