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

September 26, 2017

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

SUBJECT: CLINTON POWER STATION, UNIT NO. 1 - ISSUANCE OF AMENDMENT REGARDING PERMANENT EXTENSION OF TYPE A AND TYPE C LEAK RATE TEST FREQUENCIES (CAC NO. MF7290)

Dear Mr. Hanson:

The U.S. Nuclear Regulatory Commission (the Commission) has issued the enclosed Amendment No. 214 to Facility Operating License No. NPF-62 for the Clinton Power Station, Unit No. 1. The amendment consists of changes to the technical specifications (TSs) in response to your application dated January 25, 2016, as supplemented by letters dated March 31, 2016, March 2, and June 1, 2017.

The amendment revises TSs associated with the primary containment leakage rate testing program. Specifically, the amendment extend the frequencies for performance of the Type A containment integrated leakage rate test and the Type C containment isolation valve leakage rate test, which are required by Title 10 of the *Code of Federal Regulations* Part 50, Appendix J, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors." The amendment also deletes the requirement in TS 5.5.13 to perform Type A testing by 2008.

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

Sincerely,

Jennivine Rankin, Project Manager
Plant Licensing Branch III
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-461

Enclosures:
1. Amendment No. 214 to NPF-62
2. Safety Evaluation

cc w/encls: Distribution via Listserv

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

EXELON GENERATION COMPANY, LLC

DOCKET NO. 50-461

CLINTON POWER STATION, UNIT NO. 1

AMENDMENT TO FACILITY OPERATING LICENSE

Amendment No. 214
License No. NPF-62

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

   A. The application for amendment by Exelon Generation Company, LLC (the licensee), dated January 25, 2016, as supplemented by letters dated March 31, 2016, March 2, and June 1, 2017, 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. NPF-62 is hereby amended to read as follows:

   (2) Technical Specifications and Environmental Protection Plan

   The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 214, are hereby incorporated into this license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

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

FOR THE NUCLEAR REGULATORY COMMISSION

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

Attachment: Changes to the Technical
Specifications and Facility Operating License

Date of Issuance: September 26, 2017

ATTACHMENT TO LICENSE AMENDMENT NO. 214

CLINTON POWER STATION, UNIT NO. 1

FACILITY OPERATING LICENSE NO. NPF-62

DOCKET NO. 50-461

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

Remove	Insert
License NPF-62 Page 3	License NPF-62 Page 3
TSs Page 5.0-16a	TSs Page 5.0-16a

(4) Exelon Generation Company, pursuant to the Act and to 10 CFR Parts 30, 40, and 70, to receive, possess, and use at any time any byproduct, source and special nuclear material as sealed neutron sources for reactor startup, sealed sources for reactor instrumentation and radiation monitoring equipment calibration, and as fission detectors in amounts as required;

(5) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to receive, possess, and use in amounts as required any byproduct, source or special nuclear material without restriction to chemical or physical form, for sample analysis or instrument calibration or associated with radioactive apparatus or components;

(6) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, 40, and 70, to possess, but not separate, such byproduct and special nuclear materials as may be produced by the operation of the facility. Mechanical disassembly of the GE14i isotope test assemblies containing Cobalt-60 is not considered separation; and

(7) Exelon Generation Company, pursuant to the Act and 10 CFR Parts 30, to intentionally produce, possess, receive, transfer, and use Cobalt-60.

C. This license shall be deemed to contain and is subject to the conditions specified in the Commission's regulations set forth in 10 CFR Chapter I and is subject to all applicable provisions of the Act and to the rules, regulations and orders of the Commission now or hereafter in effect; and is subject to the additional conditions specified or incorporated below:

(1) Maximum Power Level

Exelon Generation Company is authorized to operate the facility at reactor core power levels not in excess of 3473 megawatts thermal (100 percent rated power) in accordance with the conditions specified herein.

(2) Technical Specifications and Environmental Protection Plan

The Technical Specifications contained in Appendix A and the Environmental Protection Plan contained in Appendix B, as revised through Amendment No. 214, are hereby incorporated into this license. Exelon Generation Company shall operate the facility in accordance with the Technical Specifications and the Environmental Protection Plan.

5.5 Programs and Manuals (continued)

5.5.13 Primary Containment Leakage Rate Testing Program

A program shall be established to implement the leakage rate testing of the primary containment as required by 10 CFR 50.54 (o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with the guidelines contained in NEI 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR 50, Appendix J," Revision 3-A, dated July 2012, and the conditions and limitations specified in NEI 94-01, Revision 2-A, dated October 2008, as modified by the following exception: (1) Bechtel Topical Report BN-TOP-1 is also an acceptable option for performance of Type A tests.

The peak calculated containment internal pressure for the design basis loss of coolant accident, P_a, is 9.0 psig.

The maximum allowable primary containment leakage rate L_a, at P_a, shall be 0.65% of primary containment air weight per day.

Leakage Rate acceptance criteria are:

a. Primary containment leakage rate acceptance criterion is $\leq 1.0\ L_a$. During the first unit startup following testing in accordance with this program, the leak rate acceptance criteria are $\leq 0.60\ L_a$ for the Type B and Type C tests and $\leq 0.75\ L_a$ for Type A tests;

b. Air lock testing acceptance criteria are:

   1) Overall air lock leakage rate is ≤ 5 scfh when tested at $\geq P_a$,

   2) For each door, leakage rate is ≤ 5 scfh when the gap between door seals is pressurized $\geq P_a$.

The provisions of SR 3.0.2 do not apply to the test frequencies specified in the Primary Containment Leakage Rate Testing Program.

The provisions of SR 3.0.3 are applicable to the Primary Containment Leakage Rate Testing Program.

(continued)

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 214 TO FACILITY OPERATING LICENSE NO. NPF-62

EXELON GENERATION COMPANY, LLC

CLINTON POWER STATION, UNIT NO. 1

DOCKET NO. 50-461

1.0 INTRODUCTION

By application dated January 25, 2016 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML16025A182), as supplemented by letters dated March 31, 2016, March 2, and June 1, 2017 (ADAMS Accession Nos. ML16091A077, ML17062A584, and ML17152A346, respectively), Exelon Generation Company, LLC (Exelon, the licensee) submitted a license amendment request (LAR) for Clinton Power Station, Unit 1 (CPS). The LAR proposes changes to Technical Specification (TS) 5.5.13, "Primary Containment Leakage Rate Testing Program" for the permanent extension of the Type A integrated leakage rate test (ILRT) program test interval from 10 years to 15 years in accordance with Nuclear Energy Institute (NEI) 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR [Title 10 of the *Code of Federal Regulations*] Part 50, Appendix J (ADAMS Accession No. ML12221A202)," and the conditions and limitations specified in NEI 94-01, Revision 2-A (ADAMS Accession No. ML100620847). The LAR also proposes to extend the containment isolation valve leakage rate testing (e.g., Type C) frequency from the 60 months currently permitted, to a 75-month frequency for Type C leakage rate testing of selected components in accordance with NEI 94-01, Revision 3-A.

In addition, the LAR proposes an administrative change to TS 5.5.13 to delete the requirement for performance of CPS Type A test which was to be performed no later than November 2008, as this Type A test has already occurred.

The supplements dated March 2, and June 1, 2017, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the U.S. Nuclear Regulatory Commission (NRC or the Commission) staff's original proposed no significant hazards consideration determination as published in the *Federal Register* (FR) on May 10, 2016 (81 FR 28895).

2.0 REGULATORY EVALUATION

The LAR requested a change to the Facility Operating License for CPS, in accordance with 10 CFR 50.90, "Application for amendment of license, construction permit, or early site permit." The regulations in 10 CFR 50.54(o) require that the primary reactor containments for water cooled power reactors shall be subject to the requirements set forth in Appendix J to 10 CFR Part 50, "Primary Reactor Containment Leakage Testing for Water-Cooled Power Reactors."

Appendix J to 10 CFR Part 50 includes two options: Option A – Prescriptive Requirements, and Option B – Performance-Based Requirements, either of which can be chosen for meeting the requirements of Appendix J.

The testing requirements in Appendix J ensure that leakage through the primary containment and related systems and components penetrating primary containment does not exceed allowable leakage rate value specified in the TSs or associated bases, and that integrity of the containment structure is maintained during its service life.

The licensee has voluntarily adopted and has been implementing Option B for meeting the requirements of Appendix J. The NRC staff issued the associated amendment (Amendment No. 105) by letter dated June 21, 1996 (ADAMS Accession No. ML020990619). Option B of Appendix J specifies the performance-based requirements and criteria for preoperational and subsequent leakage-rate testing. These requirements are met by: (1) performance of Type A tests to measure the containment system overall integrated leakage rate; (2) Type B pneumatic tests to detect and measure local leakage rates across pressure retaining leakage-limiting boundaries such as penetrations; and (3) Type C pneumatic tests to measure containment isolation valve leakage rates. After the preoperational tests, these tests are required to be conducted at periodic intervals, based on the historical performance of the overall containment system (for Type A tests), and based on the safety significance and historical performance of each boundary and isolation valve (for Type B and C tests), to ensure integrity of the overall containment system as a barrier to fission product release. The leakage rate test results must not exceed the maximum allowable leakage rate (L_a) with margin, as specified in the TSs.

Option B also requires that a general visual inspection for structural deterioration of the accessible interior and exterior surfaces of the containment system, which may affect the containment leak-tight integrity, be conducted prior to each Type A test, and at a periodic interval between tests based on the performance of the containment system.

Section V.B.3 of 10 CFR 50, Appendix J, Option B, requires that the regulatory guide (RG) or other implementation document used by a licensee to develop a performance-based leakage-testing program must be included, by general reference, in the plant TSs. Furthermore, the submittal for TS revisions must contain justification, including supporting analyses, if the licensee chooses to deviate from methods approved by the Commission and endorsed in an RG.

The regulations in 10 CFR 50.36(c)(5), "Administrative controls," require, in part, the inclusion of administrative controls in TSs that are necessary to ensure operation of the facility in a safe manner. This LAR requests a change to a TS under the "Administrative Controls" section of the CPS TSs.

Section 50.55a "Codes and standards," of 10 CFR contains the containment inservice inspection (ISI) program requirements that, in conjunction with the requirements of 10 CFR Part 50, Appendix J, ensure the continued leak-tight and structural integrity of the containment during its service life.

10 CFR 50.65(a), "Requirements for monitoring the effectiveness of maintenance at nuclear power plants," states in part that the licensee:

> ...shall monitor the performance or condition of structures, systems, or components, against licensee-established goals, in a manner sufficient to provide reasonable assurance that these structures, systems, and components, as defined in paragraph (b) of this section, are capable of fulfilling their intended functions. These goals shall be established commensurate with safety and, where practical, take into account industry-wide operating experience.

NEI 94-01, Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J" (ADAMS Accession No. ML11327A025), provides methods for complying with the provisions of 10 CFR Part 50, Appendix J, Option B, and includes provisions that address the extension of the performance-based Type A test interval for up to 10 years, based upon two consecutive successful tests.

The final safety evaluation (SE) for NEI 94-01, Revision 2 and Electric Power Research Institute (EPRI) Report No. 1009325, Revision 2, August 2007, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals," dated June 25, 2008 (ADAMS Accession No. ML081140105), states that NEI 94-01, Revision 2 describes an acceptable approach for implementing the optional performance-based requirements of 10 CFR Part 50, Appendix J, Option B. NEI 94-01, Revision 2 incorporates the regulatory positions stated in RG 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995 and includes provisions for extending Type A test intervals up to 15 years. The NRC staff concluded that NEI 94-01, Revision 2, is acceptable for referencing by licensees proposing to amend their containment leakage rate testing TSs, subject to the specific limitations and conditions listed in Section 4.1 of the SE. The final approved version, NEI 94-01, Revision 2-A, was published on November 19, 2008 and includes the NRC SE. The NRC staff's assessment of the limits and conditions for this amendment request are discussed in Section 3.6 of this SE.

EPRI Report No. 1009325, Revision 2[1], provides a generic assessment of the risks associated with a permanent extension of the ILRT surveillance interval to 15 years, and a risk-informed methodology/template to be used to confirm the risk impact of the ILRT extension on a plant-specific basis. Probabilistic risk assessment (PRA) methods are used in combination with ILRT performance data and other considerations, to justify the extension of the ILRT surveillance interval. This is consistent with guidance provided in RGs 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," (ADAMS Accession No. ML100910006) and 1.177, "An Approach for Plant-Specific, Risk-Informed Decisionmaking: Technical Specifications," (ADAMS Accession No. ML10091008) to support changes to surveillance test intervals.

NEI 94-01, Revision 3-A, July 2012, provides guidance for extending Type C local leak rate test (LLRT) intervals beyond 60 months. The NRC found NEI 94-01, Revision 3 acceptable for referencing in licensing application, as documented in the final SE dated June 8, 2012 (ADAMS Accession No. ML121030286).

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[1] EPRI Report 1018243 is also identified as EPRI Report 1009325, Revision 2-A. This report is publicly available and can be found at www.epri.com by typing "1018243" in the search box.

3.0 TECHNICAL EVALUATION

3.1 Licensee's Proposed Changes

The LAR would revise the CPS leakage rate testing program by implementing the guidance in NEI 94-01, Revision 3-A, and the conditions and limitations specified in NEI 94-01, Revision 2-A. The LAR also proposes to delete the requirement regarding performance of a Type A test no later than November 2008, as this test has already occurred.

CPS, TS 5.5.13 currently states, in part:

> A program shall be established to implement the leakage rate testing of the primary containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995, as modified by the following exceptions: (1) Bechtel Topical Report EN-TOP-1 is also an acceptable option for performance of Type A tests, and (2) NEI 94-01 - 1995, Section 9.2.3: The first Type A test performed after November 23, 1993 shall be performed no later than November 23, 2008.

The licensee proposes changing TS 5.5.13 to state, in part:

> A program shall be established to implement the leakage rate testing of the primary containment as required by 10 CFR 50.54(o) and 10 CFR 50, Appendix J, Option B, as modified by approved exemptions. This program shall be in accordance with the guidelines contained in NEI 94-01, "Industry Guideline for Implementing Performance-Based Option of 10 CFR 50, Appendix J," Revision 3-A, dated July 2012, and the conditions and limitations specified in NEI 94-01, Revision 2-A, dated October 2008, as modified by the following exception: (1) Bechtel Topical Report EN-TOP-1 is also an acceptable option for performance of Type A tests.

The LAR follows NEI 94-01, Revision 3-A, and the limitations and conditions of Section 4.1 of the NEI 94-01, Revision 2-A, SE. NEI 94-01, Revision 3-A, provides that extension of the Type A test interval to 15 years be based on two consecutive successful Type A tests (performance history) and other requirements stated in Section 9.2.3 in NEI 94-01, Revision 3-A. The basis for acceptability of extending the Type A test interval also includes implementation of robust Type B and Type C testing of the penetration barriers, where most containment leakage has historically been shown to occur and are expected to continue to be the pathways for a majority of potential primary containment leakage; and of a robust containment visual inspection program where deterioration of the primary containment boundary away from penetrations can be detected and remediated before any actual significant leakage can occur.

The LAR also proposes an extension of the Type C test interval. For CPS, Type C tests are currently required to be performed at no longer than 60-month interval. The LAR would extend the maximum allowed interval from 60 months to 75 months for Type C tests. NEI 94-01, Revision 3-A, provides that a maximum interval of 120 months could be allowed for Type B tests

and a maximum interval of 75 months allowed for Type C tests with a limited provision for extension or grace period up to 9 months allowed for these LLRTs.

3.2 Description of the CPS Containment

CPS is a General Electric boiling-water reactor (BWR) design with a Mark III pressure suppression containment system consisting of a drywell, a vapor suppression pool, and a primary containment building. The reinforced concrete cylindrical drywell structure with a removable steel head houses the reactor system. The suppression pool contains a large amount of water to rapidly condense steam from reactor vessel blowdown or from a break in a major pipe. The containment vessel completely surrounds the drywell and the suppression pool. A part of the suppression pool water is retained by a cylindrical concrete weir wall inside the drywell, however, a major part of the suppression pool water is outside the drywell between the drywell wall and the containment wall. A system of drywell vents in the drywell wall below the suppression pool water level connects the inner and outer parts of the suppression pool.

The primary containment consists of a right circular cylinder with a hemispherical domed roof and a flat base slab. It is constructed of reinforced concrete and completely lined on the inside of the walls and dome with a steel plate which serves as a leak tight membrane. The containment dimensions measure 124 feet (ft.) inside diameter with a height of 215 ft. above the basemat. The sidewalls of the cylinder and the dome are 3 ft. and 2 ft. 6 inches (in.) thick, respectively. The basemat consists of a 9 ft. 8 in. thick structural concrete slab. The lower section of the containment acts as the outer boundary of the suppression pool. An equipment hatch at the grade floor is sealed during normal operation and all other times when primary containment is required.

The drywell is a cylindrical reinforced concrete structure which surrounds the reactor pressure vessel and its support structure. The inside diameter is 69 ft. with a wall thickness of 5 ft. The lower portion of the drywell wall is submerged in the suppression pool. Multiple horizontal vents are provided all around the circumference of the drywell wall below the normal level of the suppression pool to channel steam release from a loss-of-coolant accident (LOCA) through the vents for condensation in the suppression pool. The surfaces of drywell wall exposed to the suppression pool are lined with stainless steel plate. Above the suppression pool level, the interior surfaces of the drywell walls and the top slab are lined with carbon steel to minimize bypass leakage through the drywell walls under accident conditions.

Both the primary containment and drywell contain a number of penetrations for pipes, electrical conductors, access for fuel handling and fuel transfer, personnel and equipment hatches.

The primary containment provides the "leak tight" barrier against the potential uncontrolled release of fission products during a design basis loss-of-coolant accident (DBLOCA). TS 5.5.13 identifies the primary containment leak rate testing requirements and an overall acceptance criterion for the Type A, Type B and Type C tests. The proposed changes in consideration under the LAR only apply to primary containment leakage. No changes are required to TS 3.6.5.1, "Drywell" as described below.

The operability of the drywell is addressed in TS 3.6.5.1. The frequency of the surveillance requirements for the drywell, including the drywell bypass leakage rate test (DBLRT) are under

the licensee Surveillance Frequency Control Program, except the drywell air lock doors are required to be tested after each drywell lock closing during MODES 1, 2, and 3. The LAR stated that any changes to the DBLRT frequency will be made in accordance NEI 04-10, "Risk-Informed Method for Control of Surveillance Frequencies" as stated in TS 5.5.16, "Surveillance Frequency Control Program" and therefore, changes to the DBLRT frequency do not require prior NRC review and approval. The LAR further stated that DBLRT is historically associated with the ILRT frequency for logistical reasons (e.g. similarity of plant line-ups, same equipment for testing), and; therefore, Exelon intends to extend the DBLRT interval to 15 years. The risk assessment in Attachment 4 of the LAR included an assessment for extending the DBLRT interval to 15 years. However, no TS changes would be required if the licensee proceeds with a change to the DBLRT frequency. See Section 3.8.2 of this SE for additional information.

3.3 Type A Integrated Leak Rate Test History

The leakage rate test results must not exceed L_a with margin, as specified in the TS. CPS TS 5.5.13 states "[t]he maximum allowable primary containment leakage rate L_a, at P_a, shall be 0.65% of primary containment air weight per day." TS 5.5.13 also provides the leakage rate acceptance criteria for the Type A, Type B, and Type C tests stating "[p]rimary containment leakage rate acceptance criterion is <1.0 L_a."

LAR Table 3.4.4-1, "CPS Type A ILRT History," presented the historical results of the Type A ILRT tests. The results are summarized below.

Table 1: CPS Type A ILRT History

Test Date	As-Found (AF) Leakage Rate (Containment air weight %/day	As-Left (AL) Leakage Rate (Containment air weight %/day)
January 1986 (Preoperational) (1)	0.2930	0.3463
November 1986 (Preoperational)	0.2875	0.2933
February 1991	0.2209	0.2291
November 1993	0.2089	0.2204
February 2008	0.2708	0.226

(1) Subsequent to the ILRT, a hole was discovered through the containment liner plate. This hole was evidently in existence during the ILRT. After repair, the hole was retested and showed zero leakage. ILRT was re-performed in November 1986.

The LAR provided historical results of all five ILRTs. All the results show margins to L_a. The LAR stated that the results of the last two Type A ILRTs for CPS were less than the maximum allowable containment leakage rate of 0.65 weight% per day (wt.%/day). As a result, since both tests were successful, CPS has been placed on a 10-year extended ILRT frequency.

NRC Staff Evaluation

The NEI 94-01, Revision 3-A, requirement for allowing the extended test interval is that the past two tests meet the performance criterion, demonstrating a leakage of L_a or less. The 1993 and

2008 ILRT showed leakage in the order of 50 percent or less of the performance criterion (0.65 wt.%/day). While the results satisfied the criteria for extended ILRT interval, the staff noted that the "Leakage Rate" increased by 22.9 percent between the 1993 AL leakage rate and the 2008 AF leakage rate. By request for additional information (RAI) dated January 17, 2017 (ADAMS Accession No. ML17018A426), the NRC staff requested information on the increase in containment leakage rates. By letter dated March 2, 2017, the licensee responded to the staff RAI and stated that the 2008 ILRT includes an AF penalty of 0.064 wt.%/day for two penetrations that were isolated during the test, which was the most significant contributor to the 22.9 percent increase. The RAI response stated that the penetrations have been repaired.

Option B does not allow reduced pressure Type A tests. Section 9.2.3 "Extended Test Intervals" of NEI 94-01, Revision 3-A, states that "[i]n the event where previous Type A tests were performed at reduced pressure (as described in 10 CFR 50, Appendix J, Option A), at least one of the two consecutive periodic Type A tests shall be performed at peak accident pressure (P_a)." By RAI dated January 17, 2017, the NRC requested the actual ILRT test pressures for the two most recent Type A tests. By letter dated March 2, 2017, the licensee provided the test pressures employed during the most recent Type A tests in November 1993, and February 2008. Both the test pressures exceed P_a value of 9.0 psig (pounds per square inch square) in TS 5.5.13.

In letter dated March 2, 2017, the licensee also responded to RAI 13. The RAI requested the licensee to address the potential for higher pressure in the wetwell space under the hydraulic control unit (HCU) floor during the short term after a DBLOCA and how it is factored into the ILRT. The licensee stated that the DBLOCA analysis was revised as part of the Extended Power Uprate (EPU) in 2002. The results indicate that the containment pressure for the long-term transient response is 6.97 psig, while the peak pressure in the wetwell during the short-term transient is 9.22 psig. The revised values are due to changes in the initial conditions and modeling. The licensee stated that CPS has continued to use the historical 9 psig ILRT pressure to conservatively envelope the long-term pressure of 6.97 psig and that peak containment pressure is derived from the long-term transient response. The NRC staff reviewed the information provided by the licensee and conclude that a short-lived transient pressure in the wetwell space slightly above the ILRT pressure would have an insignificant impact on the ILRT or LLRT determined leakage values.

In letter dated March 2, 2017, the licensee responded to RAI 10a to provide the definition of "performance leakage rate" used during the February 2008 ILRT. The licensee stated that the 2008 ILRT was performed in accordance with CPS procedure 9861.01, "Integrated Leakage Rate Test" and that the procedure was written and verified to be in compliance with the applicable sections of 10 CFR 50, Appendix J, Option B, NRC RG 1.163, NEI 94-01, Revision 0, and ANS/ANSI (American Nuclear Society/American National Standards Institute) 56.8-1994. The licensee further quoted the definition of performance leakage from NEI 94-01, Revision 0, and the acceptance criteria as stated in the surveillance procedure for the 2008 ILRT. The acceptance criteria states:

> The upper bound of the leakage rate (UCL) calculated at 95% confidence level, based on mass point calculations, is less than 0.75 L_a (0.75 x 0.65 = 0.4875 wt.%/day) as recorded in this test. Any required local leak rate additions for leakage paths that have to be blocked for successful testing (Post-Repair), or for

systems that should be vented to the containment but are not will be added to the UCL and documented in CPS 9861.01D002.

The NRC staff compared the acceptance criteria with the performance leakage criteria as defined in Section 9.2.3 of NEI 94-01, Revision 0, Revision 2-A, and Revision 3-A, and concluded that they are consistent with each other.

The previous CPS ILRT results have confirmed that the Type A containment leakage rates are acceptable with respect to the design criterion of 0.65 percent leakage of containment air weight (L_a) per day at the DBLOCA pressure (P_a). Since the last two Type A tests at CPS have "As-found" test results of less than 1.0 L_a, the NRC staff concludes a permanent extension to the test frequency of 15 years in accordance with NEI 94-01, Revisions 2-A and 3-A, is acceptable.

3.4 Inspection and Testing Programs

The LAR provides evaluations of other non-risk considerations related to the proposed amendment. This includes the inspection and testing programs that ensure the containment structure remains capable of meeting the design functions and identification of degraded conditions which may affect the containment capability.

3.4.1 ISI Program for Concrete Containment - IWL

The containment ISI program implements the requirements of 10 CFR 50.55a. The LAR stated CPS performs primary containment inspection to the requirements of American Society of Mechanical Engineers Boiler and Pressure Vessel Code (ASME Code), Section XI, "Rules for Inservice Inspection of Nuclear Power Plant Component," Subsection IWL, "Requirements for Class CC Concrete Components of Light-Water Cooled Plants" of the 2001 Edition through the 2003 Addenda. The licensee provided the ISI schedule as indicated in the Table 2 below:

Table 2 : IWL Examination Schedule

2nd and 3rd 10-Year Inspection Interval
C1R12 – 2010
C1R15 – 2015
C1R20 – 2020
C1R25 – 2025
C1R30 – 2030

3.4.2 ISI Program for Containment Metal Liner - IWE

The LAR stated that CPS performs primary containment inspection to the requirements of ASME Code, Section XI, Subsection IWE, "Requirements for Class MC and Metal Liners of Class CC Components of Light-Water Cooled Plants" of the 2001 Edition through the 2003 Addenda. The LAR also provided the ISI schedule as indicated in the Table 3, below:

Table 3: IWE Examination Schedule

2nd and 3rd 10-Year Inspection Interval	
2nd Interval 1st Period	09/10/2008 to 09/09/2011 *C1R12*
2nd Interval 2nd Period	09/10/2011 to 09/09/2015 *C1R13, C1R14, C1R15*
2nd Interval 3rd Period	09/10/2015 to 09/09/2018 *C1R16, C1R17, C1R18*
3rd Interval (1) 1st Period	09/09/2018 to 09/09/2021 *C1R19, C1R20, C1R21*
3rd Interval (1) 2nd Period	09/09/2021 to 09/09/2025 *C1R22, C1R23, C1R24, C1R25*
3rd Interval (1) 3rd Period	09/09/2025 to 09/09/2028 *C1R26, C1R27, C1R28*

(1) The dates and outages for the 3rd ISI inspection interval are proposed as the 3rd interval inspection plan and schedule have not been developed at this time.

3.4.3 CPS Protective Coating Program

The licensee stated the following regarding the CPS Protective Coating Program:

> A program to maintain containment coatings was developed to meet the requirements of Regulatory Guide 1.54, Revision 0. This program is implemented using CPS Procedure 1080.01, "CPS Protective Coating Program." Every other refueling outage (i.e., every 24 months), a preventive maintenance activity to inspect the protective coatings in the containment building, including the drywell, is performed.
>
> The most recent inspection was performed during a refueling outage (i.e., C1R15) in April 2015. During outage C1R15, all elevations of the Drywell Liner Plate, Inner Wall and floors, Containment Liner Plate, Inner Wall and Floors and Containment Steam Tunnel were inspected to identify degraded coatings.
>
> CPS 1080.01 requires that a visual inspection be performed to establish baseline condition of Containment and Drywell coatings, and to identify Unqualified and Degraded coatings. The baseline condition is the first issue of the Combined Degraded and Unqualified Coatings list. It was completed on August 19, 1998.
>
> As of April 2015, there are 2,253.31 pounds of combined Degraded and Unqualified coatings. Allowed is 20,000 lbs. per Engineering Evaluation EE-00-143, Rev. 0. Therefore, 2,253.31 lbs. of combined Degraded and Unqualified coatings would not be of concern during a LOCA. The list was compiled from the field notes and a coatings document review.

The licensee noted that there will be no change to the schedule for these inspections as a result of the extended ILRT interval.

3.4.4 NRC Staff Conclusion on Containment Inspection Programs

The NRC staff reviewed the licensee's containment inspection programs and schedules. The staff determined that the containment inspection programs meet the ASME Code requirements and regulatory guide; thus, the licensee's containment inspection programs support extension of the ILRT frequency as requested in the licensee's LAR. The NRC staff finds that there is reasonable assurance that the structural and leak-tight integrity of the CPS primary containment will continue to be monitored and maintained with the performance-based Type A test interval extended to one test in 15 years.

3.5 Historical Type B and Type C Test Results

Table 3.6.4-1, "CPS Type B and C LLRT Combined As-Found/As-Left Trend Summary" of the LAR presented the historical results of the Type B and C test combined AF/AL pathway leakage totals. The results are summarized below.

Table 4: CPS Type B and C LLRT Combined As-Found/As-Left Trend Summary

RFO/Year	AF Minimum Pathway		AL Maximum Pathway	
	SCCM(1)	% of $0.6L_a$(2)	SCCM(1)	% of $0.6L_a$(2)
C1R11/2008	11598	5.35	24925	11.5
C1R12/2010	18425	8.5	36848	17.0
C1R13/2011	31551	14.55	52689	24.31
C1R14/2013	33798	15.56	66201	30.54
C1R15/2015	35305	16.29	66465	30.66

(1) Standard Cubic Centimeters per Minute (SCCM). Values provided in the LAR rounded off to nearest integer.

(2) LAR provided LLRT data as % of L_a. Staff converted the LLRT data as % of 0.6 L_a to present a conservative comparison with TS 5.5.13a acceptance criteria.

The TS 5.5.13 acceptance criterion for combined Type B and C test total is 0.6 L_a. The LAR stated that L_a for CPS is approximately 361,277 SCCM, which translates to 216,766 SCCM at 0.6 L_a. These totals were calculated using the AL maximum pathway values. Option B has the AF minimum pathway values totaled and evaluated with the performance criterion.

The LAR stated that the Type B and Type C test results from 2008 to 2015 has shown substantial margin between the actual AF and AL outage summations and the regulatory requirements. Specifically, the LAR stated:

- The As-Found minimum pathway leak rate average for CPS shows an average of 7.2% of L_a with a high of 9.77% L_a.

- The As-Left maximum pathway leak rate average for CPS shows an average of 13.7% of L_a with a high of 18.39% L_a.

Table 3.6.5-1, "CPS Type B and Type C LLRT Program Implementation Review" of the LAR identified three components that were on extended intervals and have not demonstrated acceptable performance during the previous two outages in 2013 and 2015.

NRC Staff Evaluation

The containment performance is demonstrated by the AF minimum pathway summations, whereas the AL maximum pathway summations signify the acceptance criteria for restart. The LAR indicated that a review of the Type B and Type C test results from 2008 through 2015 was performed that showed margin between the actual AF and AL combined Type B and Type C test totals. The NRC staff notes that both the AL maximum pathway and AF minimum pathway totals shown have increased over the period of tests. However, the NRC staff notes that the test results are acceptable because Option B provides the licensee with greater flexibility in adjusting the evaluation/administrative limits of leakage for significant number of Type B and Type C penetrations, while ensuring that the combined Type B and Type C test results remain below the acceptance criterion of 0.6 L_a. In addition, the containment performance over the period of the tests continued to be demonstrated with margin. The results suggests that performance criteria are unlikely to be exceeded by use of extended LLRT frequency.

The summations above are based on comparing the test results to the regulatory requirement of L_a. The NRC staff determined that a more conservative comparison would be based on acceptance criterion of 0.6 L_a. The revised summation, based on the staff's adjustment as reflected in Table 4, is shown below:

- The AF minimum pathway leak rate average for CPS shows an average of 12.05% of 0.6 L_a with a high of 16.29% of 0.6 L_a.

- The AL maximum pathway leak rate average for CPS shows an average of 22.80% of 0.6 L_a with a high of 30.66% of 0.6 L_a.

Based on the review of the data contained in LAR Table 3.6.4-1, the NRC staff concludes that the aggregate results of the AF/AL trend summary for the Type B and Type C tests from 2008 to 2015 demonstrates a history of successful tests. Furthermore, the table shows that there has been no AF failures that resulted in exceeding the TS 5.5.13b acceptance limit of 0.6 L_a. The AF minimum pathway summations represent an acceptable quality of maintenance of Type B and Type C components, while the AL minimum pathway summations represent an effective management of the Containment Leakage Rate Testing Program by the program owner.

Regarding the three components that were on extended intervals and have not demonstrated acceptable performance during the previous two outages in 2013 and 2015, the NRC staff requested additional information to clarify the AF and AL values by email dated January 17, 2017. By letter dated March 2, 2017, and in response to RAI 12, the licensee provided a modified table. The revised Table 3.6.5-1 provided AF and AL maximum and minimum (MXPLR

and MCPLR, respectively) pathway leakage rates for the components and the results are summarized below:

1. For penetration 1MC057, valve 1IA175 failed with AF MXPLR of 56,000 SCCM. However, the AF, MNPLR for the penetration was 704.25 SCCM. The cause of failure is seat leakage and the licensee has replaced the valve.

2. For penetration 1MC070, valve 1RF021 indicated intermediate during attempts to close, with an AF MXPLR of 22000 SCCM. The actuator was refurbished with an AL MXPLR of 695 SCCM. The AF MNPLR was 130 SCCM.

3. For penetration 1MC113, valve 1VR006B failed the AF LLRT with 24,980 SCCM. This leakage applies to both 0.6 L_a and the secondary containment bypass leakage 0.08 L_a. The previous test results for this penetration was 6,904 SCCM. Post-maintenance, the AL MXPLR was 6,500 SCCM. This AL MXPLR was determined as an improvement over past leakage for the penetration and secondary containment bypass as a whole. The AF and AL MNPLR stayed at 3,250 SCCM.

All the failed components were relegated to a 30-month test frequency. The NRC staff concludes that the licensee has appropriately addressed under-performing valves in accordance with the Primary Containment Leakage Rate Testing Program and NEI 94-01, Revision 3-A.

Section 3.6.4 of the LAR provided statistics on the number of Type B and Type C components that are on extended frequencies of 120 months and 60 months, respectively. The percentage of the total number of Type B and Type C components that are on extended performance-based test intervals are 96 percent and 90 percent, respectively. The NRC staff concludes that the high percentage of Type B and Type C components on extended frequencies represents good performance and further supports the requested changes to TS 5.5.13.

3.6 NRC Staff Evaluation of the Conditions and Limitations

The implementation document that is currently referenced in CPS TS 5.5.13 is RG 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995. RG 1.163 endorsed NEI 94-01, Revision 0, as a document that provides methods acceptable to the NRC staff for complying with the provisions of Option B to Appendix J of 10 CFR Part 50, subject to four regulatory positions delineated in Section C of the RG. NEI 94-01, Revision 0, includes provisions that allow the performance-based Type A test interval to be extended to up to 10 years, based upon two consecutive successful tests.

In the NRC SE dated June 25, 2008, the staff concluded that the guidance in NEI 94-01, Revision 2, is acceptable for reference by licensees proposing to amend their TS in regards to containment leakage rate testing, subject to six conditions. The requirements of NEI 94-01 stayed essentially the same from the original version through Revision 2, except that the regulatory positions of RG 1.163 were incorporated and the maximum ILRT interval extended to 15 years. Industry review and familiarization with these changes were extensive during the NEI 94-01 revision process. The accepted version of NEI 94-01, Revision 2, was subsequently issued as Revision 2-A (ADAMS Accession No. ML100620847). However, the SE conditions

contained in Revision 2-A were left out of NEI 94-01, Revision 3, nor carried forward into the NRC staff SE for Revision 3.

To ensure licensee acknowledge and satisfy the limitations and conditions in the NEI 94-01, Revision 2 SE, the NRC staff evaluated LAR Section 3.8 "NRC Limitations and Conditions," Table 3.8.1-1, "NEI 94-01, Revision 2-A, Limitations and Conditions."

3.6.1 Limitation and Condition 1

Limitation and Condition 1 states: "For calculating the Type A leakage rate, the licensee should use the definition in the NEI TR [technical report] 94-01, Revision 2, in lieu of that in ANSI/ANS- 56.8-2002. (Refer to SE Section 3.1.1.1)."

The licensee stated in the LAR they will utilize the definition in NEI 94-01, Revision 3-A, Section 5.0.

Staff Assessment of Licensee's Response to Limitation and Condition 1

The NRC staff reviewed the definitions of "performance leakage rate" contained NEI 94-01, Revision 3-A and Revision 2-A. The staff concludes that the definitions are identical and the licensee adequately addressed Limitation and Condition 1.

3.6.2 Limitation and Condition 2

Limitation and Condition 2 states: "The licensee submits a schedule of containment inspections to be performed prior to and between Type A tests. (Refer to SE Section 3.1.1.3)."

The LAR provided the current schedule of containment inspections in Table 3.6.2-1, "CPS IWE Examination Schedule 2nd and 3rd Ten-Year Inspection Interval" for ASME Code, Section XI, Subsection IWE, and Table 3.6.2-2, "CPS IWL Examination Schedule 2nd and 3rd Ten-Year Inspection Interval" for Subsection IWL. In Section 3.6.3, "Supplemental Inspection Requirements", the licensee stated that plant procedure CPS 9861.01, "Integrated Leak Rate Test," requires a visual inspection of exposed accessible interior and exterior surfaces of the drywell and containment, including the liner plate prior to the Type A ILRT and that the same inspection also fulfills the surveillance requirement of TS Surveillance Requirement 3.6.1.1.1 and NEI 94-01.

Staff Assessment of Licensee's Response to Limitation and Condition 2

NEI 94-01 Revision 2-A, SE, Section 3.1.1.3, "Adequacy of Pre-Test Inspections (Visual Examinations), in part, states:

> NEI TR 94-01, Revision 2, Section 9.2.3.2, states that: "To provide continuing supplemental means of identifying potential containment degradation, a general visual examination of accessible interior and exterior surfaces of the containment for structural deterioration that may affect the containment leak-tight integrity must be conducted prior to each Type A test and during at least three other outages before the next Type A test if the interval for the Type A test has been extended

> to 15 years." NEI TR 94-01, Revision 2, recommends that these inspections be performed in conjunction or coordinated with the examinations required by ASME Code, Section XI, Subsections IWE and IWL. The NRC staff finds that these visual examination provisions, which are consistent with the provisions of regulatory position C.3 of RG 1.163, are acceptable considering the longer 15 year interval. Regulatory Position C.3 of RG 1.163 recommends that such examination be performed at least two more times in the period of 10 years. The NRC staff agrees that as the Type A test interval is changed to 15 years, the schedule of visual inspections should also be revised. Section 9.2.3.2 in NEI TR 94-01, Revision 2, addresses the supplemental inspection requirements that are acceptable to the NRC staff.

NEI 94-01, Revision 3-A, Section 9.2.1, "Pretest Inspection and Test Methodology," states:

> Prior to initiating a Type A test, a visual examination shall be conducted of accessible interior and exterior surfaces of the containment system for structural problems that may affect either the containment structure leakage integrity or the performance of the Type A test. This inspection should be a general visual inspection of accessible interior and exterior surfaces of the primary containment and components. It is recommended that these inspections be performed in conjunction or coordinated with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE/IWL required examinations.

NEI 94-01, Revision 3-A, Section 9.2.3.2, "Supplemental Inspection Requirements," states:

> To provide continuing supplemental means of identifying potential containment degradation, a general visual examination of accessible interior and exterior surfaces of the containment for structural deterioration that may affect the containment leak-tight integrity must be conducted prior to each Type A test and during at least three other outages before the next Type A test if the interval for the Type A test has been extended to 15 years. It is recommended that these inspections be performed in conjunction or coordinated with the ASME Boiler and Pressure Vessel Code, Section XI, Subsection IWE/IWL required examinations.

CPS completed its last Type A test February 2008. The next Type A test will be required to be completed before February 2023, if the extension is approved.

The NRC staff reviewed Table 3.6.2-1 and Table 3.6.2-2. The staff notes that the IWE examinations have been completed greater than three times since the last Type A test in February 2008. The IWL examinations have been completed two times since the last Type A test and is scheduled to be performed during the 2020 refueling outage.

Based on licensee submitted IWE and IWL schedules, the NRC staff concludes that the licensee's submitted schedule to visually inspect accessible areas of the containment complies with the guidance contained in NEI 94-01, Revision 3-A, Section 9.2.1 and 9.2.3.2, and therefore, the provisions contained in NEI 94-01, Revision 2-A, Section 3.1.1.3, are satisfied.

Therefore, the NRC staff concludes the licensee adequately addressed and satisfied Limitation and Condition 2.

3.6.3 Limitation and Condition 3

Limitation and Condition 3 states: "The licensee addresses the areas of the containment structure potentially subjected to degradation. (Refer to SE Section 3.1.3)."

The licensee response referred to LAR, Section 3.6.2 and Tables 3.6.2-1 and 3.6.2-2.

Staff Assessment of Licensee's Response to Limitation and Condition 3

NEI 94-01, Revision 2-A, SE Section 3.1.3, "Type A Test (ILRT), Type B and Type C Tests (LLRTs), and Containment In-Service Inspections (ISIs)," states, in part:

> In approving for Type A tests the one-time extension from 10 years to 15 years, the NRC staff has identified areas that need to be specifically addressed during the IWE and IWL inspections including a number of containment pressure-retaining boundary components (e.g., seals and gaskets of mechanical and electrical penetrations, bolting, penetration bellows) and a number of the accessible and inaccessible areas of the containment structures (e.g., moisture barriers, steel shells, and liners backed by concrete, inaccessible areas of ice-condenser containments that are potentially subject to corrosion).

Section 3.6.2 of the LAR describes the CPS ISI program, specifically, the Subsection IWE and IWL as follows:

> The components subject to Subsection IWE and IWL requirements are those which make up the containment structure, its leak-tight barrier (including integral attachments), and those that contribute to its structural integrity. Specifically included are Class MC pressure retaining components, including metallic shell and penetration liners of Class CC pressure retaining components, and their integral attachments.

LAR Section 3.6.2 described the inaccessible Class MC Areas and the augmented examinations. The LAR stated that for "Class MC applications, CPS shall evaluate the acceptability of inaccessible areas when conditions exist in accessible areas that could indicate the presence of or result in degradation to such inaccessible areas." In addition, Exelon would continuously review industry experience through its participation in nuclear utility group owner's group and ASME Code committees and make any adjustments necessary to inspection plans for the examination of the inaccessible areas.

The NRC staff reviewed LAR Section 3.6.2 and concludes that the licensee program during IWE and IWL inspections adequately address the areas of the containment structure potentially subject to degradation, including accessible and inaccessible areas. The NRC staff also determined (see Section 3.4 of this SE for additional information) that the frequency of the

inspections as provided in Tables 3.6.2-1 and 3.6.2-2 of the LAR are acceptable. Therefore, the licensee addressed and satisfied Limitation and Condition 3.

3.6.4 Limitation and Condition 4

Limitation and Condition 4 states: "The licensee addresses any tests and inspections performed following major modifications to the containment structure, as applicable. (Refer to SE Section 3.1.4)."

The LAR stated that no major modifications are planned to the CPS containment.

Staff Assessment of Licensee's Response to Limitation and Condition 4

NRC staff SE, Section 3.1.4, states:

> Section 9.2.4 of NEI TR 94-01, Revision 2, states that: "Repairs and modifications that affect the containment leakage integrity require LLRT or short duration structural tests as appropriate to provide assurance of containment integrity following the modification or repair. This testing shall be performed prior to returning the containment to operation." Article IWE-5000 of the ASME Code, Section XI, Subsection IWE (up to the 2001 Edition and the 2003 Addenda), would require a Type A test after major repair or modifications to the containment. In general, the NRC staff considers the cutting of a large hole in the containment for replacement of steam generators or reactor vessel heads, replacement of large penetrations, as major repair or modifications to the containment structure.

The CPS containment has been in service for approximately 28 years. By email dated January 17, 2017, the NRC staff requested RAI 11 regarding a summary of all significant modifications to the CPS containment and the subsequent post modification testing. By letter dated March 2, 2016, the licensee responded to RAI 11 and stated that there was only one modification in the operating history of CPS primary containment that occurred during the 1995 refueling outage C1R05, which implemented a modification to a spare containment penetration to provide a permanent access for use during chemical decontamination activities. A post modification LLRT was performed on this penetration.

Accordingly, the NRC staff concludes that the licensee has reviewed the modifications made during the history on the unit and ensured post modification testing was complete. The licensee also stated there are no major modifications planned. The staff notes that any future containment structure major modification will be adequately controlled and tested, consistent with the existing station design change process. Therefore, the NRC staff concludes that the licensee adequately addressed Limitation and Condition 4.

3.6.5 Limitation and Condition 5

Limitation and Condition 5 states: "The normal Type A test interval should be less than 15 years. If a licensee has to utilize the provision of Section 9.1 of NEI TR 94-01, Revision 2, related to extending the ILRT interval beyond 15 years, the licensee must demonstrate to the NRC staff that it is an unforeseen emergent condition. (Refer to SE, Section 3.1.1.2)."

LAR Table 3.8.1-1 stated:

> In accordance with the requirements of NEI 94-01 Revision 2-A, SER Section 3.1.1.2, CPS will also demonstrate to the NRC staff that an unforeseen emergent condition exists in the event an extension beyond the 15-year interval is required.

This was further clarified by letter dated March 2, 2017, in response to RAI 1 when the licensee stated:

> Except for compelling reasons, which could include unforeseen emergent conditions, [Exelon] will conduct the Type A tests within the approved 15-year interval, without seeking extensions. If an unforeseen emergent condition should arise, extension of the Type A test interval will be addressed in accordance with the June 25, 2008 NRC letter and Safety Evaluation that approved NEI 94-01, Revision 2, and Regulatory Issue Summary (RIS) 2008-27, "Staff Position on Extension of the Containment Type A Test Interval Beyond 15 Years Under Option B of Appendix J of 10 CFR Part 50."

Staff Assessment of Licensee's Response to Limitation and Condition 5

The June 25, 2008, NRC, SE, Section 3.1.1.2, states:

> As noted above, Section 9.2.3, NEI TR 94-01, Revision 2, states, "Type A testing shall be performed during a period of reactor shutdown at a frequency of at least once per 15 years based on acceptable performance history." However, Section 9.1 states that the "required surveillance intervals for recommended Type A testing given in this section may be extended by up to 9 months to accommodate unforeseen emergent conditions but should not be used for routine scheduling and planning purposes." The NRC staff believes that extensions of the performance-based Type A test interval beyond the required 15 years should be infrequent and used only for compelling reasons. Therefore, if a licensee wants to use the provisions of Section 9.1 in NEI 94-01, Revision 2, the licensee will have to demonstrate to the NRC staff that an unforeseen emergent condition exists.

In the January 25, 2016, and March 2, 2017, submittals, the licensee confirmed its understanding that any extension of the Type A test interval beyond the upper-bound performance-based limit of 15 years should be infrequent and that any requested permission (i.e., for such an extension) will demonstrate to the NRC staff that an unforeseen emergent condition exists.

Based on the above, the NRC staff finds that the licensee adequately addressed Limitation and Condition 5.

3.6.6 Limitation and Condition 6

NRC Limitation and Condition 6 states: "For plants licensed under 10 CFR Part 52, applications requesting a permanent extension of the ILRT surveillance interval to 15 years should be

deferred until after the construction and testing of containments for that design have been completed and applicants have confirmed the applicability of NEI TR 94-01, Revision 2, and EPRI Report No. 1009325, Revision 2, including the use of past ILRT data."

The licensee stated that this condition is not applicable to CPS as it was not licensed under 10 CFR Part 52.

Staff Assessment of Licensee's Response to Limitation and Condition 6

The NRC staff concludes that Limitation and Condition 6 does not apply because CPS is licensed under 10 CFR Part 50.

3.6.7 Conclusion Related to the Six Limitations and Conditions Listed in NEI 94-01, Revision 2-A, Section 4.1, of the NRC SE

The NRC staff evaluated each of the six limitations and conditions listed above and determined that the licensee adequately satisfied all of the limitations and conditions for NEI 94-01, Revision 2-A, as noted in Section 4.1 of the NRC SE.

3.7 NRC Conditions In NEI 94-01, Revision 3-A

NRC published an SE with limitations and conditions for NEI 94-01, Revision 3, by letter dated June 8, 2012. In the SE, the NRC concluded that NEI 94-01, Revision 3, describes an acceptable approach for implementing the optional performance based requirements of Appendix J, and is acceptable for reference by licensees proposing to amend their containment leakage rate testing TSs, subject to two conditions. The SE was incorporated into Revision 3 and subsequently issued as NEI 94-01, Revision 3-A, on July 31, 2012.

In the January 25, 2016, LAR, the licensee proposes to use NEI 94-01, Revision 3-A, as the implementation document for Type B and Type C LLRT program.

3.7.1 Condition 1

The June 8, 2012, NEI 94-01, Revision 3, SE, Section 4.0, Condition 1 states, in part, that:

> NEI TR 94-01, Revision 3, is requesting that the allowable extended interval for Type C LLRTs be increased to 75 months, with a permissible extension (for non-routine emergent conditions) of nine months (84 months total). The staff is allowing the extended interval for Type C LLRTs be increased to 75 months with the requirement that a licensee's post-outage report include the margin between the Type B and Type C leakage rate summation and its regulatory limit. In addition, a corrective action plan shall be developed to restore the margin to an acceptable level. The staff is also allowing the non-routine emergent extension out to 84-months as applied to Type C valves at a site, with some exceptions that are detailed in NEI 94-01, Revision 3. At no time shall an extension be allowed for Type C valves that are restricted categorically (e.g. BWR MSIVs), and those valves with a history of leakage, or any valves held to either a less than

maximum interval or to the base refueling cycle interval. Only non-routine emergent conditions allow an extension to 84 months.

Condition 1 identifies three issues that are required to be addressed:

(1) The allowance of an extended interval for Type C LLRTs of 75 months requires that a licensee's post-outage report include the margin between the Type B and Type C leakage rate summation and its regulatory limit;

(2) A corrective action plan shall be developed to restore the margin to an acceptable level; and

(3) Use of the allowed 9-month extension for eligible Type C valves is only allowed for non-routine emergent conditions with exceptions as detailed in NEI 94-01, Revision 3-A, Section 10.1.

Licensee's Response to Condition 1

The licensee's response for Condition 1 and the three issues needing to be addressed is provided in the January 25, 2016, LAR, Section 3.8.2, "Limitations and Conditions of Applicable to NEI 94-01, Revision 3-A," of Attachment 1 where the licensee stated:

(1) The post-outage report shall include the margin between the Type B and Type C minimum Pathway Leak Rate (MNPLR) summation value, as adjusted to include the estimate of applicable Type C leakage understatement, and its regulatory limit of 0.60 L_a.

(2) When the potential leakage understatement adjusted Type B and C MNPLR total is greater than the CPS leakage summation limit of 0.50 L_a, but less than the regulatory limit of 0.6 L_a, then an analysis and determination of a corrective action plan shall be prepared to restore the leakage summation margin to less than the CPS leakage limit. The corrective action plan shall focus on those components which have contributed the most to the increase in the leakage summation value and what manner of timely corrective action, as deemed appropriate, best focuses on the prevention of future component leakage performance issues so as to maintain an acceptable level of margin.

(3) CPS will apply the 9-month allowable interval extension period only to eligible type C components and only for non-routine emergent conditions. Such occurrences will be documented in the record of tests.

NRC Staff Assessment of Licensee's Response to Condition 1

The NRC staff reviewed the requirements of NEI 94-01, Revision 3-A, against the licensee's response for Condition 1. Based on the review, the NRC staff concludes that the licensee acknowledges and stated its intent to comply with all the requirements of Condition 1.

3.7.2 Condition 2

NRC SE dated June 8, 2012, Section 4.0, Condition 2, stipulates, in part, that:

> When routinely scheduling any LLRT valve interval beyond 60-months and up to 75-months, the primary containment leakage rate testing program trending or monitoring must include an estimate of the amount of understatement in the Type B & C combined total, and must be included in a licensee's post-outage report. The report must include the reasoning and determination of the acceptability of the extensions, demonstrating that the LLRT totals calculated represent the actual leakage potential of the penetrations.

Exelon's response to Condition 2 is contained in Section 3.8.2 of the LAR as summarized below:

The LAR indicated that the post-outage report will include the margin between the Type B and Type C minimum pathway leak rate summation value adjusted for understatement and the acceptance criterion. Should the Type B and C combined total exceed an administrative limits of 0.5 L_a but be less than the TS acceptance value, then an analysis will be performed and a corrective action plan prepared to restore and maintain the leakage summation margin to less than the CPS leakage limit.

NRC Staff Assessment of Licensee's Response to Condition 2

The NRC staff reviewed the requirements of NEI 94-01, Revision 3-A, and concludes the licensee acknowledges the likelihood that longer test intervals would increase the understatement of actual leakage potential given the method by which the totals are calculated, and will assign additional margin for monitoring acceptability of results via administrative limits and understatement contribution adjustments. Thus, the staff concludes the licensee stated its intent to comply with all the requirements of Condition 2, including the post-outage report trending requirements in Section 12.1 of NEI 94-01, Revision 3-A.

3.7.3 NEI 94-01, Revision 3-A, SE Section 4.0 Conclusion

Based on the evaluation of the two conditions listed in Section 4.0 of the NRC SE for NEI 94-01, Revision 3-A, the NRC staff determined that the licensee adequately addressed both conditions. Therefore, the staff finds it acceptable for CPS to adopt NEI 94-01, Revision 3-A, as the implementation document in TS 5.5.13.

3.8 Probabilistic Risk Assessment of the Proposed Extension of ILRT Test Intervals

3.8.1 Background and Regulatory Basis

Section 9.2.3.1, "General Requirements for ILRT Interval Extensions beyond Ten Years," of NEI 94-01, Revision 2-A, states that plant-specific confirmatory analyses are required when extending the Type A ILRT interval beyond 10 years. Section 9.2.3.4, "Plant-Specific Confirmatory Analyses," of NEI 94-01 states that the assessment should be performed using the approach and methodology described in EPRI Report No. 1009325, Revision 2-A, "Risk Impact

Assessment of Extended Integrated Leak Rate Testing Intervals." The analysis is to be performed by the licensee and retained in the plant documentation and records as part of the basis for extending the ILRT interval.

In the NRC SE for NEI 94-01, Revision 2, dated June 25, 2008, the NRC staff found the methodology in EPRI Report No. 1009325, Revision 2, acceptable for referencing by licensees proposing to amend their TSs to permanently extend the ILRT interval to 15 years, provided certain conditions are satisfied. These conditions, set forth in Section 4.2 of the NRC SE for EPRI Report No. 1009325, Revision 2, are summarized below:

1. The licensee submits documentation indicating that the technical adequacy of their PRA is consistent with the requirements of RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," relevant to the ILRT extension application.

2. The licensee submits documentation indicating that the estimated risk increase associated with permanently extending the ILRT surveillance interval to 15 years is small and consistent with the clarification provided in Section 3.2.4.6[2] of the SE for EPRI Report No. 1009325, Revision 2.

3. The methodology in EPRI Report No. 1009325, Revision 2, is acceptable provided the average leak rate for the pre-existing containment large leak accident case (i.e., accident case 3b) used by licensees is assigned a value of 100 times the maximum allowable leakage rate (L_a) instead of $35L_a$.

4. A LAR is required in instances where containment over-pressure is relied upon for emergency core cooling system (ECCS) performance.

3.8.2 Plant-Specific Risk Evaluation

The licensee has performed and submitted a risk impact assessment to support its request. The risk analyses for CPS was provided in Attachment 4 of the LAR dated January 26, 2016. The risk analyses include the impact of extending the Type A containment ILRT interval from 10 years to 15 years and extending the DBLRT interval by the same amount. The DBLRT frequency extension is not requested in this submittal, because it is controlled by the licensee under the surveillance frequency control program[3]. Although not required, the licensee estimated the change in risk due to the combined change in DBLRT and ILRT frequencies in the LAR. The combined extension will hereafter be referred to as the ILRT/DBLRT extension. See Section 3.8.2.5 for additional information regarding the DBLRT.

In Attachment 4, Section 1.1, of the LAR, the licensee stated that its plant-specific risk assessments to support the ILRT/DBLRT extension request follows the guidance in the following documents:

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[2] The SE for EPRI TR-1009325, Revision 2, indicates that the clarification regarding small increases in risk is provided in Section 3.2.4.5; however, the clarification is actually provided in Section 3.2.4.6.

[3] The NRC issued Amendment No. 192 for relocation of specific surveillance frequency requirements by letter dated February 15, 2011. The amendment can be found at ADAMS Accession No. ML102380477.

- NEI 94-01, Revision 3-A,
- The methodology described in EPRI Report No. 1018243 (which is the same as EPRI Report No. 1009325, Revision 2-A),
- The methodology used in EPRI Report No. 104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals," dated August 1994,
- The NRC regulatory guidance on the use of PRA as stated in RG 1.200 as applied to ILRT interval extensions and risk insights in support of a request for a plant's licensing basis as outlined in RG 1.174, and
- The methodology used for Calvert Cliffs Nuclear Plant (CCNP) to estimate the likelihood and risk implications of corrosion-induced leakage of steel liners going undetected during the extended test interval

The licensee addressed each of the four conditions for the use of EPRI Report No. 1009325, Revision 2, which are listed in Section 4.2 of the NRC SE for NEI 94-01, Revision 2. A summary of how each condition has been met is provided in the sections below.

3.8.2.1 Condition 1 - Technical Adequacy of the PRA

Condition 1

The licensee submits documentation indicating that the technical adequacy of their PRA model is consistent with the requirements of RG 1.200 relevant to the ILRT extension application.

NRC Staff Assessment of Condition 1

In RIS 2007-06, "Regulatory Guide 1.200 Implementation," the NRC clarified that the NRC staff will use Revision 2 of RG 1.200 (ADAMS Accession No. ML090410014), to assess technical adequacy of the PRA model used to support risk-informed applications received after March 2010. In Section 3.2.4.1 of the SE to EPRI Report No. 1009325, Revision 2, NRC staff stated, in part, that

> [l]icensee requests for a permanent extension of the ILRT surveillance interval to 15 years pursuant to NEI TR 94-01, Revision 2, and EPRI Report No. 1009325, Revision 2, will be treated by NRC staff as risk-informed license amendment requests. Consistent with information provided to industry in Regulatory Issue Summary 2007-06, "Regulatory Guide 1.200 Implementation," [the] NRC staff will expect the licensee's supporting Level 1/[Large Early Release Frequency] LERF PRA to address the technical adequacy requirements of RG 1.200, Revision 1... Any identified deficiencies in addressing this standard shall be assessed further in order to determine any impacts on any proposed decreases to surveillance frequencies. If further revisions to RG 1.200 are issued which endorse additional standards, the NRC staff will evaluate any application referencing NEI TR 94-01, Revision 2, and EPRI Report No. 1009325, Revision 2, to examine if it meets the PRA quality guidance per the RG 1.200 implementation schedule identified by the NRC staff.

In the same Section of the SE, the NRC staff states that Capability Category (CC) I of ASME PRA standard shall be applied as the standard for assessing PRA quality for ILRT extension applications, because approximate values of core damage frequency (CDF) and LERF, and their distribution among release categories are sufficient to support the evaluation of changes to ILRT frequencies. Furthermore, in Regulatory Position 4.2 of RG 1.200, Revision 2, the NRC staff stated that it expects the licensees to submit a discussion of the resolution of peer-review findings that are applicable to the parts of the PRA required for the application.

Internal Events

In Attachment 4, Appendix A of the LAR, the licensee stated that the submitted risk analyses use the most recent full-power internal events (FPIE) PRA model for CPS, referred to as the 2014A version, and the subsequent containment responses resulting in various fission product release categories. The licensee described the process used for controlling the PRA model and for ensuring that the model reflects the as-built and as-operated plant. CPS has a process for continued PRA maintenance and update, including procedures for regularly scheduled and interim PRA model updates and for tracking issues identified as potentially affecting the PRA model. The licensee performed a review of the plant modifications and changes and concluded that there are no plant changes that have not yet been incorporated into the FPIE PRA model that would affect this application. As a result, the FPIE PRA model sufficiently represents the as-built and as-operated plant for this application.

The FPIE PRA technical adequacy for CPS is discussed in Appendix A, Section A.2, in Attachment 4 of the LAR. The licensee stated that a full-scope peer-review of the CPS FPIE PRA models has been performed in 2009 against the ASME/ANS PRA Standard ASME/ANS RA-Sa-2009 as endorsed by RG 1.200, Revision 2. The peer-review was performed against the CC II supporting requirements (SRs). Additionally, following PRA model revisions, a self-assessment of the CPS FPIE PRA models was conducted in 2011 against the 2009 version of the ASME/ANS PRA Standard and RG 1.200, Revision 2.

By email dated January 17, 2017, the NRC staff issued an RAI requesting an overview of all other changes in the internal events PRA model that occurred after the 2009 peer review. By letter dated March 2, 2017, and in response to RAI 3b, the licensee stated that there were two updates in the CPS FPIE PRA model that were performed after the full-scope peer-review. The licensee provided an overview of all the changes to the internal events PRA model that occurred after the full-scope peer-review and stated that none of the changes constitute PRA model upgrades that would require focused-scope peer reviews. The NRC staff notes that one of the changes made to the model subsequent to the full-scope peer-review was the use of the EPRI human reliability analysis (HRA) Calculator to quantify the human error probabilities (HEPs). The use of the HRA Calculator can potentially qualify as a PRA model upgrade. Additional information on this topic was requested via RAI 3a and the NRC staff's review of the corresponding response is discussed later in this section in review of Facts and Observations (F&O) 5-7.

In its supplement dated March 31, 2016, the licensee provided the F&Os from the 2009 peer review, which did not meet CC I of the 2009 ASME/ANS PRA Standard SRs, along with the licensee's resolutions. In Table A-2, "Summary of Clinton 2006 PRA Self-Assessment Identified Enhancements (Status After Completion of Clinton 2014 PRA Updated Provided)" of

Attachment 4 of the LAR, the licensee provided a summary of the "gaps to Category II identified in the 2011 self-assessment and the status of those gaps following the 2011 and 2014 PRA updates." The NRC staff reviewed the F&Os and the gaps reported by the licensee to determine whether the licensee's resolutions appropriately addressed the corresponding F&Os such that the resulting quality of the FPIE PRA model is sufficient to support the risk assessment for this application. The staff requested additional information regarding the resolution of several F&Os via RAI 2 (see email dated January 17, 2017) and are discussed below. The staff's review of the other F&Os found that they were either appropriately dispositioned for the purposes of this application or did not have an impact on the risk assessment for this application.

In Table 1, "Resolution of Peer Review F&Os" of the licensee's supplement dated March 31, 2016, F&Os 1-3, 1-26 and 6-8, related to SRs IE-A5, SY-A22, and SY-B6, respectively, found that room heat-up calculations were not performed to support the exclusion of room ventilation from the PRA model. By letter dated March 2, 2017, and in response to RAI 2a, the licensee provided an overview of the room cooling dependencies modeled in the PRA for rooms housing risk significant systems and justification for not modeling room cooling or for crediting opening doors as an alternative way of room cooling. The NRC staff reviewed the licensee provided information and determined the licensee provided sufficient technical justification for not modeling room cooling dependency for the battery rooms and cable spreading rooms. Further, in response to RAI 2b, the licensee provided additional justification for the switchgear rooms, the main control room and the ECCS pump rooms. The licensee justified not modeling heat removal for the switchgear room using computational analysis. The licensee justified not modeling the heat-up for the main control room using qualitative arguments including the large size of the room relative to the expected heat load as well as possible compensatory actions, such as using temporary fans. The NRC staff finds the licensee's justification for excluding the room cooling from the PRA model for the switchgear rooms and the main control room to be acceptable for this application. The licensee further stated that a computational fluid dynamics (CFD) simulation has been performed for residual heat removal (RHR)-B room to support the credit for opening doors as an alternative method of room cooling. The licensee stated that the other ECCS pump rooms are comparable to the RHR-B room and provided information on the volume and heat loads for those rooms. However, the NRC staff found that, based on the information provided by the licensee, some of the ECCS rooms, such as the RHR-C, high pressure core spray (HPCS), and low pressure core spray (LPCS) rooms had higher heat load per unit volume than the RHR-B room. Therefore, by email dated May 2, 2017 (ADAMS Accession No. ML17125A321), the staff requested the licensee to provide justification for crediting opening doors for these ECCS rooms or perform a sensitivity analysis to assess the impact of removing this credit. By letter dated June 1, 2017 and in response to follow-up RAI 2-1, the licensee provided the results of a sensitivity analysis by removing credit for opening doors to counter the failure of room cooling in the RHR-C, HPCS, and LPCS rooms. The results of the analysis demonstrated that the risk acceptance criteria for this application are met when credit for opening doors of the above-mentioned rooms is removed. Therefore, the staff finds the licensee's response to RAI 2-1 to be acceptable for this application. The results from the analysis performed in response to RAI 2-1 are discussed in Section 3.8.2.2 of this SE.

In Table 1 of the licensee's supplement dated March 31, 2016, F&O 1-4, related to SR IE-A6, was entered because the peer review team found no evidence that a systematic evaluation of initiating events due to multiple equipment failures and routine system alignments has been

performed. By letter dated March 2, 2017, and in response to RAI 2c, the licensee stated that a systematic evaluation of initiating events was performed prior to the peer review, but was not well documented. The licensee further stated that this systematic evaluation has been subsequently reviewed and that no new initiating events were identified. The licensee also stated that the PRA documentation has been updated to include the systematic review of all systems that have the potential for causing a plant trip, including evaluation of multiple equipment failures. The NRC staff reviewed the provided information and concludes that the licensee's response is acceptable for this application because it confirmed that the systematic evaluation of initiating events was performed and documented.

In Table 1 of the licensee's supplement dated March 31, 2016, F&O 1-14, related to SR IFSN-A6, was entered because the peer review team found no evidence that a systematic assessment of the effects of jet impingement, pipe whip, humidity, temperature, etc., on systems, structures and components was performed. By letter dated March 2, 2017, and in response to RAI 2d the licensee stated that it meets CC I requirements of the 2009 ASME/ANS PRA Standard, as amended by RG 1.200, Revision 2, and that the above-mentioned dynamic effects are required to be considered for CC II. In order to meet CC I, only internal flood induced submergence and spray mechanisms need to be considered, which were addressed in the PRA, as stated in the F&O. Therefore, the staff concludes that the licensee's treatment of the internal flood induced mechanisms is adequate to meet CC I and is acceptable for this application.

In Table 1 of the licensee's supplement dated March 31, 2016, F&O 1-17 related to SR IE-C3, found that the basis for recovery actions for the initiating event fault trees for the Service Water and Turbine Building Closed Cooling Water was not documented. The licensee's resolution to this F&Os did not provide the basis for crediting these recovery actions. By letter dated March 2, 2017, and in response to RAI 2e, the licensee assessed that these recovery actions do not impact the conclusions for this application because of their low risk importance, therefore,the NRC staff concludes that this F&O has no impact on this application.

In Table 1 of the licensee's supplement dated March 31, 2016, F&O 1-21, related to SR AS-B3, found that no evaluation of the ECCS pump operation at post-containment venting conditions was provided. By letter dated March 2, 2017, and in response to RAI 2e, the licensee provided the basis for crediting ECCS operation following containment venting. The licensee provided discussion of the physical arrangement, procedural guidance, alternative injection mechanisms, and a summary of deterministic calculations to demonstrate that the suppression pool depth will provide sufficient overpressure to prevent the water in the vicinity of the ECCS suction piping from flashing to steam even though the surface of the pool may be at saturated conditions. The staff concludes that the response is acceptable for this application because the licensee has provided sufficient technical justification for the credit for continued ECCS operation following containment venting.

In Table 1 of the licensee's supplement dated March 31, 2016, F&O 1-24, related to SR SY-A18, and F&O 1-22, related to SR AS-B3, identified a lack of a concerted effort to identify accident conditions that could cause system failures. By letter dated March 2, 2017, and in response to RAI 2f the licensee summarized the process followed to identify, review, and model accident conditions that could cause system failures. The licensee stated that aspects such as the location of components in the plant, spatial dependencies, and component performance

during accident conditions, as well as interviews with system engineers were considered in the process and are documented in the PRA model documentation. The staff finds the licensee's response to be acceptable for this application because the licensee provided sufficient information about the process in question and, based on the information provided by the licensee, the process has the ability to identify, review, and model accident conditions that could cause system failures.

In Table 1 of the licensee's supplement dated March 31, 2016, F&O 1-27, related to SR SY-A24 and DA-C15, found that plant-specific data was not analyzed to support credit for RHR repair. In resolution to this F&O the licensee stated that the repair data are based on generic industry experience. Since RG 1.200, Revision 2 states that industry experience should be used only if plant-specific experience is insufficient to estimate the failure to repair, the staff requested the licensee to justify exclusion of plant specific experience. By letter dated March 2, 2017, and in its response to RAI 2g, the licensee reviewed the plant-specific experience and concluded that the generic industry data can adequately represent the CPS specific events. The NRC staff finds the licensee's response to be acceptable for this application because the licensee has adequately justified the use of the generic industry repair data for the RHR recovery in the PRA model.

In Table 1 of the licensee's supplement dated March 31, 2016, F&O 1-43, related to SR QU-D1, and F&O 1-46, related to SR QU-D5, found that a review of the significant and non-significant cutsets and accident sequences was not performed as required by the supporting requirements. By letter dated March 2, 2017, and in response to RAI 2h, the licensee confirmed that the review of the significant and non-significant cutsets and accident sequences was performed during PRA model updates subsequent to the peer-review, in accordance with the 2009 ASME/ANS PRA Standard; therefore, the staff finds that the licensee's response acceptable for this application.

In resolution to F&O 5-7, the licensee indicated a change to the PRA model to using the EPRI HRA Calculator to quantify the HEPs, which was performed subsequent to the peer-review. In RAI 3a, the NRC staff requested justification for not considering this change as a PRA upgrade, which would require a focused-scope peer-review per RG 1.200, Revision 2. In response, the licensee stated that the HRA methods used for calculating the HEPs were not changed from the full-scope peer-review. The licensee further stated that the results between the peer-reviewed HRA methods and the EPRI HRA Calculator were compared during the HRA update. The licensee also provided a discussion of the F&O resolution, which included PRA model modifications, for each F&O related to the human reliability (HR) SRs. The discussion included the rationale for each modification being a PRA update as opposed to an upgrade, and identified, in several cases, the low risk significance of the modification. The licensee also stated that it conducted a review of the HRA portion of its FPIE PRA model by an experienced HRA analyst. The licensee included observations from this review that supported its assertion that the use of the EPRI HRA calculator did not constitute a PRA upgrade. The licensee also stated that the HRA SRs related to the F&Os from the full-scope peer-review were also reviewed and assessed for technical adequacy (i.e., capability category). According to the licensee, the review found that the current CPS FPIE PRA model meets or exceeds CC II for all related HRA SRs.

The NRC staff does not possess all the necessary information to unequivocally state that the use of the EPRI HRA Calculator does not constitute a PRA upgrade. Furthermore, the staff does not accept the use of an unendorsed method of review in lieu of a focused-scope peer-review for PRA upgrades. However, the NRC staff notes:

1. the licensee asserted that the HRA methods remain unchanged.
2. the licensee performed a review of the HRA supporting requirements and confirmed the HRA results, and
3. sufficient margin exists between the reported risk metrics for the application and the acceptance guidelines, as discussed in Section 3.8.2.2 of this SE.

The NRC staff notes that these reasons provide additional confidence that any uncertainties in the implementation of the EPRI HRA Calculator will not change the conclusions of this SE; therefore, the staff concludes that the licensee's response to RAI 3a is acceptable for this application. It should be noted that the acceptability in the context of this application does not eliminate the possibility of staff scrutiny and review of the use of the EPRI HRA Calculator for other risk-informed license amendment requests from the licensee where acceptability requirements can be different.

Based on the review of the submitted information regarding the quality of the licensee's internal events PRA model as described above, the NRC staff concludes that the CPS FPIE PRA model is of sufficient technical adequacy to support the current ILRT/DBLRT interval extension request.

External Events

In Section 3.2.4.2 of the SE for NEI 94-01, Revision 2, and EPRI Report No. 1009325, Revision 2, the NRC staff states that:

> Although the emphasis of the quantitative evaluation is on the risk impact from internal events, the guidance in EPRI Report No. 1009325, Revision 2, Section 4.2.7, "External Events," states that: "Where possible, the analysis should include a quantitative assessment of the contribution of external events (e.g., fire and seismic) in the risk impact assessment for extended ILRT intervals." This section also states that: "If the external event analysis is not of sufficient quality or detail to directly apply the methodology provided in this document [(i.e., EPRI Report No. 1009325, Revision 2)], the quality or detail will be increased or a suitable estimate of the risk impact from the external events should be performed." This assessment can be taken from existing, previously submitted and approved analyses or other alternate method of assessing an order of magnitude estimate for contribution of the external event to the impact of the changed interval."

Therefore, the NRC staff's review of the contribution of external events for this application is framed by the context that an order of magnitude estimate for the corresponding risk contribution is sufficient.

The licensee evaluated the impact of external events in LAR Section 5.7 of Attachment 4. The licensee's assessment included an estimate of internal fires and seismic events and included justification for screening high winds, external floods and other hazards.

To assess the fire risk for this application the licensee used the latest version of the CPS Fire PRA (FPRA). The licensee stated that this FPRA is an interim implementation of the approach documented in NUREG/CR-6850, "Fire PRA Methodology for Nuclear Power Facilities" (ADAMS Accession No. ML052580075) and provided a discussion of the tasks from NUREG/CR-6850 that were not addressed. The licensee also noted that the CPS FPRA has not been peer-reviewed. Therefore, the NRC staff finds that its technical adequacy cannot be readily determined and requested additional information by email dated January 17, 2017. By letter dated March 2, 2017, and in response to RAI 7, the licensee provided a detailed explanation of how different guidance relevant to FPRA development issued subsequent to the publication of NUREG/CR-6850 has been incorporated in the current version of the CPS FPRA. In addition, the licensee's response revealed that the CPS FPRA does not include credit for incipient fire detection. In order to address the question of whether the CPS FPRA under-predicts the fire risk metrics due to potential non-conservatisms in the model, the licensee presented the results of a sensitivity study in which the fire CDF and LERF were increased by factor of 9 (i.e. 9 times the values reported in the original submittal). This sensitivity study demonstrated that the risk acceptance criteria for this application are met even with an appreciable increase in the fire CDF and LERF. Based on the information submitted in LAR, Attachment 4, Section A.3.1, the licensee's RAI response, and the results of the sensitivity study reported by the licensee, the NRC staff finds the current CPS FPRA order of magnitude estimate acceptable for this application.

To estimate the risk contribution from seismic events, the licensee used the seismic core damage frequency (SCDF) calculations performed for CPS as part of Generic Issue (GI) 199, "Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants: Safety/Risk Assessment" (ADAMS Accession No. ML11356A034). The licensee used the maximum value of the SCDF calculated for CPS as part of the GI-199 issue. It should be noted that based on the seismic hazard re-evaluation in response to recommendation 2.1 of the near-term task force (ADAMS Accession No. ML12053A340), the licensee concluded, and the NRC staff confirmed (ADAMS Accession No. ML15281A226), that a seismic risk evaluation is not merited for CPS. Therefore, the GI-199 analysis represents the most recent available estimate of the seismic risk for CPS and the staff concludes that the use of the maximum value from the GI-199 analysis for CPS to provide an order of magnitude estimate of the seismic risk contribution is acceptable for this application.

The licensee stated that the risk from other external hazards, including high winds and tornadoes, external floods, transportation accidents, and nearby facility accidents is negligible, based on the CPS individual plant examination for external events analysis. By letter dated March 2, 2017, and in response to RAI 6, the licensee performed a review of the current plant conditions and any updated hazards and concluded that the risk from these external hazards remains negligible. The NRC staff reviewed the licensee's provided information and concludes that that the licensee's assessment of risk from high winds and tornadoes, external floods, transportation accidents, and nearby facility accidents is acceptable for this application.

Staff Conclusion on Condition 1

The licensee submitted appropriate documentation that indicated technical adequacy of their PRA is consistent with the requirements of RG 1.200 relevant to the ILRT extension application. The NRC staff reviewed the internal events PRA model and the treatment of external events in the context of the current ILRT/DBLRT frequency extension application utilizing the corresponding endorsed guidance. Based on the review, as documented in the preceding discussion, the staff concludes that Condition 1 is met for this application.

3.8.2.2 Condition 2 - Estimated Risk Increase

Condition 2

The second condition in Section 4.2 of the NRC SE for the use of EPRI Report No. 1009325, Revision 2, stipulates that the licensee submit documentation indicating that the estimated risk increase associated with permanently extending the ILRT interval to 15 years is small, and consistent with the guidance in RG 1.174, and the clarification provided in Section 3.2.4.6 of the NRC SE for NEI 94-01, Revision 2-A. Specifically, a small increase in population dose should be defined as an increase in population dose of less than or equal to either 1.0 person-rem per year or 1 percent of the total population dose, whichever is less restrictive. In addition, a small increase in conditional containment failure probability (CCFP) should be defined as a value marginally greater than that accepted in previous one-time 15-year ILRT extension requests. This would require that the increase in CCFP be less than or equal to 1.5 percentage points. Additionally, for plants that rely on containment over-pressure for net positive suction (NPSH) for ECCS injection, both CDF and LERF will be considered in the ILRT evaluation and compared with the risk acceptance guidelines in RG 1.174. In Section 3.3 of Attachment 1 of the LAR, the licensee states that containment over-pressure is not relied upon for ECCS performance for CPS. Therefore, the associated risk metrics of interest for the CPS ILRT/DBLRT extension application are LERF, population dose, and CCFP.

NRC Staff Assessment of Condition 2

The licensee reported the results of the plant-specific risk assessment in Section 3.5.3 of the LAR. Details of the risk assessment for CPS are provided in Attachment 4 of the submittal. The reported risk impacts are based on a change in test frequency from three tests in 10 years (the test frequency under 10 CFR 50 Appendix J, Option A) to one test in 15 years.

The following conclusions can be drawn based on the licensee's analysis associated with extending the ILRT/DBLRT frequency:

1. The reported increase in LERF for a change in the ILRT/DBLRT frequency from three tests in 10 years to one test in 15 years is 1.11×10^{-7} per year (from Table 5.7-2 of Attachment 4 of the LAR). This estimate includes the contribution from both internal and external events (internal fires and seismic events) and the impact from steel liner corrosion. The change is considered to be "small" (i.e., between 1×10^{-6} per year and 1×10^{-7} per year) per acceptance guidelines in RG 1.174. According to RG 1.174, for "small" changes in risk, an assessment of baseline LERF is required to show that the total LERF is less than 1×10^{-5} per year. In Table 5.7-4 of Attachment 4 of the submittal,

the licensee estimated the total base LERF to be 2.06 x 10^{-6} per year, which is below the total LERF value of 1.0 x 10^{-5} per year in RG 1.174.

Sensitivity Analyses

By letter dated June 1, 2017, and in response to RAI 2-1, the licensee performed a quantitative analysis by eliminating credit for opening doors to counter the failure of room cooling in the RHR-C, HPCS, and LPCS rooms. The resulting increase in LERF for a change in the ILRT/DBLRT frequency from three tests in 10 years to one test in 15 years is 1.25 x 10^{-7} per year which includes both internal and external events (internal fires and seismic events) and the impact from steel liner corrosion. The licensee estimated the total base LERF from the analysis in response to RAI 2-1 is 2.09 x 10^{-6} per year. In this calculation, the NRC staff noted that the LERF contribution from external hazards other than internal fires, which is estimated by the licensee by applying a multiplier to the internal events LERF, was not updated to reflect the increased internal events LERF. Correcting the external events LERF estimate would result in a total base LERF of 2.23 x 10^{-6} per year, which remains below the total LERF acceptance criteria of 1.0 x 10^{-5} per year in RG 1.174.

During review of the previous one-time ILRT/DBLRT extension, the licensee submitted the results of a sensitivity analysis in which the probability of each of the drywell failure categories was determined based on consideration of an expanded data set consisting of all "as-found" DBLRT results for all Mark III containments (ADAMS Accession No. ML030370524). The licensee estimated the failure probability for each leakage category using a 95 percent confidence Chi-square upper bound value. In RAI 5 of email dated January 17, 2017, the staff requested the licensee to provide results of such a sensitivity study to support this application. Based on the calculations performed by the licensee in response to RAI 5, the total increase in LERF from internal and external events and including the effect of steel liner corrosion is estimated to be 1.62 x 10^{-7} per year. The total base LERF for the sensitivity case is estimated to be 2.12 x 10^{-6} per year. Both the increase in LERF as well as the total base LERF are below the corresponding acceptance criterion. In addition, the licensee stated that CPS is required to vent the drywell approximately once per day to relieve drywell pressure buildup demonstrating drywell integrity. The licensee also asserted that, based on the available "as-found" DBLRT results for Mark III containments, the CPS drywell leakage history is considerably better than the average suggested by generic Mark III data. The staff finds the licensee's response to be acceptable for this application because the licensee has performed the requested sensitivity and the results meet the risk acceptance criteria.

2. Given a change in Type A ILRT frequency from three in 10 years to one in 15 years, the reported increase in the total population dose for CPS from internal and external events is 4.3 x 10^{-2} person-rem per year, or 0.73 percent of the total population dose (Section 5.7 of Attachment 4 of the submittal). The licensee assumes that the calculated dose for external events is the same percentage of the total population dose as that from internal events. The reported increase in the total population dose for CPS is less than the value associated with a small increase in population dose. The increase in the total population dose for CPS from internal and external events resulting from the quantitative analysis related to room cooling performed by the licensee in response to RAI 2-1 is 4.85 x 10^{-2}

person-rem per year, or 0.68 percent of the total population dose which is below the threshold associated with a small increase in population dose.

3. RG 1.174 also discusses the need to show that the proposed change is consistent with the defense-in-depth philosophy. Consistency with the defense-in-depth philosophy is maintained if a reasonable balance is preserved between prevention of core damage, prevention of containment failure, and consequence mitigation. The licensee reports the increase in CCFP for CPS from internal and external events in going from a test frequency of three in 10 years to one in 15 years to be 0.44 percent. The licensee assumes that the increase in CCFP from external events is the same as that from internal events. The reported increase in CCFP is below the guideline value of 1.5 percentage points for a small increase in CCFP, as provided in EPRI Report No. 1009325, Revision 2-A, and defined in Section 3.2.4.6 of the NRC SE for NEI 94-01, Revision 2. Thus, based on the small magnitude of the change in CCFP for the proposed amendment, the staff finds the balance among the goals of prevention of core damage and prevention of containment failure is preserved for the change proposed in this application.

It should be noted that the licensee has also provided risk assessment results based on expert elicitation of the probability for large and small pre-existing leaks in the containment in Section 6.2 of Attachment 4 to the LAR. As stated in Section 3.2.4.5 of the SE for NEI 94-01, Revision 2 and EPRI Report No. 1009325, Revision 2, the NRC staff does not accept the expert elicitation as presented in the appendices of EPRI Report No. 1009325, Revision 2. Therefore, the risk assessment based on expert elicitation has not been considered in the staff's evaluation of this application.

Staff Conclusion on Condition 2

Based on the review of the risk assessment results, as documented in the preceding discussion, the NRC staff concludes that the increases in LERF at CPS for the proposed ILRT/DBLRT frequency extension is small and consistent with the acceptance guidelines of RG 1.174, the increase in the total integrated plant risk and the small magnitude of the change in the CCFP for the proposed change are small and supportive of the proposed change. The defense-in-depth philosophy is maintained as the independence of barriers will not be degraded as a result of the requested change, and the use of quantitative risk metrics collectively ensures that the balance between prevention of core damage, prevention of containment failure, and consequence mitigation is preserved. Therefore, the staff concludes that second condition in Section 4.2 of the NRC SE for the use of EPRI Report No. 1009325, Revision 2, is met for this application.

3.8.2.3 Condition 3 - Leak Rate for the Large Pre-Existing Containment Leak Rate Case

Condition 3

The third condition stipulates that in order to make the methodology in EPRI Report No. 1009325, Revision 2, acceptable, the average leak rate for the pre-existing containment large leak rate accident case (i.e., accident case 3b) used by the licensees shall be 100 L_a instead of 35 L_a.

NRC Staff Assessment and Conclusion of Condition 3

As noted by the licensee in Table 3.5.1-1, "EPRI Report No. 1009325 Revision 2 Limitations and Conditions" of Attachment 1 of the LAR, the methodology in EPRI Report No. 1009325, Revision 2-A, incorporates the use of 100 L_a as the average leak rate for the pre-existing containment large leak rate accident case, and this value has been used in the CPS risk assessment. Accordingly, the NRC staff concludes that the third condition in Section 4.2 of the NRC SE for the use of EPRI Report No. 1009325, Revision 2 is met for this application.

3.8.2.4 Condition 4 - Applicability if Containment Over-Pressure is Credited for ECCS Performance

Condition 4

An LAR is required in instances where containment over-pressure is relied upon for ECCS performance.

NRC Staff Assessment and Conclusion of Condition 4

In Section 3.3 and Table 3.5.1-1 of Attachment 1 of the LAR the licensee stated that containment over-pressure is not relied upon for ECCS performance for CPS. Therefore, the NRC staff concludes that the fourth condition in Section 4.2 of the NRC SE for the use of EPRI Report No. 1009325, Revision 2, is not applicable to the review of this application.

3.8.2.5 Drywell Bypass Leak Rate Test Risk Assessment Methodology

The licensee has performed a risk impact assessment that includes the impact of extending the duration of the DBLRT to match that of the ILRT. The consideration of the DBLRT extension in the risk assessment uses the methodology presented in EPRI Report No. 1009325, Revision 2, for the ILRT extension with a few additional assumptions and considerations. The licensee has cited prior BWR Mark III ILRT/DBLRT extension risk assessments, specifically, those for CPS, Grand Gulf Nuclear Station (ADAMS Accession No. ML031400345), and River Bend Station (ADAMS Accession No. ML040540445), in support of the methodology. The primary difference in the methodology used to evaluate the DBLRT extension is in the determination of the conditional probability of an existing drywell leak, and in the assignment of various drywell and containment leakage combinations to appropriate containment failure categories. In a Mark III containment, the drywell is completely enclosed by the primary containment. As such, drywell bypass leakage does not leak directly to the environment, but is further mitigated by the primary containment. Because of this dual structure, the licensee considered the probability of various drywell bypass and containment leakage combinations.

Similar to the EPRI Report No. 1009325, Revision 2, methodology for ILRT extensions, the drywell was considered to be intact (base leakage assumed), or to have a small pre-existing failure (10 times the base leakage), or to have a large pre-existing failure (100 times the base leakage). The base drywell bypass leakage rate (300 standard cubic feet per minute [scfm]) was established through review of the "as-found" DBLRT results from the previous DBLRTs at CPS. The probability of each of the drywell failure categories (intact, small leak, and large leak) was assumed to be the same as the equivalent categories for the ILRT evaluations. The three drywell bypass leakage levels were considered in combination with the three different

containment leakage levels in the EPRI Report No. 1009325 methodology, resulting in nine combinations of drywell bypass and containment leakage sizes. Each of the nine combinations was assigned to one of the EPRI containment failure categories based on the cesium iodide releases predicted using deterministic CPS-specific modular accident analysis program (MAAP) simulations.

It is noted that the methodology followed to include the impact of the DBLRT extension in the risk assessment in the current LAR is identical to that used for a previously approved one-time ILRT/DBLRT extension (ADAMS Accession No. ML033360470).

The deterministic CPS-specific simulations used by the licensee to assign each of the nine combinations of DBLRT and ILRT leakages in the previous one-time ILRT/DBLRT extension addressed only LOCA events. As part of its previous review of the one-time ILRT/DBLRT extension application the staff requested the licensee to provide deterministic evaluations of the impact of increased drywell bypass leakage on containment response and fission product releases to the environment for the frequency-dominant core damage sequences for CPS and justify that the treatment of such frequency-dominant sequences in the DBLRT risk assessment methodology. The licensee's response, which was accepted by the staff as part of the one-time extension review, was found to be applicable to this ILRT/DBLRT extension request.

By email dated January 17, 2017, the NRC staff requested additional information regarding DBLRT methodology. In response to the RAI 4, the licensee justified the classification of the combination of a nominal leak in the containment with a large pre-existing leak in the drywell into the small pre-existing leak category, i.e. EPRI Class 3a, using results from an available and relevant deterministic CPS-specific simulation. The NRC staff reviewed the licensee's response and determined it is acceptable for this application because the response included sufficient justification for the chosen classification.

In its response to RAI 8, the licensee provided clarification on the description of the treatment of the EPRI Class 7 sequences in the LAR. The NRC staff has reviewed the information and finds that the response provides adequate clarification, is consistent with the guidance in EPRI Report No. 1009325, Revision 2, and has no impact on the safety conclusion of this SE.

As such, the NRC staff has reviewed the risk impact assessment of the DBLRT extension provided by the licensee and concludes that it is technically acceptable for this application.

3.8.3 Conclusion

The NRC staff has reviewed the risk evaluation provided by the licensee. Based on the review and assessment described above, the staff determined the licensee has adequately addressed each of the four conditions of EPRI Report No. 1009325, Revision 2. Therefore, the staff concludes that the proposed LAR for a permanent extension of the Type A containment ILRT frequency, along with the DBLRT frequency, from once in 10 years to once in 15 years for CPS is acceptable.

3.9 Deletion of Type A test by November 2008

The LAR dated January 25, 2015, requested deletion of the requirement to perform the next CPS Type A test no later than November 2008.

The NRC staff has reviewed this change and considers this change to be editorial in nature as this Type A test has already been performed. Therefore, the NRC staff concludes this changes is acceptable.

3.10 Final Staff Conclusion

Consistent with the guidance in NEI 94-01, Revision 3-A, and the conditions and limitations of NEI 94-01, Revision 2-A, the licensee justified the proposed change by demonstrating adequate performance of its containment based on: (a) plant-specific containment leakage testing program results, (b) containment ISI results, and (c) a plant-specific risk assessment.

Based on the NRC staff's review of the licensee's January 25, 2016, LAR, as supplemented by letters dated March 31, 2016, March 2, 2017, and June 1, 2017, and the regulatory and technical evaluations above, the staff finds that the licensee has addressed the applicable NRC conditions to demonstrate acceptability of adopting NEI 94-01, Revision 3-A, and the conditions and limitations specified in NEI 94-01, Revision 2-A, as the 10 CFR 50, Appendix J, Option B, implementation documents.

The NRC staff reviewed the proposed changes to verify the revised program description continues to contain the appropriate administrative controls for the Containment Leak Rate Testing Program. The NRC staff concludes that the revised TS continue to provide the appropriate administrative controls to ensure that the requirements of 10 CFR 50.36(c)(5) continue to be satisfied.

The NRC staff also finds that the licensee adequately implemented its primary containment leakage rate testing program for the CPS containment. The results of past ILRTs and recent LLRTs demonstrate acceptable performance of the containment and demonstrate that the structural and leaktight integrity of the containment structure is being adequately maintained. The staff also finds that the structural and leaktight integrity of the containment will continue to be monitored and maintained if CPS adopts NEI 94-01, Revision 3-A, and the conditions and limitations of NEI 94-01, Revision 2-A. Accordingly, the NRC staff determined that there is reasonable assurance that the structural and leaktight integrity for the containment will continue to be maintained, without undue risk to public health and safety, if the current Type A test intervals are extended to 15 years, and if the current Type C test intervals are extended to 75 months.

Therefore, the NRC staff concludes the proposed changes to the CPS TS 5.5.13 regarding the primary containment leakage rate testing program 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 on September 5, 2017. The State official had no comments.

5.0 ENVIRONMENTAL CONSIDERATION

The amendment changes a requirements 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 amendment 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 (81 FR 28895, dated May 10, 2016). Accordingly, the amendment 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 amendment.

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) there is reasonable assurance that 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.

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Date of issuance: September 26, 2017

SUBJECT: CLINTON POWER STATION, UNIT NO. 1 - ISSUANCE OF AMENDMENT REGARDING PERMANENT EXTENSION OF TYPE A AND TYPE C LEAK RATE TEST FREQUENCIES (CAC NO. MF7290)
DATED: SEPTEMBER 26, 2017

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