



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

January 8, 2018

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: LASALLE COUNTY STATION, UNITS 1 AND 2 - RELIEF FROM THE REQUIREMENTS OF THE ASME CODE AND OM CODE RE: RELIEF REQUEST I4R-01, PROPOSED ALTERNATIVES TO VARIOUS INSERVICE INSPECTION INTERVAL REQUIREMENTS OF THE AMERICAN SOCIETY OF MECHANICAL ENGINEERS, SECTION XI, 2007 EDITION WITH THE 2008 ADDENDA FOR THE FOURTH 10-YEAR ISI INTERVAL (CAC NOS. MF9758 AND MF9759; EPID L-2017-LLR-0057)

Dear Mr. Hanson:

By letter dated May 30, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17150A449), as supplemented by letters dated July 20, 2017 (Accession No. ML17201Q396) and November 10, 2017 (Accession No. ML17317A543), Exelon Generation Company, LLC (EGC, the licensee) submitted relief requests associated with the fourth Inservice Inspection (ISI) interval for LaSalle County Station (LSCS), Units 1 and 2. The fourth interval of the LSCS ISI program began on October 1, 2017, and is scheduled to end on September 30, 2027, and will comply with the American Society of Mechanical Engineers Boiler and Pressure Vessel (ASME Code), Section XI, 2007 Edition with the 2008 Addenda.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee requested the following relief request for the LSCS fourth 10-year ISI interval:

Relief Request [RR] I4R-01, approval of alternative risk-informed ISI program and examination criteria for Examination Category 8-F, 8-J, C-F-1, and C-F-2 pressure retaining piping welds in accordance with ASME Code Case N-578-1, "Risk-Informed Requirements for Class 1, 2, or 3 Piping, Method B, Section XI, Division 1."

The other RRs submitted by letter dated May 30, 2017 (ADAMS Accession No. ML17150A449), will be addressed via separate correspondence.

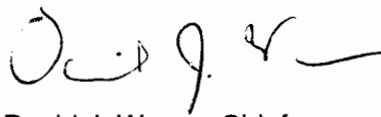
The U.S. Nuclear Regulatory Commission (NRC) staff has reviewed the subject request, as supplemented, and concludes, as set forth in the enclosed safety evaluation, that the proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1).

Therefore, the NRC staff authorizes use of this proposed alternative at LSCS, Units 1 and 2, for the fourth 10-year ISI interval, which began on October 1, 2017, and is scheduled to end on September 30, 2027.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and approved remain applicable, including third-party review by the Authorized Nuclear Inservice Inspector.

Please contact the Project Manager, Bhalchandra K. Vaidya at (301)-415-3308, if you have any questions.

Sincerely,

A handwritten signature in black ink, appearing to read "David J. Wrona", with a stylized flourish at the end.

David J. Wrona, Chief  
Plant Licensing III  
Division of Operating Reactor Licensing  
Office of Nuclear Reactor Regulation

Docket Nos. 50-373 and 50-374

Enclosures:  
As stated

cc: Listserv



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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELIEF REQUEST I4R-01, FOR

RENEWED FACILITY OPERATING LICENSE NOS. NPF-11 AND NPF-18

LASALLE COUNTY STATION, UNITS 1 AND 2

EXELON GENERATION COMPANY, LLC

DOCKET NOS. 50-373 AND 50-374

1.0 INTRODUCTION

By letter dated May 30, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17150A449), as supplemented by letters dated July 20, 2017 (Accession No. ML17201Q396) and November 10, 2017 (ADAMS Accession No. ML17317A543), Exelon Generation Company (the licensee) requested relief from the requirements of the American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI. Relief request (RR) I4R-01 pertains to use of a risk informed (RI) inservice inspection (ISI) program for Class 1 and 2 piping welds at the LaSalle County Station (LaSalle), Units 1 and 2.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) 50.55a(z)(1), the licensee proposed an alternative ISI program for Class 1 and 2 piping welds on the basis that the alternative provides an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Pursuant to 10 CFR 50.55a(g)(4), Inservice Inspection (ISI) Standards Requirement for Operating Plants, throughout the service life of a boiling or pressurized water-cooled nuclear power facility, components (including supports) that are classified as ASME Code Class 1, Class 2, and Class 3 must meet the requirements, except design and access provisions and preservice examination requirements, set forth in Section XI of editions and addenda of the ASME Code that become effective subsequent to editions specified in paragraphs (g)(2) and (3) of 50.55a and that are incorporated by reference in paragraph (a)(1)(ii) of 50.55a, to the extent practical within the limitations of design, geometry, and materials of construction of the components.

Pursuant to 10 CFR 50.55a(g)(4)(ii), Applicable ISI Code: Successive 120-Month Intervals, inservice examination of components and system pressure tests conducted during successive 120-month inspection intervals must comply with the requirements of the latest edition and

addenda of the ASME Code incorporated by reference in paragraph (a) of 50.55a 12 months before the start of the 120-month inspection interval (or the optional ASME Code Cases listed in NRC Regulatory Guide (RG) 1.147, Revision 17, when using ASME Code, Section XI, as incorporated by reference in paragraphs (a)(3)(ii) of 50.55a), subject to the conditions listed in paragraph (b) of 50.55a. However, a licensee whose ISI interval commences during the 12 through 18-month period after August 17, 2017, may delay the update of their Appendix VIII program by up to 18 months after August 17, 2017. Alternatively, licensees may at any time in their 120-month ISI interval, elect to use the Appendix VIII in the latest edition and addenda of the ASME Code incorporated by reference in paragraph (a) of 50.55a, subject to any applicable conditions listed in paragraph (b) of 50.55a. Licensees using this option must also use the same edition and addenda of Appendix I as Appendix VIII, including any applicable conditions listed in paragraph (b) of 50.55a.

Pursuant to 10 CFR 50.55a(z), Alternatives to Codes and Standards Requirements, alternatives to the requirements of paragraphs (b) through (h) of 50.55a or portions thereof may be used when authorized by the Director, Office of Nuclear Reactor Regulation, or Director, Office of New Reactors, as appropriate. A proposed alternative must be submitted and authorized prior to implementation. The applicant or licensee must demonstrate that: (1) Acceptable Level of Quality and Safety, the proposed alternative would provide an acceptable level of quality and safety; or (2) Hardship without a Compensating Increase in Quality and Safety, compliance with the specified requirements of 50.55a would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

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

### 3.0 TECHNICAL EVALUATION

#### 3.1 Background

During second and third 10-year ISI intervals of LaSalle, Units 1 and 2, the licensee implemented the NRC approved LaSalle RI-ISI program for Class 1 and 2 piping welds. The licensee developed the LaSalle original RI-ISI program (approved by the NRC in the December 27, 2001, letter (ADAMS Accession No. ML013610078)), in accordance with the NRC-approved methodology of the Electric Power Research Institute (EPRI) Topical Report (TR)-112657, Revision B-A, "Revised Risk-Informed Inservice Inspection Evaluation Procedure" (ADAMS Accession No. ML013470102), for the second 10-year ISI interval of Units 1 and 2. Subsequently, by letter dated April 29, 2008 (Accession No. ML080940215), the NRC authorized LaSalle RI-ISI program for the third 10-year ISI interval of Units 1 and 2.

By letters dated May 30, 2017, July 20, 2017, and November 10, 2017, the licensee submitted for the NRC approval RR 14R-01 proposing to implement the RI-ISI program in the fourth 10-year ISI interval of LaSalle, Units 1 and 2. As required, the licensee periodically evaluated its RI-ISI program and updated it as necessary during previous 10-year ISI intervals (second and third). The outcome of these reviews and updates is the latest LaSalle RI-ISI program that is the subject of the current RR 14R-01.

#### 3.2 Components Affected

ASME Code Class 1 and 2 piping welds are affected. These are:

- Class 1 vessel nozzle to pipe dissimilar metal (DM) welds classified as Examination Category B-F, Item No. B5.10, (Table IWB-2500-1 of Section XI);
- Class 1 piping similar and DM welds classified as Examination Category B-J, Item No. B9.11, B9.21, B9.31, B9.32, and B9.40, (Table IWB-2500-1);
- Class 2 austenitic stainless steel or high alloy piping welds classified as Examination Category C-F-1, Item No. C5.11 and C5.21, (Table IWC-2500-1); and
- Class 2 carbon or low alloy steel piping welds classified as Examination Category C-F-2, Item No. C5.51 and C5.81, (Table IWC-2500-1).

### 3.3 Applicable Code Edition and Addenda

The code of record for the fourth 10-year ISI interval is the 2007 Edition through 2008 Addenda of the ASME Code.

### 3.4 Duration of Request

The licensee submitted this request for the fourth 10-year ISI interval of LaSalle, Units 1 and 2. For each unit the fourth 10-year ISI interval began on October 1, 2017, and is scheduled to end on September 30, 2027.

### 3.5 ASME Code Requirement

The ASME Code requirements applicable to the ISI of Class 1 and 2 piping welds originate in Table IWB-2500-1 and Table IWC-2500-1 of Section XI, respectively.

Examination Category B-F and B-J in Table IWB-2500-1 require Class 1 piping welds be subjected to volumetric examination, surface examination, or both during successive 120-month (10-year) intervals. According to the above requirements, 100 percent of all nozzle to pipe DM welds in Examination Category B-F, and 25 percent of all piping welds with more than one inch nominal diameter in Examination Category B-J shall be inspected.

Examination Category C-F-1 and C-F-2 in Table IWC-2500-1 require Class 2 piping welds be subjected to the volumetric examination, surface examination, or both during successive 120-month (10-year) intervals. According to above requirements, 7.5 percent of non-exempt piping welds in Examination Category C-F-1 and C-F-2 shall be inspected.

### 3.6 Proposed Alternative

The licensee proposed an alternative to the ASME Code requirements. The proposed alternative is to use a plant-specific RI-ISI program (i.e., to continue implementing LaSalle RI-ISI program for Class 1 and 2 piping welds) in the fourth 10-year ISI interval.

### 3.7 Basis for Use of Alternative

The licensee stated that the original LaSalle RI-ISI program (approved by the NRC dated December 27, 2001) has been maintained as a living program requiring feedback of new relevant information. The proposed LaSalle RI-ISI program for the fourth 10-year ISI interval is based on the same risk informed methodology of the evaluation as the original RI-ISI program. The licensee has reviewed the LaSalle RI-ISI program during previous intervals and has periodically adjusted the risk ranking of piping segments. There have been two updates to the internal events probabilistic risk assessment (PRA) model since the 2008 peer review (one in 2011 and the other in 2014). The most recent update of LaSalle PRA model was completed in November 2015. The proposed RI-ISI program for the fourth interval is the outcome of these reviews and updates.

In tables in Attachment 1 to RR I4R-01, the licensee summarized the results of its risk impact assessment for the fourth 10-year ISI interval of LaSalle, Units 1 and 2. Based on this assessment, the change in risk from the ASME Code ISI program to the RI-ISI program is shown to be less than 1.00E-06 per year for delta-core damage frequency (CDF) and less than 1.00E-07 per year for delta-large early release frequency (LERF).

### 3.8 NRC Staff Evaluation

The NRC staff has evaluated this RR pursuant to 10 CFR 50.55a(z)(1). The NRC staff focuses on whether the proposed alternative provides an acceptable level of quality and safety.

#### NRC Guidelines Utilized for this Evaluation

The requirements in RG 1.174, Revision 2, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis" provides guidance on the use of PRA findings and risk insights to support licensee requests for changes to a plant's licensing basis (LB). RG 1.174, Revision 2, also defines an acceptable approach to analyzing and evaluating proposed LB changes. The approach includes traditional engineering evaluations supported by insights derived from the use of PRA methods about the risk significance of the proposed changes. In implementing risk informed decision making, the NRC expects LB changes meet the acceptance guidelines and key principles of risk informed regulation specified in RG 1.174, Revision 2. Directly relevant to RG 1.174, Revision 2, are:

- RG 1.200, Revision 2, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities;"
- RG 1.178, Revision 1, "An approach for Plant-Specific Risk-Informed Decision Making for Inservice Inspection of Piping;"
- Standard Review Plan (SRP) Chapter 3.9.8, Revision 0, "Standard Review Plan for the Review of Risk-Informed Inservice Inspection of Piping" (NUREG 0800, "Standard Review Plan for the Review of Safety Analysis Reports for Nuclear Power Plants: LWR [light-water reactor] Edition").

Revision 2 of RG 1.200 describes an approach to determine whether the technical adequacy of the PRA used to support a submittal is consistent with accepted practices. RG 1.178, Revision 1, describes methods acceptable to the NRC for integrating insights from PRA techniques with traditional engineering analyses into ISI programs for piping. Incorporating risk

insights into the programs can focus inspections on the more important locations and reduce personnel exposure, while at the same time maintaining public health and safety. The SRP provides guidance for evaluating the licensee's requests for changes to the LB due to use of risk insights.

Revision 1 of RG 1.178 provides guidance for development, review, approval, and implementation of a plant-specific RI-ISI program.

As a basis for its proposed alternative, the licensee used the methodology of the NRC approved EPRI TR-112657, Revision B-A, along with enhancement specified in ASME Code Case N-578-1, "Risk-Informed Requirements for Class 1, 2, or 3 Piping, Method B, Section XI, Division 1," to develop the initial LaSalle RI-ISI program (approved by the NRC in the December 27, 2001, letter). The EPRI TR provides technical guidance on an alternative for selecting and categorizing the risk significance of piping components for the purpose of developing an RI-ISI program. The guidance in RG 1.174, Revision 2, and RG 1.178, Revision 1, defines an acceptable approach to analyzing and evaluating the licensee's proposed LB changes that are supported with risk information. As part of evaluating the proposed change to the LaSalle ISI program, the licensee performed an engineering analysis (i.e., traditional engineering evaluation methods supported by insights derived from the use of PRA methods about the risk significance of the proposed changes) to demonstrate that the proposed changes are in conformance with the key principles of risk informed regulation in RG 1.174, Revision 2, and will not compromise defense in depth and safety margins. As part of the RI-ISI process, the licensee performed periodic performance evaluations of the LaSalle RI-ISI program and updated it in accordance with RG 1.174, Revision 2, and RG 1.178, Revision 1.

The key principles of risk informed regulation in RG 1.174, Revision 2, are as follows:

- Principle 1. The proposed change meets the current regulations unless it is explicitly related to a requested exemption (i.e., a specific exemption under 10 CFR 50.12, "Specific Exemptions").
- Principle 2. The proposed change is consistent with a defense in depth philosophy.
- Principle 3. The proposed change maintains sufficient safety margins.
- Principle 4. When proposed changes result in an increase in CDF or risk, the increases should be small and consistent with the intent of the Commission's Safety Goal Policy Statement.
- Principle 5. The impact of the proposed change should be monitored using performance measurement strategies.

#### Review of Adequacy of Fulfillment of Key Principles of Risk informed Regulation

In evaluation of this RR, the NRC staff focuses on whether the licensee's proposed RI-ISI program for the fourth 10-year ISI interval conforms to these five key principles of risk informed regulation. The staff findings are as follows.

The first key principle is met in this RR because the licensee's proposed RI-ISI program is an alternative to the ASME Code ISI program as may be requested for NRC approval pursuant to 10 CFR 50.55a(z)(1).

The second and third key principles require assurance that the alternative program is consistent with the defense-in-depth philosophy and that sufficient safety margins are maintained, respectively. The NRC staff assessed the manner in which the licensee applied the principles in

EPRI TR-112657, Revision B-A, and finds that the methods were correctly applied. Since the NRC staff evaluated the EPRI TR to determine that the methodology proposed would provide for adequate adherence to the principles of defense in depth and adequate margins, and since the NRC staff finds that the process described in EPRI TR was adequately followed, the staff determines that the second and third principles have been met.

The fourth principle requires that any increase in CDF and LERF are small and consistent with the Commission's Safety Goal Policy Statement. The change in risk estimate is dependent on the location of inspections in the proposed ISI program compared to the location of inspections that would be performed using the requirements of ASME Code, Section XI. The NRC staff has previously determined that it is not necessary to develop a new deterministic ASME Code program for each new 10-year ISI interval but, instead, it is acceptable to compare the new proposed RI-ISI program with the last deterministic ASME Code program. In Attachment 1 to the May 30, 2017, submittal, the licensee stated that the change in risk of implementing the RI-ISI program was determined to meet the requirements of Section 3.7, "Risk Impact Assessment" in EPRI TR-112657; therefore, the NRC staff finds that implementation of the RI-ISI program will have a small and acceptable impact on risk consistent with the acceptance guidelines in RG 1.174.

The licensee states that a new risk impact analysis was performed. The fourth interval update of the risk impact assessment provided in the November 10, 2017, request for additional information (RAI) response identifies an increase of  $5.26\text{E-}09$  per year for Unit 1 and  $6.31\text{E-}09$  per year for Unit 2 with regards to CDF, and an increase of  $4.34\text{E-}09$  per year for Unit 1 and  $4.94\text{E-}09$  per year for Unit 2 with regards to LERF. The delta-CDF and delta-LERF results are roughly the same because the dominant, contributing consequence of a pipe break for delta-CDF is a containment bypass event such as a break in the break exclusion region piping at LaSalle. Since the accident sequences bypass containment, the delta-LERF contribution from these sequences is identical to the delta-CDF contribution and, since they dominate the total changes, they lead to the near equivalence of delta-LERF with delta-CDF at each unit. These values satisfy the acceptance criteria for RG 1.174 and EPRI TR-112657 when compared to the last deterministic Section XI inspection program. Thus, the NRC staff finds that the licensee's analysis provides assurance that this aspect of the fourth key principle is met.

The fourth principle also requires demonstration of the technical adequacy of the PRA. As discussed in RGs 1.178 and 1.200, an acceptable change in risk evaluation (and risk-ranking evaluation used to identify the most risk significant locations) requires the use of a PRA of appropriate technical quality that models the as-built and as-operated plant. A peer review of the LaSalle PRA was conducted under the auspices of the Boiling Water Reactor Owners' Group in 2008 using the Nuclear Energy Institute (NEI) 05-04 process and the ASME Code PRA Standard RA-Sc-2007 version along with RG 1.200, Revision 1. There have been two PRA updates to the internal events model since the performance of the 2008 peer review, in 2011 and 2014. During these PRA updates, a self-assessment was performed against RG 1.200, Revision 2. In addition, an independent assessment was conducted for the purpose of Facts & Observations (F&Os) closure and to identify the classification of all PRA changes associated with F&O resolution. With respect to adoption of the EPRI Human Reliability Analysis (HRA) Calculator, an independent reviewer compared the 2006 and 2011 documentation, i.e., the licensee's HRA methodology prior to adoption of the HRA Calculator, and determined that the same methods and techniques were used in the final PRA update. The licensee concluded that adoption of the HRA Calculator can be considered as PRA "maintenance" versus PRA "upgrade," excluding the need for a focused-scope peer review of the HRA technical element of the PRA Standard. In the November 10, 2017, RAI response, the



licensee provided the qualifications of the independent reviewer which helped the NRC staff conclude that the HRA expert could qualify as an expert capable of performing a focused-scope review for the HRA technical element as required for a PRA upgrade. While the NRC staff could not determine whether the independent review itself could be considered equivalent to a focused-scope peer review, the NRC staff concludes that, for this specific application, the licensee's conclusion that adoption of the HRA Calculator constituted only PRA "maintenance," thereby pre-empting the need for a focused-scope peer review, is acceptable given the performance of the independent review and the qualifications of the reviewer.

In the submittal, the licensee referred to EPRI TR-1021467, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-Service Inspection Programs" (Reference 2), which received a safety evaluation from the NRC in January 2012 (ADAMS Accession No. ML11325A340). This TR provides guidance on determining the technical adequacy of PRAs used to develop a RI-ISI program that utilizes the traditional methodology as described in EPRI TR-112657, Revision B-A. Based on the self-assessment following the 2014 PRA model update, the licensee states that the LaSalle PRA contains two supporting requirements (SRs) (DA-C6 and DA-C10) as not being met. The licensee's open F&Os were found to be documentation-only issues or to have no impact on the RI-ISI program. Based on a review of the identified gaps using the NRC-approved EPRI TR-1021467, "Nondestructive Evaluation: Probabilistic Risk Assessment Technical Adequacy Guidance for Risk-Informed In-service Inspection Programs" (Reference 3), the NRC staff finds that the licensee has assessed the technical adequacy of its PRA using an appropriate version of RG 1.200 and the PRA is of sufficient technical adequacy to support the proposed RI-ISI program. In addition, the licensee states that the 2008 peer review shows these SRs as met with a suggestion to improve documentation. From detailed calculations presented in the November 10, 2017, RAI response with respect to these SRs, the licensee demonstrates that additional refinements to the plant-specific data will not have a significant impact on the PRA model. Therefore, consistent with the guidelines in EPRI TR-1021467, the NRC staff finds the LaSalle PRA model suitable for use in this RI-ISI application, assuring this other aspect of the fourth key principle is met.

The fifth principle of risk-informed decision making requires that the impact of the proposed change be monitored by using performance measurement strategies. The RI-ISI program is a living program and, as such, is subject to periodic reviews. The licensee indicates that the Consequence Evaluation, Degradation Mechanism Assessment, Risk Ranking, Element Selection and Risk Impact Assessment steps encompass the living program process applied to the LaSalle RI-ISI program. The May 30, 2017, submittal, stated that the evaluation and ranking procedure for the fourth interval remain unchanged, and are continually applied to maintain the Risk Categorization and Element Selection methods of EPRI TR-112657, Revision B-A. These portions of the RI-ISI Program have been and will continue to be re-evaluated as major revisions of the site PRA occur and modifications to plant configuration are made. Therefore, the NRC staff finds that the licensee's proposed alternative provides assurance the fifth principle is met.

Based on the above, the NRC staff determines that the proposed RI-ISI program for the fourth 10-year ISI interval meets the five key principles of risk informed regulation and, therefore, provides an acceptable level of quality and safety.

#### 4.0 CONCLUSION

As set forth above, the NRC staff determines that the proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1). Therefore, the NRC staff authorizes use of this proposed alternative at LaSalle, Units 1 and 2, for the fourth 10-year ISI interval, which began on October 1, 2017, and is scheduled to end on September 30, 2027.

All other ASME Code, Section XI, requirements for which relief was not specifically requested and authorized herein by the NRC staff remain applicable, including the third-party review by the Authorized Nuclear In service Inspector.

Principal Contributor: O. Yee, NRR/EVIB

Date of issuance: January 8, 2018

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**ADAMS Package Accession No. ML18003A247**

(\*) No Substantial change from SE Input Memorandum

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