



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

July 15, 2015

Mr. Bryan C. Hanson  
Senior Vice President  
Exelon Generation Company, LLC  
President and Chief Nuclear Officer (CNO)  
Exelon Nuclear  
4300 Winfield Road  
Warrenville, IL 60555

SUBJECT: CLINTON POWER STATION, UNIT NO. 1 - REQUESTS FOR ALTERNATIVES  
FROM ASME OM CODE REQUIRED FREQUENCY (TAC NOS. MF5344 AND  
MF5345)(RS-14-291 AND RS-14-292)

Dear Mr. Hanson:

By two letters dated December 1, 2014, as supplemented by letters dated March 26 and June 3, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML14335A540, ML14335A541, ML15085A458 and ML15154A957, respectively), Exelon Generation Company, LLC (EGC; the licensee), submitted alternatives to the required refueling outage frequency for cold shutdown justification valves and refueling justification valves, and motor-operated valves (MOV) at Clinton Power Station, Unit 1 (CPS).

The U.S. Nuclear Regulatory Commission (NRC) staff has completed its review of relief requests (RRs) 2203 and 2204. The details of the NRC staff's review are included in the enclosed safety evaluation. Accordingly, RRs 2203 and 2204 are authorized pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR), Section 50.55a(z)(1), based on the NRC staff's determination that the proposed alternatives provide an acceptable level of quality and safety.

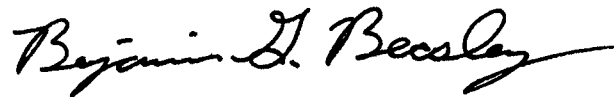
Therefore, the NRC staff authorizes the proposed alternatives in RRs 2203 and 2204 for the third 10-year IST program interval, which began on July 1, 2010 and is currently scheduled to conclude on June 30, 2020.

B. Hanson

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If you have any questions, please contact Ms. Eva A. Brown, at 301-415-2315 or via e-mail at [eva.brown@nrc.gov](mailto:eva.brown@nrc.gov).

Sincerely,

A handwritten signature in black ink, reading "Benjamin G. Beasley". The signature is fluid and cursive, with a long horizontal stroke extending to the right.

Benjamin G. Beasley, Acting Branch Chief  
Plant Licensing III-2 and  
Planning and Analysis Branch  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosure:  
Safety Evaluation

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

RELATED TO ALTERNATIVE VALVE TEST FREQUENCY

RELIEF REQUESTS 2203 AND 2204

EXELON GENERATION COMPANY, LLC

CLINTON POWER STATION, UNIT NO. 1

DOCKET NO. 50-461

1.0 INTRODUCTION

By two letters dated December 1, 2014, as supplemented by letters dated March 26, and June 3, 2015 (Agencywide Documents Access and Management System (ADAMS) Accession Nos. ML14335A540, ML14335A541, ML15085A458 and ML15154A957, respectively), Exelon Generation Company, LLC (EGC, the licensee), submitted alternatives to the required refueling outage frequency for cold shutdown justification and refueling justification valves, and motor operated valves (MOV) at Clinton Power Station Unit, 1 (CPS). The alternatives are necessary due to the licensee transitioning the refueling outage (RFO) periodicity from 24 to 12 months. Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 50.55a(z)(1), the licensee proposed alternatives for relief requests (RRs) 2203 and 2204 on the basis that the alternatives provide an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Section 50.55a(z)(1) to 10 CFR requires that inservice testing (IST) of certain American Society of Mechanical Engineers Code for Operation and Maintenance of Nuclear Power Plants (ASME OM Code) Class 1, 2, and 3 valves be performed in accordance with the specified ASME OM Code and applicable addenda incorporated by reference in the regulations, except where alternatives have been authorized or relief has been requested by the licensee and granted by the U.S. Nuclear Regulatory Commission (NRC) pursuant to paragraphs (z)(1) or (z)(2) of 10 CFR 50.55a. In proposing alternatives, a licensee must demonstrate that the proposed alternatives provide an acceptable level of quality and safety (10 CFR 50.55a(z)(1)) or that compliance would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety (10 CFR 50.55a(z)(2)).

Section 50.55a(f) to 10 CFR requires, in part, that IST of certain ASME Code Class 1, 2, and 3 components must meet the requirements of the ASME OM Code and applicable addenda, except where alternatives have been authorized pursuant to paragraphs 10 CFR 50.55a(z)(1) or 10 CFR 50.55a(z)(2).

Enclosure

Relief requests 2203 and 2204, dated December 1, 2014, cited 10 CFR 50.55a(a)(3)(i), which covered RRs for alternatives on the basis that the proposed alternative would provide an acceptable level of quality and safety. On December 5, 2015 the NRC reorganized 10 CFR 50.55a (79 FR 214), and RRs that had been previously covered by 10 CFR 50.55a(a)(3)(i) are now covered under the equivalent 10 CFR 50.55a(z)(1).

The ASME OM Code establishes the requirements of preservice and IST and examination of certain components to assess their operational readiness in light-water reactor nuclear power plants. It identifies the components subject to test or examination, responsibilities, methods, intervals, parameter to be measured and evaluated, criteria for evaluating the results, corrective action, personnel qualification, and record keeping. These requirements apply to pumps and valves that are required to perform a specific function in shutting down a reactor to the safe shutdown condition, in maintaining the safe shutdown condition, or in mitigating the consequences of an accident.

The proposed alternatives are for the CPS third 10-year IST program interval, which began on July 1, 2010, and is currently scheduled to conclude on June 30, 2020.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to authorize the alternative requested by the licensee.

### 3.0 TECHNICAL EVALUATION

#### 3.1 Licensee's Alternative Request 2203

ASME OM Code (ISTC) Requirements:

ISTC-3521(e), "Category A and Category B Valves," states that if exercising is not practicable during operation at power or cold shutdowns, it may be limited to full stroke during refueling outages.

ISTC-3521(h), "Category A and Category B Valves," states that all valve testing required to be performed during a refueling outage shall be completed before returning the plant to operation at power.

ISTC-3522(c), "Category C Check Valves," states if exercising is not practicable during operation at power and cold shutdowns, it shall be performed during refueling outages.

ISTC-3522(f), "Category C Check Valves," states all valve testing required to be performed during a refueling outage shall be completed before returning the plant to operation at power.

Alternative testing is requested for all ASME Class 1, 2, and 3 valves listed in CPS IST program Cold Shutdown Justification (CSJ) and Refuel Justification (RFJ) section 4 attachments.

The licensee states in part:

Reason for Request

In accordance with 10 CFR 50.55a(z)(1), relief is requested from the requirements of the OM Code, Subsection ISTC-3521(e), ISTC-3521(h), ISTC-3522(c) and ISTC-3522(f). The proposed alternative would provide an acceptable level of quality and safety.

These sections require CSJ and RFJ valves to be tested each refueling outage. CPS is currently on a 24-month fuel cycle, thus, CSJ and RFJ valves are currently tested every 24 months. For financial reasons, CPS will be transitioning to a 12-month fuel cycle beginning in the Spring of 2015; performing a refueling outage every 12 months. CPS intends to alternately schedule one short outage that will focus primarily on refueling activities with minimal maintenance activities (i.e., "refueling only outages") and one more traditional refueling outage consisting of both refueling activities and maintenance activities (i.e., "refueling/maintenance outages"). Based on the above referenced code requirements, CPS will be required to test all CSJ and RFJ valves every year. This in effect cuts the testing frequency of these valves in half (i.e., 1 year vs 2 years). This change in outage scheduling and its OM Code implications do not provide a compensating increase in level of quality or safety.

This RRs is being pursued to maintain the current (i.e., 2-year) testing frequency for the CPS CSJ and RFJ valves. This will allow CPS to maintain a minimal amount of testing during the "refueling only outage" and still maintain the same level of quality and safety by continuing the two year frequency that these valves have historically been tested at during the "refueling/maintenance outages."

Proposed Alternative

CPS proposes to continue testing CSJ and RFJ valves every two years with the CSJ valves being tested during all cold shutdowns lasting longer than 48 hours and continuing until the plant is ready to return to operation at power per ISTC-3521(g) and ISTC-3522(e). Based on the current outage plans, CPS proposes treating the "refueling only outage" as a cold shutdown in accordance with OM Code requirements and not a refueling outage. This will maintain the current time between tests at every 2 years for the CSJ and RFJ valves.

CPS currently maintains a list of all CSJ valves that are eligible for testing during an extended cold shutdown (i.e., greater than 48 hours). This list is provided to Operations and Outage Planning before each planned outage and within one shift in the case of a forced outage. From this list, Operations selects the valves to be tested during the course of the outage. Engineering coordinates with Operations to ensure testing of CSJ valves is consistent with the guidance provided in Section 3.1.1.1 of NUREG 1482, Revision 2.

The OM Code permits the testing of valves to be deferred to cold shutdown or refueling outages based on practicality. The CPS valves currently classified as RFJ valves have been tested each refueling outage in accordance with the requirements of the OM Code.

In response to NRC request for additional information, CPS has reviewed the test history for the RFJ valves to determine if test failures would indicate that more frequent testing of these valves would ensure more reliable performance.

After reviewing the test history for all 70 current RFJ valves for the past 6 RFOs (i.e., 2003 (C1R09) 2013 (C1R14)), a total of 11 unsatisfactory tests were identified involving 7 different valves. The valves that had an unsatisfactory test are listed in the table below organized by the outage that the failure occurred in.

Valve (RFJ#)	Test Failure Outage (test type)
1E12-F041B (RFJ-005)	C1R11 (CC)
1E22-F005 (RFJ-005)	C1R11 (CC)
1E51-F066 (RFJ-002)	C1R11 (CC)
1B21-F032A (RFJ-003)	C1R11 (CC)
1E21-F006 (RFJ-005)	C1R11 (CC)
1E22-F005 (RFJ-005)	C1R11 (CC)
1B21-F032B (RFJ-003)	C1R11 (CC)
1E51-F066 (RFJ-002)	C1R11 (CC)
1CM067 (RFJ-013)	C1R11 (CC)
1E51-F066 (RFJ-002)	C1R11 (CC)
1E12-F041B (RFJ-005)	C1R11 (CO)

CC = Check Valve Exercise Test – Closed

CO = Check Valve Exercise Test – Open

The other 63 valves have satisfactory test history that supports their continued testing on a 2-year test interval. Of the 7 valves that experienced an unsatisfactory test, 4 valves experienced one failure, 2 valves experienced two failures, and 1 valve was found to have experienced three failures. By virtue of no reoccurring failures, it has been demonstrated that the corrective actions taken with the 4 single failure valves have fixed their issues. The reactor pressure excess flow check valve 1CM067, which experienced a failure in C1R14 (2013), was replaced with a new valve.

Low pressure coolant injection testable check valve (i.e., 1E12-F041B) has experienced 2 failures, one on its open test and one on its close test. The open test issue found the packing gland out of alignment. This was repaired in C1R14. In C1R11 (2008), the closed test found the clearances between the disk and the valve body to be out of tolerance. The disk hole was re-bored to align the disk and body in C1R11. No repeat close test failure has occurred since C1R11.

High pressure core spray system testable check valve (i.e., 1E22-F005) had back to back failures of its check closed test, one in C1R11 and again in C1R12 (2010). Each time, repair work orders were completed. In C1R11 the valve was disassembled, no issues noted, the valve was reassembled, and passed its post-maintenance testing (PMT). In C1R12 it was disassembled and noted there were out of tolerance gaps between the valve disk and body. This was corrected under the repair work order and no repeat failure has occurred since C1R12.

Reactor core isolation cooling (RCIC) system testable check valve (i.e., 1E51-F066) has experienced multiple failures with the last two in consecutive outages. This valve is in a position to be tested during "refueling only outages" in addition to "refueling/maintenance outages." Until four consecutive years of tests are passed, this valve will be tested each refueling outage (i.e., 1 year test interval).

During the proposed "refueling only outage" there is no intent to perform maintenance on CSJ/RFJ valves other than stroking the valves as required (i.e. those valves classified as CSJ). If a valve were to fail during stroking, corrective action would be implemented and a post maintenance test would be performed prior to returning the valve to service. There would be no change in test frequency and no defined number of consecutive successful tests required to return to a 24 month test frequency. History shows that a 24-month testing frequency has been acceptable for these valves.

By maintaining the current testing frequency, CPS maintains the current acceptable level of quality and safety with regards to the CPS RFJ valves. This change in outage schedules will also increase the level of quality and safety for the CPS CSJ valves due to the planned outage in between the "refueling/maintenance outages" that will provide time to perform some of the CSJ valve testing. This statement is supported by the years of testing these valves at a 24-month interval.

In summary, CPS is proposing to test all of its CSJ and RFJ valves every 2 years during the "refueling/maintenance outages" and continue testing the CSJ valves as time allows during the "refueling only outage" to satisfy the requirements of ISTC-3521(g) and ISTC-3522(e). This will maintain the current time between tests for the CSJ and RFJ valves at a maximum of 2 years.

The proposed alternative identified in this relief request shall be utilized during the third 10-Year IST interval.

### 3.1.2 NRC Staff Evaluation

In the submittal, the licensee indicated that CPS is currently on a 24-month refuel cycle, but is in the process of transitioning to a 12-month refueling cycle. The licensee indicated that the reason for the change was that a 12-month refueling cycle with an alternating "refueling only outage" followed by a "refueling/maintenance outage" cycle would be financially beneficial.

The ASME OM Code recognizes that not every valve can meet the nominal exercise frequency every 3 months due to the exercise not being practicable during normal plant operation. The ASME OM Code allows extension of the exercise requirement to be performed during a cold shutdown event. Valve exercising shall commence within 48 hours of achieving cold shutdown and continue until all testing is complete or the plant is ready to return to operation at power. If valve exercising is not practicable during a cold shutdown then exercising will be limited to refueling outages. All valve tests required to be performed during a refueling outage shall be completed before returning the plant to operation at power.

Section ISTC of the ASME OM Code delineates the requirements for IST of valves in light-water reactor nuclear power plants. The valve testing requirements outlined in section ISTC-3500 of the ASME OM Code can be simply stated as:

- Exercise Test (nominally every 3 months)
- Leakage Test (nominally once every 2 years)
- Valve Obturator Movement (verify during exercise test)
- Fail-Safe Actuators (verify during exercise test)
- Remote Position Indicator Test (nominally once every 2 years)

In lieu of this requirement, the licensee has proposed an alternative. A 12-month refuel cycle would require all ASME OM Code valve exercise tests that have been justified to be extended to be completed prior to returning the plant to operation at power. CPS proposes to continue testing CSJ and RFJ valves every two years with the CSJ valves being tested during all cold shutdowns lasting longer than 48 hours and continuing until the plant is ready to return to operation at power per ISTC-3521(g) and ISTC-3522(e).

The NRC staff reviewed the proposed valve scheduling during cold shutdowns longer than 48 hours and valve maintenance history to ensure that the licensee's program will not allow CSJ valves to exceed the 24 month test interval. The NRC staff questioned how the licensee determines scheduling for the CSJ valves during the shorter "refueling only" outages. In the supplement dated March 26, 2015, the licensee indicated that based on the current outage plans, CPS proposes treating the "refueling only outage" as a cold shutdown in accordance with OM Code requirements and not a refueling outage. Valve selection for testing will be in accordance with the guidance of NUREG-1482 Revision 2 section 3.1.1.1 "IST Cold Shutdown Testing". The NRC staff finds that use of this guidance should ensure that the valves tested in the preceding cold shutdown are the last valves tested during the next cold shutdown with the exception of valves that must be tested during each cold shutdown.

The NRC staff reviewed the proposed testing for the RFJ valves to assess the effectiveness of the proposed test interval. The NRC staff questioned the maintenance history for the affected valves to assess whether sufficient reliability would be maintained. In the supplement dated March 26, 2015, the licensee indicated that based on the maintenance history 70 valves that have been designated as RFJ valves will maintain their current 24 month test interval with the exception of Reactor Core Isolation Cooling system testable check valve 1E51-F066. This valve has experienced multiple failures with the last two consecutive outages. Corrective maintenance has been performed on this valve. To verify that the corrective maintenance action is effective, CPS proposes to maintain testing check valve 1E51-F066 during each "refueling only outage" and "refueling/maintenance outage" interval until four successful consecutive years of tests are completed. Upon completion, check valve 1E51-F066 will return to the normal 24 month test interval.

The NRC staff reviewed the maintenance history for 70 RFJ valves to determine whether some valves would benefit from the ASME OM Code required interval test frequency. The NRC staff found that the licensee's corrective maintenance has been sufficient to address almost all identified performance issues for valve 1E51-F066, and therefore concludes that maintaining the 24 month test interval for the 70 RFJ valves is acceptable.

Based on the satisfactory maintenance history and valve scheduling for RFJ and CSJ valves, the NRC staff has determined that the alternative provides an acceptable level of quality and safety.



### 3.2.1 Licensee's Alternative RR 2204

#### ASME OM Code Requirements:

ASME OM Code Case OMN-1 "Alternative Rules for Preservice and Inservice Testing of Active Electric Motor-Operated Valve Assemblies in Light-Water Reactor Power Plants" Subsection 3.6.1, "Normal Exercising Requirements," states that all MOVs, within the scope of this Code Case, shall be full-cycle exercised at least once per refueling cycle with the maximum time between exercises to be not greater than 24 months. Full-cycle operation of an MOV, as a result of normal plant operations or Code requirements, may be considered an exercise of the MOV, if documented. If full-stroke exercising of an MOV is not practical during plant operation or cold shutdown, full-stroke exercising shall be performed during the plant's refueling outage.

Alternative testing is requested for all ASME Class 1, 2, and 3 MOVs currently included in the CPS MOV testing program.

The licensee states:

#### Reason for Request

In accordance with 10 CFR 50.55a(z)(1), relief is requested from the requirements of OM Code Case OMN-1, Subsection 3.6.1. The proposed alternative would provide an acceptable level of quality and safety.

Subsection 3.6.1 requires the applicable valves to be tested each refueling outage not to exceed 24 months. CPS is currently on a 24 month fuel cycle, thus, the applicable valves are currently being tested every 24 months. For financial reasons, CPS will be transitioning to a 12 month fuel cycle beginning in the Spring of 2015; performing a refueling outage every 12 months. CPS intends to alternately schedule one short outage that will focus primarily on refueling activities with minimal maintenance activities (i.e., "refueling only outages") and one more traditional refueling outage consisting of both refueling activities and maintenance activities (i.e., "refueling/maintenance outages"). Based on the above referenced code case requirements, CPS will be required to test all valves every 12 months. This in effect cuts the allowable testing frequency of these valves in half (i.e., 12 months vs 24 months). This change in outage scheduling and its OM Code implications do not provide a compensating increase in level of quality or safety.

This relief request is being pursued to maintain the current (i.e., 24 month) exercise frequency for the CPS valves covered by OMN-01. This will allow CPS to maintain a minimal amount of testing during the "refueling only outage" and still maintain the same level of quality and safety by continuing the 24 month frequency that these valves have historically been tested at during the "refueling/maintenance outage."

#### Proposed Alternative

CPS proposes to continue performing the exercise tests required by Subsection 3.6.1 of OMN-1 for the applicable valves every 24 months, as opposed to the required once per refueling cycle not to exceed 24 months.

By maintaining the current testing frequency at once every 24 months, CPS maintains the current acceptable level of quality and safety with regards to valves covered by OMN-1. This statement is supported by the years of testing these valves at a 24 month interval.

In summary, CPS is proposing to perform the exercise test for all of the valves covered by OMN-1 every 24 months. This will maintain the current time between tests at 2 years.

### 3.2.2 NRC Staff Evaluation

The ASME OM Code establishes the requirements of preservice and IST and examination of certain components to assess their operational readiness in light-water reactor nuclear power plants. It identifies the components subject to test or examination, responsibilities, methods, intervals, parameter to be measured and evaluated, criteria for evaluating the results, corrective action, personnel qualification, and record keeping. These requirements apply to pumps and valves that are required to perform a specific function in shutting down a reactor to the safe shutdown condition, in maintaining the safe shutdown condition, or in mitigating the consequences of an accident.

Section ISTC-3500 of the ASME OM Code delineates the valve testing requirements, which can be simply stated as:

- a) Exercise Test (nominally every 3 months)
- b) Leakage Test (nominally once every 2 years)
- c) Valve Obturator Movement (verify during exercise test)
- d) Remote Position Indicator Test (nominally once every 2 years)

In lieu of the testing requirements of section ISTC of the ASME OM Code, the licensee may implement an alternative provided that the test method has been authorized by NRC staff per 10 CFR 50.55a(z)(1) or 10 CFR 50.55.a(z)(2). Previously, CPS requested and was authorized to use alternative ASME OM Code case OMN-1 on June 10, 2010 (ADAMS Accession No. ML101340691). ASME OM Code Case OMN-1 expands the testing requirements to include static and dynamic diagnostic testing of MOVs. The use of diagnostics offers a more comprehensive evaluation of the components health and provides engineering justification for extending test intervals. The MOV testing requirements of ASME OM Code Case OMN-1 can be simply stated as:

- a) One time design basis verification test
- b) MOV exercise (once per refuel cycle not to exceed 24 months)
- c) Diagnostic test (mix of static and dynamic until appropriate test interval is set)

The June 2010, approval allows the licensee to replace the requirements of ASME OM Code Case OMN-1 with the exception of the leakage test requirements.

The NRC staff reviewed the submittal to assess whether the MOV diagnostic test interval remained appropriate. The NRC staff recognizes that the MOV exercise is not considered to be part of the diagnostic test. It is a preventive maintenance action to maintain proper lubrication of the internal moving parts with the requirement to complete the exercise once every 2 years. Calculations for determining MOV functional margin shall account for potential performance related degradation. Maintenance activities and associated intervals can affect test intervals

and shall be considered. The inservice diagnostic test interval shall be set such that the MOV functional margin does not decrease below acceptance criteria.

Based on the ASME OM Code case OMN-1 permitting the MOV exercise interval to not exceed 24 months and the licensee assertion that the current level of quality and safety will be maintained, the NRC staff finds that maintaining the MOV exercise test interval at 24 months continues to be sufficient to account for potential performance related degradation. Therefore, the NRC staff finds that the alternative provides an acceptable level of quality and safety.

#### 4.0 CONCLUSION

As set forth above, the NRC staff finds that the proposed alternative described in request 2203 provides an acceptable level of quality and safety for all ASME Class 1, 2, and 3 valves listed in CPS IST program CSJ and RFJ section 4 attachments. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1).

As set forth above, the NRC staff finds that the proposed alternative described in request 2204 provides an acceptable level of quality and safety for all ASME Class 1, 2, and 3 MOV currently included in the CPS MOV testing program. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1).

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

Therefore, the NRC staff authorizes the proposed alternatives in RRs 2203 and 2204 for the third IST interval at CPS which began on June 15, 2010, and is currently scheduled to end on June 14, 2020.

Principle Contributor: Michael Farnan, NRR

Date of issuance: July 15, 2015

B. Hanson

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If you have any questions, please contact Ms. Eva A. Brown, at 301-415-2315 or via e-mail at [eva.brown@nrc.gov](mailto:eva.brown@nrc.gov).

Sincerely,

**/RA/**

Benjamin G. Beasley, Acting Branch Chief  
Plant Licensing III-2 and  
Planning and Analysis Branch  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosure:  
Safety Evaluation

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