October 19, 2004

Mr. Christopher M. Crane, President
and Chief Nuclear Officer
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

SUBJECT: DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3 AND QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2 - ISSUANCE OF AMENDMENTS FOR MAIN STEAM LINE RELIEF VALVES AND ASSOCIATED RELIEF REQUESTS (TAC NOS. MC1792, MC1793, MC1794 AND MC1795)

Dear Mr. Crane:

The U.S. Nuclear Regulatory Commission (Commission) has issued the enclosed Amendment No. 211 to Facility Operating License No. DPR-19 and Amendment No. 203 to Facility Operating License No. DPR-25 for Dresden, Units 2 and 3 respectively; and Amendment No. 222 to Facility Operating License No. DPR-29 and Amendment No. 217 to Facility Operating License No. DPR-30 for Quad Cities, Units 1 and 2 respectively. The amendments are in response to your application dated January 15, 2004, as supplemented by letter dated July 19, 2004.

The amendments modify the technical specification surveillance requirements to provide for an alternative means of testing the main steam Electromatic relief valves and the dual function Target Rock safety/relief valves. These valves provide reactor overpressure protection, automatic depressurization and low set relief functions. The proposed changes will allow demonstration of the valves' ability to function without requiring the valves to be cycled with steam pressure while installed.

The licensee's application also contained a relief request to provide for an alternative to the requirements of the American Society of Mechanical Engineers Code (ASME Code) inservice testing requirements for the Dresden, Units 2 and 3 and Quad Cities, Units 1 and 2 main steam Electromatic relief valves and safety/relief valves. The licensee seeks relief for the duration of the fourth 10-year inservice testing interval for Dresden, Units 2 and 3, which ends on October 31, 2012, and for the fourth 10-year inservice testing interval for Quad Cities, Units 1 and 2, which ends on February 18, 2013 for Unit 1 and on March 10, 2013 for Unit 2. The staff concludes that the proposed alternative to the ASME Code inservice testing requirements is authorized pursuant to Section 50.55a(a)(3)(i) of Title 10 of the *Code of Federal Regulations* (10 CFR), on the basis that the proposed alternative provides an acceptable level of quality and safety.

A copy of the Safety Evaluation is enclosed. The Notice of Issuance of the Amendment will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Gene Y. Suh, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos. 50-237, 50-249, 50-254 and 50-265

Enclosures:
1. Amendment No. 211 to DPR-19
2. Amendment No. 203 to DPR-25
3. Amendment No. 222 to DPR-29
4. Amendment No. 217 to DPR-30
5. Safety Evaluation - License Amendment
6. Safety Evaluation - Relief Request

cc w/encls: See next page

A copy of the Safety Evaluation is enclosed. The Notice of Issuance of the Amendment will be included in the Commission's biweekly *Federal Register* notice.

Sincerely,

/RA/

Gene Y. Suh, Chief, Section 2
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Dresden and Quad Cities Nuclear Power Stations

cc:

Site Vice President - Dresden Nuclear Power Station
Exelon Generation Company, LLC
6500 N. Dresden Road
Morris, IL 60450-9765

Dresden Nuclear Power Station Plant Manager
Exelon Generation Company, LLC
6500 N. Dresden Road
Morris, IL 60450-9765

Regulatory Assurance Manager - Dresden
Exelon Generation Company, LLC
6500 N. Dresden Road
Morris, IL 60450-9765

U.S. Nuclear Regulatory Commission
Dresden Resident Inspectors Office
6500 N. Dresden Road
Morris, IL 60450-9766

Chairman
Grundy County Board
Administration Building
1320 Union Street
Morris, IL 60450

Regional Administrator
U.S. NRC, Region III
801 Warrenville Road
Lisle, IL 60532-4351

Illinois Emergency Management Agency
Division of Disaster Assistance & Preparedness
110 East Adams Street
Springfield, IL 62701-1109

Document Control Desk - Licensing
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Senior Vice President - Nuclear Services
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Vice President of Operations - Mid-West Boiling Water Reactors
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Vice President - Licensing and Regulatory Affairs
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Director - Licensing and Regulatory Affairs
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Associate General Counsel
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Manager Licensing - Dresden, Quad Cities and Clinton
Exelon Generation Company, LLC
4300 Winfield Road
Warrenville, IL 60555

Site Vice President - Quad Cities Nuclear Power Station
Exelon Generation Company, LLC
22710 206th Avenue N.
Cordova, IL 61242-9740

Quad Cities Nuclear Power Station Plant Manager
Exelon Generation Company, LLC
22710 206th Avenue N.
Cordova, IL 61242-9740

cc:

Regulatory Assurance Manager - Quad Cities
Exelon Generation Company, LLC
22710 206th Avenue N.
Cordova, IL 61242-9740

Quad Cities Resident Inspectors Office
U.S. Nuclear Regulatory Commission
22712 206th Avenue N.
Cordova, IL 61242

David C. Tubbs
MidAmerican Energy Company
One River Center Place
106 E. Second, P.O. Box 4350
Davenport, IA 52808-4350

Vice President - Law and Regulatory Affairs
MidAmerican Energy Company
One River Center Place
106 E. Second Street
P.O. Box 4350
Davenport, IA 52808

Chairman
Rock Island County Board of Supervisors
1504 3rd Avenue
Rock Island County Office Bldg.
Rock Island, IL 61201

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-237

DRESDEN NUCLEAR POWER STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 211
License No. DPR-19

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by the Exelon Generation Company, LLC (the licensee) dated January 15, 2004, as supplemented by letter dated July 19, 2004, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 2.C.(2) of Facility Operating License No. DPR-19 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 211, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Gene Y. Suh, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: October 19, 2004

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-249

DRESDEN NUCLEAR POWER STATION, UNIT 3

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 203
License No. DPR-25

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by the Exelon Generation Company, LLC (the licensee) dated January 15, 2004, as supplemented by letter dated July 19, 2004, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act), and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment and paragraph 3.B. of Facility Operating License No. DPR-25 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 203, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Gene Y. Suh, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: October 19, 2004

EXELON GENERATION COMPANY, LLC

AND

MIDAMERICAN ENERGY COMPANY

DOCKET NO. 50-254

QUAD CITIES NUCLEAR POWER STATION, UNIT 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 222
License No. DPR-29

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by the Exelon Generation Company, LLC (the licensee) dated January 15, 2004, as supplemented by letter dated July 19, 2004, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B. of Facility Operating License No. DPR-29 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 222, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Gene Y. Suh, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: October 19, 2004

EXELON GENERATION COMPANY, LLC

AND

MIDAMERICAN ENERGY COMPANY

DOCKET NO. 50-265

QUAD CITIES NUCLEAR POWER STATION, UNIT 2

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 217
License No. DPR-30

1. The Nuclear Regulatory Commission (the Commission) has found that:

   A. The application for amendment by the Exelon Generation Company, LLC (the licensee) dated January 15, 2004, as supplemented by letter dated July 19, 2004, complies with the standards and requirements of the Atomic Energy Act of 1954, as amended (the Act) and the Commission's rules and regulations set forth in 10 CFR Chapter I;

   B. The facility will operate in conformity with the application, the provisions of the Act, and the rules and regulations of the Commission;

   C. There is reasonable assurance (i) that the activities authorized by this amendment can be conducted without endangering the health and safety of the public, and (ii) that such activities will be conducted in compliance with the Commission's regulations;

   D. The issuance of this amendment will not be inimical to the common defense and security or to the health and safety of the public; and

   E. The issuance of this amendment is in accordance with 10 CFR Part 51 of the Commission's regulations and all applicable requirements have been satisfied.

2. Accordingly, the license is amended by changes to the Technical Specifications as indicated in the attachment to this license amendment, and paragraph 3.B. of Facility Operating License No. DPR-30 is hereby amended to read as follows:

B. Technical Specifications

The Technical Specifications contained in Appendices A and B, as revised through Amendment No. 217, are hereby incorporated in the license. The licensee shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of the date of its issuance and shall be implemented within 30 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

/RA/

Gene Y. Suh, Chief, Section 2
Project Directorate III
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Attachment: Changes to the Technical Specifications

Date of Issuance: October 19, 2004

ATTACHMENT TO LICENSE AMENDMENT NOS. 211 AND 203

FACILITY OPERATING LICENSE NOS. DPR-19 AND DPR-25

DOCKET NOS. 50-237 AND 50-249

Replace the following pages of the Appendix "A" Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain marginal lines indicating the area of change.

Remove Pages	Insert Pages
3.4.3-2	3.4.3-2
3.5.1-6	3.5.1-6
3.6.1.6-2	3.6.1.6-2

ATTACHMENT TO LICENSE AMENDMENT NOS. 222 AND 217

FACILITY OPERATING LICENSE NOS. DPR-29 AND DPR-30

DOCKET NOS. 50-254 AND 50-265

Replace the following pages of the Appendix "A" Technical Specifications with the attached pages. The revised pages are identified by amendment number and contain marginal lines indicating the area of change.

Remove Pages	Insert Pages
3.4.3-2	3.4.3-2
3.5.1-6	3.5.1-6
3.6.1.6-2	3.6.1.6-2

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 211 TO FACILITY OPERATING LICENSE NO. DPR-19

AND AMENDMENT NO. 203 TO FACILITY OPERATING LICENSE NO. DPR-25

AMENDMENT NO. 222 TO FACILITY OPERATING LICENSE NO. DPR-29

AND AMENDMENT NO. 217 TO FACILITY OPERATING LICENSE NO. DPR-30

EXELON GENERATION COMPANY, LLC

AND

MIDAMERICAN ENERGY COMPANY

DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3

QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2

DOCKET NOS. 50-237, 50-249, 50-254 AND 50-265

1.0 INTRODUCTION

In a letter dated January 15, 2004, Exelon Generation Company, LLC (the licensee, EGC) submitted a Technical Specification amendment for Dresden Nuclear Power Station, Units 2 and 3, and for Quad Cities Nuclear Power Station, Units 1 and 2. In a letter dated July 19, 2004, the licensee supplemented this request with additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on March 16, 2004 (69 FR 12368). The proposed changes would modify Technical Specification (TS) Surveillance Requirements (SRs) 3.4.3.2, 3.5.1.10, and 3.6.1.6.1 to provide an alternative means for testing the main steam Electromatic Relief Valves (ERVs), including those that provide the Automatic Depressurization System (ADS) and the low-set relief functions. In addition, the proposed changes provide an alternative means for testing the dual function Target Rock safety/relief valves (S/RVs). The proposed changes would allow the testing of the ERVs and S/RVs such that full functionality is demonstrated without requiring that the valves be cycled with steam pressure while installed.

The licensee states that the ERVs and S/RVs at Dresden and Quad Cities have exhibited elevated tailpipe temperatures due to suspected seat leakage. Leakage from ERVs and S/RVs is discharged to a point below the minimum water level in the suppression pool. Thus, the

steam leakage can result in increasing suppression pool temperature and level. In addition, the licensee states that leakage past the pilot valves of these valves can cause an inadvertent opening of the main valves.

The licensee states that experience in the industry and at Dresden and Quad Cities indicates that manual actuation of main steam relief valves during plant operation can lead to increased seat leakage. The licensee further states that the alternative testing proposed for the ERVs and S/RVs will reduce the potential for seat leakage, thus reducing the potential for suppression pool temperature and level effects and the potential for pilot valve leakage, which can cause an inadvertent opening of the valves and impair their ability to re-close.

The proposed TS changes would modify SR 3.4.3.2, SR 3.5.1.10, and SR 3.6.1.6.1 to provide an alternative means for testing the main steam ERVs and dual function S/RVs. The proposed changes would allow demonstration of valve capability by requiring that the valve actuator be manually stroked during each refueling outage without lifting the main valve seat.

The SRs listed above for Dresden, Units 2 and 3 currently require verification that the S/RVs and ERVs stroke when manually actuated. The SRs listed above for Quad Cities, Units 1 and 2 currently require verification that the S/RVs and ERVs are capable of being opened. For both Dresden and Quad Cities, the proposed changes modify the SRs to read as follows:

SR 3.4.3.2 Verify each relief valve actuator strokes when manually actuated.

SR 3.5.1.10 Verify each ADS valve actuator strokes when manually actuated.

SR 3.6.1.6.1 Verify each low set relief valve actuator strokes when manually actuated.

Each of these SRs currently includes a Note that states, “Not required to be performed until 12 hours after reactor steam pressure and flow are adequate to perform the test.” Deletion of this Note is also proposed by the licensee.

2.0 REGULATORY EVALUATION

The staff finds that the licensee in Section 4.0 of its submittal identified the applicable regulatory requirements. The regulatory requirements on which the staff based its acceptance are discussed below.

In Section 50.36 of Title 10 of the *Code of Federal Regulations* (10 CFR), "Technical specifications," there are regulatory requirements for the content in a licensee's TS. Criterion 3 of 10 CFR 50.36(c)(2)(ii) requires a limiting condition for operation to be established for a structure, system, or component that is part of the primary success path and which functions or actuates to mitigate a design basis accident or transient that either assumes the failure of or presents a challenge to the integrity of a fission product barrier. The licensee states that

Criterion 3 of 10 CFR 50.36(c)(2)(ii) will continue to be met since full functionality will be tested under the proposed methodology.

The S/RVs and ERVs are part of the ADS. The ADS is a part of the Emergency Core Cooling System (ECCS). The ECCS is designed to provide adequate core cooling across the entire spectrum of line break accidents. The ADS is designed to depressurize the reactor to permit either the Low Pressure Coolant Injection (LPCI) system or Core Spray (CS) system to cool the reactor core during a small break loss of coolant accident. This size break would result in a loss of coolant without a significant pressure reduction, so neither system alone could provide adequate core cooling. When the ADS is actuated, the flow of steam through the S/RV and ERVs results in a maximum energy removal rate with a corresponding minimum mass loss. Thus, the specific internal energy of the saturated fluid in the system is rapidly decreased, which causes a pressure reduction. Since the ADS does not provide coolant makeup to the reactor, the ADS is considered only in conjunction with the LPCI or CS systems as a backup to the High Pressure Coolant Injection system.

The S/RVs and ERVs also provide overpressure protection to the reactor pressure vessel as discussed in Updated Final Safety Analysis Report Section 5.2.2. The S/RVs and ERVs actuate in the relief mode to control reactor coolant system pressure during transient conditions to prevent the need for safety valve actuation following such transients.

The S/RVs also function in the safety mode to relieve pressure when the inlet steam pressure reaches the lift set pressure. This ensures that peak reactor pressure vessel pressure in the nuclear system will not exceed the American Society of Mechanical Engineers Boiler and Pressure Vessel Code limits for the reactor coolant pressure boundary. In addition, two ERVs on each unit function in the low set relief mode to limit induced thrust loads on the relief valve discharge line for any subsequent actuations of the relief valve.

The Nuclear Regulatory Commission (NRC) has approved a similar TS change (Amendment dated May 28, 2003, ADAMS Accession No. ML031420622) for testing the Quad Cities, Units 1 and 2 main steam ERVs and S/RVs, with the major exception that the current proposal is to test the ERVs less frequently than the previous change. The NRC has also previously approved similar TS changes at several boiling water reactor (BWR) facilities (e.g., the LaSalle, Clinton, and Peach Bottom nuclear power facilities) regarding alternatives to stroke testing the main steam S/RVs while the plant is on-line with system steam pressure.

3.0 TECHNICAL EVALUATION

The staff has reviewed the licensee's regulatory and technical analyses in support of its proposed license amendment as described in the licensee's submittals dated January 15 and July 19, 2004. The detailed evaluation below supports the conclusion that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the

Commission's regulations, and (3) the issuance of the amendment will not be inimical to the common defense and security or to the health and safety of the public.

3.1 Licensee's Basis for TS Change

As a basis for the proposed TS change the licensee provides the following information:

There are four Dresser model 1525VX ERVs on the main steam lines between the reactor vessel and the first isolation valve within the drywell on Dresden, Units 2 and 3 and Quad Cities, Units 1 and 2 (i.e., four valves on each unit). The ERVs consist of a main valve disc and seat and a pilot valve. The ERVs are opened by automatic or manual switch actuation of a solenoid. The switch energizes the solenoid to actuate a plunger, which contacts the pilot valve operating lever, thereby opening the pilot valve. When the pilot valve opens, pressure under the main valve disc is vented. This allows reactor pressure to overcome main valve spring pressure, which forces the main valve disc downward to open the main valve.

There is one dual function Target Rock model 67F S/RV on one of the main steam lines between the reactor vessel and the first Isolation valve within the drywell of each Dresden and Quad Cities unit. The S/RV can actuate in either the safety mode or the relief mode. In the safety mode (i.e., when actuated by system pressure), the S/RV opens when the inlet steam pressure reaches the lift set pressure. In the relief mode (i.e., power actuated mode of operation), automatic or manual switch actuation energizes a solenoid valve that admits air to the air operator diaphragm chamber and strokes the air plunger, which strokes the second-stage disc that is 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.

At the time of the January 15, 2004, submittal, there were four power-operated relief valves (PORVs) on the main steam line between the reactor vessel and the first isolation valve within the drywell on Quad Cities, Unit 2 manufactured by Target Rock. The licensee states that because of operating experience with these PORVs, involving seat leakage and an inadvertent opening, these PORVs were replaced with the Dresser ERVs described above during the refueling outage on Quad Cities, Unit 2, in February 2004.

The licensee states that experience in the industry and at Dresden and Quad Cities has indicated that manual actuation of main steam relief valves during plant operation can lead to valve seat leakage. Relief valve leakage from either the main valve disc or pilot valve results in increased suppression pool temperature and level. 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 and level are maintained within TS limits. However, leakage from the pilot valve can lead to inadvertent opening of the main valve, and the subsequent inability to re-close the valve.

The proposed revision to the SRs deletes the requirement to demonstrate the capability of the relief valves to open using steam pressure and substitutes a requirement to demonstrate that the valve actuator strokes when manually actuated. The licensee states that the combination of testing the valve actuator and the verification of the capability of the valve to open provides a complete verification of the valve's functional capability. This testing is described in more detail below.

For the S/RVs, the licensee proposes the actuator test be performed by energizing a solenoid that pneumatically actuates a plunger located within the main valve body. The plunger depresses the second stage disc. The licensee states that this test will verify movement of the plunger in accordance with vendor recommendations, but that, since this test will be performed prior to establishing the reactor pressure needed to overcome main valve closure spring force, the main valve will not stroke during the test. This test does not disturb the safety-mode first stage pilot valve. The licensee states that this is desirable, since leakage through the first stage pilot valve can mask main valve seat leakage after steam is applied to the valve.

For the ERVs, the licensee proposes that the actuator test 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. This test will verify pilot valve movement, but since this test will be performed prior to establishing the reactor pressure needed to overcome main valve closure spring force, the main valve will not stroke during the test.

The licensee states that the proposed testing for ERVs is adequate and not detrimental to the pilot valves in light of the Nine Mile Point 1 events described in an NRC Inspection Report for Nine Mile Point 1 dated December 22, 2000, and NRC Event Notification Report 39779, dated April 21, 2003. The 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. The inspection report notes that dry cycling of pilot valves can cause the partial disk-stem separation.

The licensee states that the valve actuator testing at Dresden and Quad Cities 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 licensee would energize the ERV solenoid to manually stroke the pilot valve. The stem travel and lever arm adjusting screw gap would 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. The licensee's 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, licensee states that it has performed dry cycling of the pilot valves at Dresden and Quad Cities for many years, with no signs of partial or full disc detachment. Therefore, the licensee determined 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 the 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 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 is checked. The licensee states that this check assures that the stem is straight, the pilot can travel freely, and the pilot disc can seat properly.

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 proposed testing for the Dresden and 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 spring force, the main valve will not stroke during the test. Since the proposed testing for the ERVs includes a manual actuation of the solenoid and pilot valve, the licensee states that the test will demonstrate that the solenoid force is adequate to overcome the pilot spring force. Further, the licensee states that resistance checks of the cutout switch will assure the solenoid is capable of producing its full output force.

The licensee states 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.

During inspection of the operator prior to testing, the licensee gives specific attention 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 resistance is verified. 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 determined that these steps provide substantial indication that the solenoid operator is capable of functioning as designed.

Further, the licensee 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 also states that pilot actuation and verification of coil and contact performance provides additional assurance that the ERVs will actuate when required.

The licensee states that the ERVs and S/RVs are tested in accordance with the Dresden and Quad Cities inservice testing (IST) programs. The IST programs for relief valves are based on the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of

Nuclear Power Plants (OM Code) 1998 Edition through 2000 Addenda. As required by this code, following the initial five-year Interval, all valves of each type and manufacturer shall be tested during each subsequent five-year interval, with a minimum of 20 percent of the valves to be tested within any 24 months. The licensee states that, in practice, this means that half of the ERVs (i.e., two on each unit) are tested each refueling outage, and that each S/RV (i.e., one on each unit) is tested each refueling outage. This is normally accomplished by replacing the installed valves with new or refurbished valves that have been pre-tested.

The licensee proposes that valve testing be performed at a steam test facility, where the valve (i.e., main valve and pilot valve) and an actuator representative of the actuator used at the plant will be installed on a steam header in the same orientation as the plant installation. The licensee states that 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 would then be leak tested, functionally tested to ensure the valve Is capable of opening and closing (including stroke time) and, leak tested a final time. Valve seat tightness would be verified by a cold bar test; and, if not free of fog, leakage will be measured and verified to be below design limits. In addition, for the safety mode of S/RVs, an as-found setpoint verification and as-found leak check are performed, followed by verification of set pressure, and delay time. The licensee states that the valves will then be shipped to the plant without any disassembly or alteration of the main valve or pilot valve components. A receipt inspection will be performed in accordance with the requirements of the EGC Quality Assurance Program. The storage requirements in effect ensure the valves are protected from physical damage. Prior to installation, the valve will again be inspected for foreign material and damage. The licensee states that the valves will be installed, insulated, and pneumatically and electrically connected and that proper connections will be verified per procedure.

In addition to the requirements of the OM Code, as part of the preventive maintenance program during each refueling outage, the licensee states that the pilot valve assemblies are replaced in the ERVs that are not scheduled for removal and testing. The replacement of the pilot valve assemblies does not involve removal of the ERVs and does not affect the main valve disc. Following replacement of the pilot valve assemblies, the proposed SR will require testing of the ERV actuator as described in the section above (i.e., ERV valve actuator testing), without stroking the main valve. The licensee states that this SR will ensure that the affected portion of the valve will be fully tested. If other maintenance is performed, controls regarding testing requirements following maintenance ensure that appropriate post-maintenance testing is performed. For example, if maintenance is performed that affects the main valve, the capability of the main valve would be tested as described above.

The licensee determined that the combination of the steam testing of the valve at the test facility and the valve actuator testing at the site will provide a complete check of the capability of the valves to open and close. Therefore, the licensee concludes that the proposed changes will allow the testing of the S/RVs and ERVs such that full functionality is demonstrated through overlapping tests, without cycling the valves under steam pressure with the valves installed.

The licensee determined that the use of overlapping tests to demonstrate operability of active components is similar to that used elsewhere in the TS for other systems and components. For example, SR 3.5.1.8 is modified by a note that excludes vessel injection/spray during ECCS injection/spray subsystem actuation testing. The TS Bases for SR 3.5.1.8 state that coolant injection into the vessel is not required since all active components are testable and full flow can be demonstrated by recirculation through test lines.

Additionally, the licensee referred to the Boiling Water Reactor Owners Group (BWROG) evaluation of NUREG-0737, "Clarification of TMI Action Plan Requirements," Item ll.K.3.16, “Reduction of Challenges and Failures of Relief Valves,” which recommended that the number of safety relief valve openings be reduced as much as possible and unnecessary challenges should be avoided.

The licensee states that another potential reason for in-situ testing of the relief valves is to verify that the discharge line is not blocked, and that the probability of blocking a relief valve discharge line and preventing the valve function is considered to be extremely remote. The licensee determined that, as implemented at Dresden and Quad Cities, the Foreign Material Exclusion (FME) program provides the necessary requirements and guidance to prevent and control introduction of foreign materials into structures, systems, and components, and that this program minimizes the potential for debris blocking a relief valve discharge line.

As a result of deleting the requirement for full functional testing of the S/RVs and ERVs during each refueling outage, and replacing these requirements with the proposed SRs, the licensee states that the only change in the frequency of testing is that the main valve disc of the ERVs will be lift tested every two operating cycles (approximately every four years) compared to the current one operating cycle (approximately two years) frequency. The licensee’s review of the ERV surveillance testing results for the past ten years at Dresden and Quad Cities checked for any failures of the main valve disc to stroke open. Based on this review, the licensee concluded that no failures of the valves to lift have occurred, and that extending the frequency of checking the function of the main disc from approximately every two years to approximately every four years is not expected to result in additional valve failures.

As a result of a question from the staff regarding the effectiveness of the FME program at Dresden and Quad Cities as it relates to identifying blockage of the relief valve discharge lines, the licensee submitted additional information in its July 19, 2004, submittal. The licensee stated that under the current requirements, a manual actuation of each ERV is performed at power to verify that the valve is functioning properly. The ERV discharge lines are not flow instrumented; therefore, this test provides a gross system check that verifies flow indirectly by observing the response of the turbine control valves or bypass valves. The current method may not have the sensitivity to detect partial blockage in all cases. This assurance is provided through the administrative requirements associated with the FME program.

The licensee recognizes there have been recent failings in the FME program at Dresden and Quad Cities and provided a summary of recent failings as they could relate to identification of

blockage of the relief valve discharge lines. This summary includes several events at both Dresden and Quad Cities, which are described below.

At Quad Cities, during the Unit 2 refueling outage in February 2004, a new ERV was found with the pilot valve flange open (i.e., no FME cover) and no one in attendance; however, this incident did not result in any foreign material entering the valve. During removal of the Unit 1 3D ERV in November 2003, a black plastic like material was found on the inlet flange. This material was subsequently analyzed and determined to be consistent with duct tape; however, there was no foreign material on the valve disc and the as-found location of the foreign material would not have prevented the valve from operating. During the May 2003 Unit 1 fuel replacement outage, insufficient FME barriers contributed to the fall of the gasket for the 3D ERV into the main steam piping through the opening for the ERV. This material was identified and retrieved prior to valve installation. Insufficient control or cleanup of wood used for scaffolding in the main condenser during a recent refueling outage resulted in a Unit 2 condensate pump seal failure because of wood splinters blocking the seal cooling line to the pump. In March 2002, FME shipping plugs were not removed from newly installed Unit 2 C and D feedwater heater relief valves during maintenance activities; however, the plugs were identified in the installed relief valve before plant startup. In December 2001, a screw located inside the station blackout diesel prevented the fuel injector from being seated properly, resulting in excessive external fuel spray that required the diesel to be shut down during its post-maintenance testing. The screw was left in the station blackout diesel during the just-completed scheduled maintenance of the diesel generator.

The licensee also identified similar FME events that occurred at Dresden. Examples of the Dresden events include a small wire brush found inside the Unit 2 E ERV inlet piping during the October 2003 Unit 2 refueling outage. The condition of this brush indicated that it was not in the pipe during the previous cycle. The brush was found by Engineering during an inspection of the inlet flange prior to installation of the new valve. Also during the October 2003 Unit 2 refueling outage, welding slag and pieces from a wire wheel were found in the ‘C’ feedwater pump suction line. This foreign material was believed to have come from welding that was performed on the suction valve internal seats during that same refueling outage. In December 2003, two ½" 0-rings were discovered in the electrohydraulic control (EHC) reservoir during cleaning of that reservoir. The 0-rings were similar to the ones used at the turbine valve actuator for the installation of solenoids and servo valves. These 0-rings were too small to have plugged the EHC pump suction strainer. In January 2004, post-maintenance testing of a newly installed emergency diesel generator (EDG) fuel oil pump identified that FME caps were not removed from the pump inlet and outlet prior to installation of the pump. The caps were discovered when the pump failed the post-maintenance test causing a delay in returning the EDG to operable status.

The licensee states that it is confident that the incidents described above, if they had been involved with an ERV or S/RV, would not have prevented the actuation of the ERV or S/RV or proper function of the discharge line. However, the licensee has initiated an FME improvement project to improve performance in this area, which includes various training and walkthrough

demonstrations. The licensee determined that these FME programmatic improvements coupled with the specific FME procedural requirements provide effective FME controls, and include measures to ensure any foreign material would be discovered without performing the currently required in-situ testing.

As a result of a question from the staff regarding the reduction in the testing frequency for the main disks of ERVs as it relates to detection of the capability of the pilot leak-off lines and the need to frequently replace some components, the licensee submitted additional information in its July 19, 2004, submittal, as described below.

To address failures due to pilot leak-off line cold spring or cyclic fatigue effects, the licensee states that the pilot leak-off line and above seat drain are not required to be routed to the downcomer in order for the ERV to be operable, and that the pilot leak-off lines need only provide a discharge path. The licensee has completed or scheduled specific actions at Quad Cities in response to the pilot leak-off line issue, including improvement of welds, cold spring checks, non-destructive examination of welds, and reanalysis of piping loads. At Dresden, the licensee determined that the ERV leak-off lines are not susceptible to fatigue failure. During the last Dresden Unit 2 refueling outage, preventive maintenance activities on the ERV actuators did not identify any leak-off line issues and a walkdown during a subsequent forced outage found no anomalies. For Dresden Unit 3, the ERVs were instrumented and the vibration data was compared to the Quad Cities data for analysis. The results of the licensee's evaluation found that for Unit 3 vibrations were significantly less than the Quad Cities vibrations; therefore, the ERV and leak-off line piping are not susceptible to fatigue failure.

To address failures due to internal component wear or binding, the licensee states that the as-found testing prior to shutdown is not currently performed, and that the following method is currently used for identifying issues related to wear or binding. The pilot valve assemblies (i.e., internal assembly, but not the pilot body) are replaced every outage. Two pilots are included as part of complete valve refurbishment, and the other two pilots are replaced with the main valve still installed in the plant. The main valve is replaced every second refueling outage, in a staggered fashion such that two of four valves are replaced at each refueling outage. After the pilot or main valve is removed, the valves are disassembled completely, with the exception of removing welded seats from valve bodies, and inspected for proper dimensions as well as any signs of wear or damage.

To address the need to replace components more often than every two cycles, the licensee states that each refueling outage, the following general maintenance is performed on the relief valves. The Target Rock dual function S/RV is removed each refueling outage, and a fully refurbished and certified S/RV is installed in its place. Two of the four ERVs are completely removed, and fully refurbished valves are installed. Also, for Quad Cities Unit 1, the 3E ERV is replaced every refueling outage due to historic wear and vibration data. Therefore, for Quad Cities Unit 1, three ERVs are replaced during some refueling outages. Refurbished pilot valve assemblies are installed on the ERVs that are not replaced. Refurbished solenoid actuators are installed on all four ERVs.

The licensee also provided some information regarding the maintenance history of the ERVs and S/RVs at Dresden and Quad Cities. Prior to extended power uprate (EPU) operation, maintenance frequencies described above were followed for approximately three to four operating cycles per unit, and included post-maintenance cycling of the valves at 300 psi during reactor startup. The licensee provided the following information about the valves at Dresden and Quad Cities during this period.

- S/RVs performed adequately, but experienced occasional seat leakage.
- S/RV setpoint drift was experienced, typical of drift experienced for this valve model at other boiling water reactors.
- S/RV seat damage was usually found when seat leakage was present.
- ERVs performed adequately, with no failures noted during startup cycling. At Quad Cities, one failure was identified during valve refurbishment where the main disk was wearing grooves into the guide that may have prevented operation. This failure was attributed to insufficient reassembly torque, which allowed the main disk to become loose after valve heat up.
- ERVs experienced occasional seat leakage from both main seats and pilot seats.
- ERV solenoid operators performed adequately. During refurbishment, wear was identified, sometimes significant at Quad Cities, on the solenoid plunger guide assembly.
- At Quad Cities, a 125 VDC ground was experienced, associated with cables from the ERV junction box to the ERV solenoid operator. The ground was a result of cable insulation degradation from rubbing on the conduit.
- Typical ERV refurbishment findings included seat wear or damage as a result of steam leakage on applicable valves, and degradation of threads in the valve bodies from repeated installation and removal. Seats and disks sometimes required replacement due to steam cutting or as a result of multiple cycles of lapping and grinding.

The licensee stated that following EPU operation, the Quad Cities valves have experienced some additional wear that has been attributed to increased vibration levels. The licensee has implemented or planned the corrective actions described below for Quad Cities.

- To address the wear of the S/RV adjusting spring to bellows cap which results in high lift setpoint, shaker table testing is scheduled for the Summer 2004, and the need for modifications will be evaluated based on the results of this testing.

- To address the ERV pilot line failure due to cold spring, which also had a weld indication and excessive vibration, the welds were redesigned on the Quad Cities Unit 2 ERV small bore lines. Similar modifications are planned for Quad Cities Unit 1 and spare ERVs. The cold spring was relieved as needed and maintenance procedures were revised to inspect for cold spring. The refurbishment procedure is being revised to include weld inspections. Also, a reanalysis was performed based on measured vibrations.

- To address the ERV solenoid actuator being degraded or failed due to vibration-induced wear, shaker table testing identified the frequency where self-excitation was present, and materials were upgraded to withstand the effects of this vibration. The materials for the parts experiencing wear were upgraded. Age testing was performed on the shaker table to show that these parts can withstand expected vibration magnitudes over an entire fuel cycle.

The licensee concludes that proper valve operation will be demonstrated by testing at a steam test facility. The licensee states that this testing will demonstrate that pilot operation results in main disk operation, the hydraulic balance of the valve is correct, and internal ports are clear. The licensee further states that plant circuit operation is verified by both logic testing on a periodic basis, and by installation procedures for the ERV or air operator testing of the S/RV. For the ERVs, installation testing includes verification that the pilot valve stroke and return are correct, and that the electrical characteristics of the solenoid are correct.

The licensee states that when the full valve is replaced, adherence to the FME program will ensure that ERV or S/RV tailpipes do not become obstructed, and that ERV pilot or drain lines do not become obstructed. Also, the licensee states that pilot replacement on the ERV will rely on the same FME controls for the pilot valve body, followed by pilot valve stroke verifications.

The licensee states that shaker table testing identified critical frequencies for the ERVs, and that it plans to perform similar testing on the portion of the S/RV which has recently experienced what appears to be vibration-induced wear. For the ERVs, the licensee made material changes, and the new materials have been tested on the shaker table with successful results in an aging run. The licensee states that the aging run was intended to prove component integrity for a full cycle at EPU conditions.

The licensee states that on-line monitoring will focus primarily on valve leakage, which is not necessarily a function of vibrations, and that the 125Vdc Ground Detection System captures grounds that may develop in the circuits controlling the valves.

The licensee also states that the option to perform cycling of the relief valves while on-line or during reactor startup will be maintained as a method to demonstrate valve operability.

As a result of a question from the staff regarding the lack of as-found stroke time testing, as proposed, the licensee states that currently, as-found stroke time testing is not performed prior

to performing maintenance. After completion of maintenance, plant surveillance tests with steam at reduced pressure are performed per site procedures in order to detect gross failures of the ERVs to change position. The licensee states that tests performed at Dresden and Quad Cities are not as refined as the valve response time test performed at the steam test facility. Therefore, the licensee concludes that the tests performed at Dresden and Quad Cities are not refined enough to detect valve performance degradation, other than gross failures to change position. Steam facility as-left test procedures indicate an allowed time delay not to exceed 500 milliseconds. Typical values in recent tests show delay times of approximately 250 to 425 milliseconds.

The licensee states that ERV refurbishment practices at Dresden and Quad Cities include complete tear down and rebuild of the main valve every two refueling cycles. Two of the four ERVs per unit are replaced every fueling outage and the remaining valves have their pilot stages replaced. The licensee states that, as a result, a full visual examination of all installed pilots and two of the four main valve stages are performed every refueling outage. In addition, leakage tests are performed to verify the seat tightness of both main and pilot stages after refurbishment.

The licensee states that ERV as-left stroke delay time measurements during the as-left steam tests will provide an additional verification of proper performance before installation in the plant. The licensee states that if measurement of as-found delay time prior to refurbishment was performed it could show some change from the prior as-left delay time, but that such differences would not be a conclusive indication of degradation unless a gross change occurred. The licensee concludes that visual and dimensional inspections that are performed during refurbishment will provide a conclusive method of identifying degradations, making an as-found steam test unnecessary, and that they will identify maintenance improvements to avoid degradations that might be detrimental to function.

The licensee states that an as-found set pressure test is performed for the safety function of the S/RVs using steam as required by the ASME Code, and this test will be retained with the proposed changes. During this test the delay time is measured and compared to acceptance criteria (i.e., maximum delay time 400 milliseconds and maximum main disc opening time 100 milliseconds). The licensee also states that a relief function test is also performed to determine the condition of the air operator, and that delay time is measured during this test and is reported to the sites.

The licensee states that the S/RVs are subsequently torn down and refurbished regardless of whether they met as-left acceptance criteria during the as-found test, and that the delay time from the relief test is used for information only. Subsequent refurbishment and associated visual and dimensional verifications are the primary basis for identifying degradation or changes to maintenance practices or frequencies.

3.2 Evaluation of TS Changes

The staff has reviewed the licensee's basis for the proposed TS change and finds that with the proposed testing, the functional capability of the ERVs and the S/RVs are adequately verified. A manual actuation and valve leakage test will be performed at a steam 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 actuate the ERVs and the 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.

In addition, the staff finds that the current testing requirements could result in seat leakage of the ERVs and the S/RVs during power operation. Excessive seat leakage 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 also finds that the licensee's improvements to the FME program provide reasonable assurance that the ERV and S/RV discharge lines would remain unblocked and that foreign material would not interfere with valve operation.

The staff also finds that the licensee's reduction to the test frequency of the ERV main valve disks from every cycle to every two cycles is acceptable since the licensee has had no failures of the valves to stroke open in the past 10 years. While the staff has been concerned with the increased vibration and wear of the valve parts during recent operating cycles, the licensee's changes to the valve design have been verified by the licensee's shaker table testing, and the licensee's maintenance and monitoring programs provide reasonable assurance that problems such as these will be detected and that corrective action will be taken. The staff notes that the vibration related problems affecting ERV operability have occurred in the ERV actuators, not in the main valve disks, and that the actuators will continue to be stroke tested every cycle.

In a meeting with the staff on September 23, 2004, and in a followup discussion with the staff on September 28, 2004, the licensee stated that shaker table testing of modified material for the S/RV pilot stage adjusting springs and bellows caps is not yet completed. However, the pilot stages are not required to function in order to actuate the S/RVs in the relief mode; therefore, it is acceptable to approve the subject TS changes prior to completion of the licensee's shaker table testing for the pilot stage materials. The testing of these pilot stage materials is being monitored by the NRC, separate from the review of this license amendment.

The deletion of the current note in the TS SRs is also acceptable. The note states that the testing is not required until 12 hours after steam pressure and flow are adequate, and its deletion is appropriate since online testing with steam pressure will no longer be required.

As described above, the licensee has proposed changes to the Dresden, Units 2 and 3 TS and the Quad Cities, Units 1 and 2 TS, which would provide for testing of the ERVs and the S/RVs to demonstrate proper functional operation, without the need to stroke test the valves on-line with system steam pressure conditions. Based on the above evaluation, the staff finds that the licensee has adequately justified the proposed changes to the TS for Dresden, Units 2 and 3 and for Quad Cities, Units 1 and 2. Therefore, the proposed TS changes to SRs 3.4.3.2, 3.5.1.10, and 3.6.1.6.1 are acceptable.

4.0 STATE CONSULTATION

In accordance with the Commission's regulations, the Illinois State official was notified of the proposed issuance of the amendment. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendments change a requirement with respect to installation or use of a facility component located within the restricted area as defined in 10 CFR Part 20. The NRC staff has determined that the amendments involve no significant increase in the amounts, and no significant change in the types, of any effluents that may be released offsite, and that there is no significant increase in individual or cumulative occupational radiation exposure. The Commission has previously issued a proposed finding that the amendments involve no significant hazards consideration, and there has been no public comment on such finding (69 FR 12368). Accordingly, the amendments meet the eligibility criteria for categorical exclusion set forth in 10 CFR 51.22(c)(9). Pursuant to 10 CFR 51.22(b) no environmental impact statement or environmental assessment need be prepared in connection with the issuance of the amendments.

6.0 CONCLUSION

The Commission has concluded, based on the considerations discussed above, that: (1) there is reasonable assurance that the health and safety of the public will not be endangered by operation in the proposed manner, (2) such activities will be conducted in compliance with the Commission's regulations, and (3) the issuance of the amendments will not be inimical to the common defense and security or to the health and safety of the public.

Principal Contributor: G. Hammer, NRR/DE

Date: October 19, 2004

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO REQUESTS FOR RELIEF REGARDING INSERVICE TESTING OF THE

MAIN STEAM ELECTROMATIC RELIEF VALVES AND SAFETY/RELIEF VALVES

AT DRESDEN NUCLEAR POWER STATION, UNITS 2 AND 3

AND QUAD CITIES NUCLEAR POWER STATION, UNITS 1 AND 2

DOCKET NUMBERS 50-237, 50-249, 50-254 AND 50-265

1.01 INTRODUCTION

By letter dated January 15, 2004, Exelon Generation Company, LLC, (the licensee, EGC) the licensee for Dresden, Units 2 and 3 (DNPS) and Quad Cities, Units 1 and 2 (QCNPS), submitted a request for relief from certain American Society of Mechanical Engineers (ASME) Code inservice testing (IST) requirements pertaining to testing of the main steam Electromatic Relief Valves (ERVs) and the main steam safety/relief valves (S/RVs). The licensee also provided additional supporting information in a submittal dated July 19, 2004. Specifically, the licensee's relief requests RV-021 for Dresden, Units 2 and 3, and RV-30E for Quad Cities, Units 1 and 2, seek relief from performing certain stroke testing of the ERVs and S/RVs. The affected components are the main steam relief valves listed below.

Dresden, Units 2 and 3

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

Quad Cities, Units 1 and 2

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
2-0203-3B	Main Steam 3B Electromatic Relief Valve
2-0203-3C	Main Steam 3C Electromatic Relief Valve
2-0203-3D	Main Steam 3D Electromatic Relief Valve
2-0203-3E	Main Steam 3E Electromatic Relief Valve

2.0 REGULATORY EVALUATION

Section 50.55a of Title 10 of the *Code of Federal Regulations* (10 CFR), requires that IST of certain ASME Code Class 1, 2 and 3 pumps and valves be performed in accordance with the ASME Code for Operation and Maintenance of Nuclear Power Plants (OM Code) and applicable addenda, except where relief has been requested and granted or proposed alternatives have been authorized by the Nuclear Regulatory Commission (Commission, NRC) pursuant to 10 CFR 50.55a (f)(6)(i), (a)(3)(i), or (a)(3)(ii). In proposing alternatives or requesting relief pursuant to 10 CFR 50.55a(a)(3)(i), the licensee must demonstrate that the proposed alternative would provide an acceptable 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. A Commission 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, "Guidance on Developing Acceptable Inservice Testing Programs" and NUREG-1482, “Guidelines for Inservice Testing at Nuclear Power Plants.”

For Dresden, Units 2 and 3 and Quad Cities, Units 1 and 2, the regulations in 10 CFR 50.55a require that the inservice testing program meet the requirements of the ASME OM Code 1998 Edition through 2000 Addenda. Specifically, Section ISTC-3510, states, “Power operated relief valves shall be exercise tested once per fuel cycle.” Section ISTC-5113 states, “Active valves shall have their stroke times measured when exercised in accordance with ISTC-3500.” The definition of stroke time is given in Section lSTC-2000 as the time interval from initiation of the actuating signal to the indication of the end of the operating stroke. Section ISTC-5114 states, “Test results shall be compared to the reference values established In accordance with ISTC-3300, ISTC-3310, or ISTC-3320.” Subsection I-3410(d) states, “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 or normal system pressure to verify open and

close capability of the valve prior to resumption of electric power generation. Set pressure verification is not required." The licensee seeks relief from the above OM Code requirements and requests authorization of the proposed alternative for the duration of the fourth 10-year inservice testing interval for Dresden, Units 2 and 3, which ends on October 31, 2012, and for the fourth 10-year inservice testing interval for Quad Cities, Units 1 and 2, which ends on February 18, 2013 for Unit 1 and on March 10, 2013 for Unit 2.

The licensee's requested alternative is consistent with similar alternatives authorized for Clinton Power Station, LaSalle County Station, and an earlier alternative authorized for Quad Cities Nuclear Power Station.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Basis for Relief

The licensee provides the following basis for the requested relief:

> The basis of the relief request is that the proposed alternative would provide an acceptable level of quality and safety. There are four Dresser model 1525VX ERVs on DNPS, Units 2 and 3, and on QCNPS, Units 1 and 2 (i.e., 3B, 3C, 3D, and 3E). Each unit also has a dual function Target Rock model 67F S/RV (i.e., 3A) which can actuate in either the safety mode or the relief mode. There were four PORVs on Quad Cities, Unit 2 (i.e., 3B, 3C, 3D, and 3E) manufactured by Target Rock. Because of operating experience with these PORVs involving seat leakage and an inadvertent opening, Quad Cities replaced these PORVs with the Dresser ERVs described above during the February 2004 refueling outage on Quad Cities, Unit 2.
>
> The ERVs are solenoid-operated with a single-stage pilot. Operation of the pilot valve vents the chamber under the main valve disc, which causes it to open. The S/RVs have two pilots; both pilots operate in the safety mode. In the relief mode, the second-stage pilot disc is stroked by the air plunger.
>
> Experience in the industry, at Quad Cities and Dresden, has indicated that manual actuation of main steam relief valves during plant operation can lead to valve seat leakage. Leakage from either the main valve disc or pilot valve results in increased suppression pool temperature and level. Leakage from the main valve disc and seat has little safety significance, as long as suppression pool temperature and level are maintained within Technical Specification limits. However, leakage from the pilot valve can lead to inadvertent opening of the main valve, and the subsequent inability to re-close the valve.

The proposed relief will allow testing of the S/RVs and ERVs that is appropriate to demonstrate functionality, without cycling the valves in place under steam pressure.

Additionally, the Boiling Water Reactor Owners Group (BWROG) 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 Proposed Alternative Testing

The following alternatives are proposed by the licensee to the requirements stated above. For Code Section ISTC-3510, the relief valve actuators will be exercised each refueling outage. The relief valve will be exercise tested at the frequency required by paragraph I-1330. For Code Section ISTC-5113 and 5114, stroke times will be measured at the test facility. Stroke times will be measured following valve rebuild. The timing will begin with the actuating electrical signal and end with the indirect indication of the end of the operating stroke. Stroke time acceptance criteria will use a pre-established reference value that represents good performance for the valve type. For Code subsection I-3410(d), following main valve refurbishment or replacement, a series of overiapping tests will assure functionality without actuating the valves when installed in the nuclear facility. Following pilot valve maintenance on the ERVs, only the valve actuator and pilot valve will be tested.

As a basis for the proposed alternatives, the licensee provided the following information:

The proposed alternative is to exercise test the valve actuators each refueling outage and test the relief valve at the frequency required by Section I-1330, or following any refurbishment or replacement of the relief valve. The valve actuator exercise test will be performed in the plant with the actuator disconnected from the relief valve. The valve test will be performed at the test facility. Thus, the full capability of the valves will be tested without cycling the valves in the plant under steam pressure.

In accordance with Section I-1330, "Test Frequencies, Class I Pressure Relief Valves," each S/RV is tested each refueling outage and two ERVs on each unit are tested every refueling outage. All four ERVs on each unit are thus tested every two refueling outages. This is normally accomplished by replacing the installed valves with new or refurbished valves that have been pre-tested.

Valve testing will be performed at a steam test facility, where the valve (i.e., main valve and pilot valve) and an actuator representative of the actuator used at the plant 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 (including stroke time), and leak tested a final time. Valve seat tightness will be verified by a cold bar test; and, if not free of fog, leakage will be measured and verified to be below design limits. In addition, for the safety mode of S/RVs, an as-found setpoint verification and as-found leak-check are performed, followed by verification of set pressure, and delay. The valve will then be shipped to the plant without any disassembly or alteration of the main valve or pilot valve components. A receipt inspection will be performed in accordance with the requirements of the EGC Quality Assurance Program. The storage requirements in effect at DNPS and QCNPS ensure the valves are protected from physical damage. Prior to installation, the valve will again be inspected for foreign material and damage. The valve will be installed, insulated, and pneumatically and electrically connected. Proper connections will be verified per procedure.

As a result of the proposed alternative, exercising of the main valve for the ERVs will occur every two operating cycles (approximately every four years) compared to every operating cycle (approximately two years) as required by Section ISTC. A review of the surveillance testing results for the past ten years at DNPS and QCNPS was performed for the DNPS and QCNPS ERVs. The review checked for any failures of the main valve disc to stroke open. Based on this review, It was concluded that no failures of the valves to lift have occurred. Therefore, extending the frequency of checking the function of the main disc from approximately every two years to approximately every four years is not expected to result in additional valve failures.

For the relief mode of S/RVs, the valve actuator test will be performed by energizing a solenoid that pneumatically actuates a plunger located within the main valve body. The plunger depresses the second stage pilot valve. Steam pressure actuation of the plunger during plant operation allows pressure to be vented from the top of the main valve piston, allowing reactor pressure to lift the main valve piston, which opens the main valve disc. The test will verify movement of the plunger in accordance with vendor recommendations. However, since this test will be performed prior to establishing the reactor pressure needed to overcome main valve closure spring force, the main valve disc will not stroke during the test.

This test does not disturb the safety-mode first stage pilot valve. This is desirable, since leakage through the first stage pilot valve can mask main valve seat leakage after steam is applied to the valve.

For the ERVs, the valve actuator 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. This test will verify pilot valve movement. However, since this test will be performed prior to establishing the reactor pressure needed to overcome main valve closure spring force, the main valve will not stroke during the test.

The proposed valve actuator testing for ERVs is adequate and not detrimental to the pilot valves in light of the Nine Mile Point events described in an NRC Inspection Report for Nine Mile Point dated December 22, 2000, and NRC Event Notification Report 39779, dated April 21, 2003. The NRC inspection report for Nine Mile Point states that the spurious operation and

sticking of valve ERV-111 most probably was caused by a bent stem and partial disk-stem separation. The inspection report shows that dry cycling of pilot valves can cause the partial disk-stem separation.

The valve actuator testing at DNPS and QCNPS 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. 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, EGC has performed dry cycling of the pilot valves at DNPS and QCNPS for many years, with no signs of partial or full disc detachment. Therefore, the proposed testing is adequate to detect the partial disk-stem separation experienced at Nine Mile Point during the simulated bench test described in the NRC inspection report.

The EGC 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 EGC 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 is checked. This check assures that the stem is straight, the pilot can travel freely, and the pilot disc can seat properly.

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 proposed testing for DNPS and QCNPS 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 spring force, the main valve will not stroke during the test. Since the proposed testing for DNPS and QCNPS 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 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.

During inspection of the 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 if required, the associated springs and mechanisms are inspected, and as-left contact resistence is verified. 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. These steps provide substantial indication that the solenoid operator is capable of functioning as designed.

In addition, 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. Pilot actuation and verification of coil and contact performance provides additional assurance that the ERVs will actuate when required.

In addition to the requirements of the OM Code, as part of the preventive maintenance program during each refueling outage, DNPS and QCNPS replace the pilot valve assemblies in the ERVs that are not scheduled for removal and testing. This replacement does not involve removal of the ERVs and does not affect the main valve disc. Following replacement of the pilot valve assemblies, the proposed relief will allow testing of the ERV actuator and pilot as described above, without stroking the main valve. This proposed relief provides an acceptable level of quality and safety, since the affected portion of the valve will be fully tested.

These verifications will provide a complete check of the capability of the valves to open and close. Therefore, the proposed changes will allow the testing of the S/RVs and ERVs such that full functionality is demonstrated through overlapping tests, without cycling the valves.

The proposed alternatives also provide adequate assurance that valve stroke time will be acceptable. Stroke timing of the S/RVs and ERVs will be performed at the test facility as described above. Since the valves are rebuilt at the frequency specified for exercising the valves (i.e., every refueling outage for the S/RVs and every other refueling outage for the ERVs), stroke timing is not useful for identifying valve degradation over several operating cycles. Rather, stroke timing will be used to ensure that the rebuilt valve performs acceptably compared to the stroke times of known good performing valves. Since the test facility can not duplicate the electrical control system at the plant, actuation of the valve at the test facility is accomplished through a simplified electrical actuation. Observation of the end of the operating stroke at the test facility is indirect, based on evidence of steam flow, as it is at the nuclear facility, since the relief valves have no positive open indication. Although these differences may result in minor differences in measured stroke time compared to those measured when installed in the plant, the stroke times measured at the test facility will be comparable to each other and thus can be used to detect any abnormality in valve performance.

3.3 Staff 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 adequately verified. A manual actuation and valve leakage test will be performed at a steam 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. The staff also finds that the licensee's reduction to the test frequency of the ERV main valve disks from every cycle to every two cycles is acceptable since the licensee has had no failures of the valves to stroke open in the past 10 years. While the staff has been concerned with the recent increased vibration and wear of the valve parts during recent operating cycles, the licensee's changes to the valve design have been verified by the licensee's shaker table testing, and the licensee's maintenance and monitoring programs provide reasonable assurance that any such problems will be detected and that corrective action will be taken. The licensee described these changes in the July 19, 2004, submittal. The staff notes that the vibration related problems affecting ERV operability have occurred in the ERV actuators, not in the main valve disks, and that the actuators will continue to be stroke tested every cycle. In a meeting with the staff on September 23, 2004, and in a follow-up discussion with the staff on September 28, 2004, the licensee stated that shaker table testing of modified materials for the S/RV pilot stage adjusting springs and bellows caps are not yet completed. However, the pilot stages are not required to function in order to actuate the S/RVs in the relief mode: therefore, it is acceptable to approve the subject TS changes prior to completion of the licencee's shaker table testing for the pilot stage materials. The testing of these pilot stage materials is being monitored by the NRC, separate from the review of this relief request. 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 that the valves will continue to operate when called upon to perform their safety related function. Therefore, the staff finds that the proposed alternative testing method to that required by the OM Code 1998 Edition through 2000 Addenda, Sections ISTC-3510, ISTC-5113, ISTC-5114, and I-3410(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 Dresden, Units 2 and 3 and 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 fourth 10-year inservice testing interval for Dresden, Units 2 and 3 and for the fourth 10-year inservice testing interval for Quad Cities, Units 1 and 2. The licensee's proposed testing provides reasonable assurance that the plant ERVs and S/RVs will remain operationally ready and will perform their intended safety function when called upon.

Principal Contributor: G. Hammer, NRR/DE

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