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

August 30, 2016

Mr. Thomas A. Vehec
Vice President
NextEra Energy
Duane Arnold Energy Center
3277 DAEC Road
Palo, IA 52324-9785

SUBJECT: DUANE ARNOLD ENERGY CENTER - ISSUANCE OF AMENDMENT TO EXTEND CONTAINMENT LEAKAGE TEST FREQUENCY (CAC NO. MF6619)

Dear Mr. Vehec:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 296 to Renewed Facility Operating License No. DPR-49 for the Duane Arnold Energy Center. The amendment consists of changes to the technical specification (TS) in response to your application dated August 18, 2015, as supplemented by letters dated January 29, April 14, and May 31, 2016.

The amendment revises TS 5.5.12, "Primary Containment Leakage Rate Testing Program," to state that the program shall be in accordance with Nuclear Energy Institute 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."

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

Sincerely,

For Sujata Goetz

Mahesh L. Chawla, Project Manager
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosures:
1. Amendment No. 296 to License No. DPR-49
2. Safety Evaluation

cc w/encls: Distribution via Listserv

NEXTERA ENERGY DUANE ARNOLD, LLC

DOCKET NO. 50-331

DUANE ARNOLD ENERGY CENTER

AMENDMENT TO RENEWED FACILITY OPERATING LICENSE

Amendment No. 296
License No. DPR-49

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

   A. The application for amendment by NextEra Energy Duane Arnold, LLC, dated April 18, 2015, as supplemented by letters dated January 29, April 14, and May 31, 2016, 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 Renewed Facility Operating License No. DPR-49 is hereby amended to read as follows:

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 296, are hereby incorporated in the license. NextEra Energy Duane Arnold, LLC shall operate the facility in accordance with the Technical Specifications.

3. This license amendment is effective as of its date of issuance and shall be implemented within 60 days of the date of issuance.

FOR THE NUCLEAR REGULATORY COMMISSION

David J. Wrona, Chief
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Attachment:
Changes to the Renewed Facility Operating License No. DPR-49 and Technical Specifications

Date of Issuance: August 30, 2016

DUANE ARNOLD ENERGY CENTER

ATTACHMENT

TO LICENSE AMENDMENT NO. 296

RENEWED FACILITY OPERATING LICENSE NO. DPR-49

DOCKET NO. 50-331

Replace the following page of Renewed Facility Operating License DPR-49 with the attached revised page. The revised page is identified by amendment number and contains a marginal line indicating the area of change.

REMOVE	INSERT
3	3

Replace the following pages of 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
5.0-17	5.0-17

C. This renewed operating license shall be deemed to contain and is subject to the conditions specified in the following Commission regulations in 10 CFR Chapter I; Part 20, Section 30.34 of Part 30, Section 40.41 of Part 40, Sections 50.54 and 50.59 of Part 50, and Section 70.32 of Part 70; 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

NextEra Energy Duane Arnold, LLC is authorized to operate the Duane Arnold Energy Center at steady state reactor core power levels not in excess of 1912 megawatts (thermal).

(2) Technical Specifications

The Technical Specifications contained in Appendix A, as revised through Amendment No. 296, are hereby incorporated in the license. NextEra Energy Duane Arnold, LLC shall operate the facility in accordance with the Technical Specifications.

(a) For Surveillance Requirements (SRs) whose acceptance criteria are modified, either directly or indirectly, by the increase in authorized maximum power level in 2.C.(1) above, in accordance with Amendment No. 243 to Facility Operating License DPR-49, those SRs are not required to be performed until their next scheduled performance, which is due at the end of the first surveillance interval that begins on the date the Surveillance was last performed prior to implementation of Amendment No. 243.

(b) Deleted.

(3) Fire Protection Program

NextEra Energy Duane Arnold, LLC shall implement and maintain in effect all provisions of the approved fire protection program that comply with 10 CFR 50.48(a) and 10 CFR 50.48(c), as specified in the licensee amendment request dated August 5, 2011 (and supplements dated October 14, 2011, April 23, 2012, May 23, 2012, July 9, 2012, October 15, 2012, January 11, 2013, February 12, 2013, March 6, 2013, May 1, 2013, May 29, 2013, two supplements dated July 2, 2013, and supplements dated August 5, 2013 and August 28, 2013) and as approved in the safety evaluation report dated September 10, 2013. Except where NRC approval for changes or deviations is required by 10 CFR 50.48(c), and provided no other regulation, technical specification, license condition or requirement would require prior NRC approval, the licensee may make changes to the fire protection program without prior approval of the Commission if those changes satisfy the provisions set forth in 10 CFR 50.48(a) and 10 CFR 50.48(c), the change does not require a change to a technical specification or a license condition, and the criteria listed below are satisfied.

5.5 Programs and Manuals

5.5.11 Safety Function Determination Program (SFDP) (continued)

2. Provisions for ensuring the plant is maintained in a safe condition if a loss of function condition exists;

3. Provisions to ensure that an inoperable supported system's Completion Time is not inappropriately extended as a result of multiple support system inoperabilities; and

4. Other appropriate limitations and remedial or compensatory actions.

b. A loss of safety function exists when, assuming no concurrent single failure, no concurrent loss of offsite power or no concurrent loss of onsite diesel generator(s), a safety function assumed in the accident analysis cannot be performed. For the purpose of this program, a loss of safety function may exist when a support system is inoperable, and:

1. A required system redundant to system(s) supported by the inoperable support system is also inoperable; or

2. A required system redundant to system(s) in turn supported by the inoperable supported system is also inoperable; or

3. A required system redundant to support system(s) for the supported systems (1) and (2) above is also inoperable.

c. The SFDP identifies where a loss of safety function exists. If a loss of safety function is determined to exist by this program, the appropriate Conditions and Required Actions of the LCO in which the loss of safety function exists are required to be entered. When a loss of safety function is caused by the inoperability of a single Technical Specification support system, the appropriate Conditions and Required Actions to enter are those of the support system.

5.5.12 Primary Containment Leakage Rate Testing Program

a. 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.

b. This program shall be in accordance with the guidelines contained in NEI 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR 50, Appendix J," and conditions and limitations specified in NEI 94-01, Revision 2-A, as modified by the following exceptions:

1. DELETED

(continued)

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

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATED TO AMENDMENT NO. 296 TO FACILITY OPERATING LICENSE NO. DPR-49

NEXTERA ENERGY DUANE ARNOLD, LLC

DUANE ARNOLD ENERGY CENTER

DOCKET NO. 50-331

1.0 INTRODUCTION

By application dated August 18, 2015 (Reference 1), as supplemented by letters dated January 29, April 14, and May 31, 2016 (References 2, 3, and 4, respectively), NextEra Energy Duane Arnold, LLC (the licensee), requested changes to the Technical Specifications (TSs) for the Duane Arnold Energy Center (DAEC). The license amendment request (LAR) would revise TS 5.5.12, "Primary Containment Leakage Rate Testing Program," by replacing the reference to Regulatory Guide (RG) 1.163, "Performance-Based Containment Leak-Test Program," September 1995 (Reference 7), with a reference to Nuclear Energy Institute (NEI) Technical Report (TR) NEI 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," July 2012 (Reference 5), and the conditions and limitations specified in NEI 94-01, Revision 2-A,"Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," November 19, 2008 (Reference 6). These references are the implementing documents used by the licensee to implement the DAEC performance-based primary containment leakage testing program in accordance with Title 10 of *Code of Federal Regulations* (10 CFR), Part 50, Appendix J, Option B. The proposed changes would change the periodic interval between "Type A Tests"[1] from 10 years to no longer

[1] Section III "Performance-Based Leakage-Test Requirements" of "Option B" of 10 Appendix J to 10 CFR Part 50, describe the following concerning a "Type A Test:"

> Type A tests to measure the containment system overall integrated leakage rate must be conducted under conditions representing design basis loss-of-coolant accident containment peak pressure. A Type A test must be conducted (1) after the containment system has been completed and is ready for operation and (2) at a periodic interval based on the historical performance of the overall containment system as a barrier to fission product releases to reduce the risk from reactor accidents. A general visual inspection of the accessible interior and exterior surfaces of the containment system for structural deterioration which may affect the containment leak-tight integrity must be conducted prior to each test, and at a periodic interval between tests based on the performance of the containment system. The leakage rate must not exceed the allowable leakage rate (L_a) with margin, as specified in the Technical Specifications. The test results must be compared with previous results to examine the performance history of the overall containment system to limit leakage.

Enclosure 2

than 15 years, and would permit the containment isolation valve local leakage rate testing (LLRT), also known as Type C test, intervals to be extended from 60 to 75 months. The proposed changes would also delete the one-time exception granted to the Type A test interval in TS 5.5.12.b.1, previously granted in Amendment No. 249 (Reference 12).

The supplemental letters dated January 29, April 14, and May 31, 2016, provided additional information that clarified the application, did not expand the scope of the application as originally noticed, and did not change the staff's original proposed no significant hazards consideration determination as published in the *Federal Register* on October 27, 2015 (80 FR 65814).

2.0 REGULATORY EVALUATION

Title 10 of the *Code of Federal Regulations* (10 CFR) 50.54(o) requires 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 includes two options, Option A – "Prescriptive Requirements," and Option B – "Performance-Based Requirements," either of which may be chosen for meeting the requirements of Appendix J.

The testing requirements in Appendix J ensure that: (a) leakage through the containments or systems and components penetrating the containments does not exceed allowable leakage rates specified in the TS, and (b) the 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.

Option B of Appendix J specifies the performance-based requirements and criteria for preoperational and subsequent leakage-rate testing. These requirements are met by 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 Type C pneumatic tests to measure containment isolation valve leakage rates.[3] After the preoperational tests, these tests

[2] Per Section II "Definitions" of Option B of Appendix J to 10 C.F.R. Part 50, "*Overall integrated leakage rate* means the total leakage rate through all tested leakage paths, including containment welds, valves, fittings, and components that penetrate the containment system."

[3] Per Section II "Definitions" of Option B of Appendix J to 10 C.F.R. Part 50:

> Type B pneumatic tests to detect and measure local leakage rates across pressure retaining, leakage-limiting boundaries, and Type C pneumatic tests to measure containment isolation valve leakage rates, must be conducted (1) prior to initial criticality, and (2) periodically thereafter at intervals based on the safety significance and historical performance of each boundary and isolation valve to ensure the integrity of the overall containment system as a barrier to fission product release to reduce the risk from reactor accidents. The performance-based testing program must contain a performance criterion for Type B and C tests, consideration of leakage-rate limits and factors that are indicative of or affect performance, when establishing test intervals, evaluations of performance of containment system components, and comparison to

are required to be conducted at periodic intervals, based on the historical performance of the overall containment system (for Type A tests) and 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 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. "Application" of Option B "Performance-Based Requirements" of Appendix J to 10 CFR Part 50 describes the licensing process for Option B. It states in the relevant parts:

> A. Applicability
>
> The requirements in either or both Option B, III.A for Type A tests, and Option B, III.B for Type B and C tests, may be adopted on a voluntary basis by an operating nuclear power reactor licensee as specified in § 50.54 in substitution of the requirements for those tests contained in Option A of this appendix. If the requirements for tests in Option B, III.A or Option B, III.B are implemented, the recordkeeping requirements in Option B, IV for these tests must be substituted for the reporting requirements of these tests contained in Option A of this appendix.
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> B. Implementation
>
> 1. Specific exemptions to Option A of this appendix that have been formally approved by the AEC or NRC, according to 10 CFR 50.12, are still applicable to Option B of this appendix if necessary, unless specifically revoked by the NRC.
>
> 2. A licensee ... may adopt Option B, or parts thereof, as specified in Section V.A of this appendix, by submitting its implementation plan and request for revision to technical specifications (see paragraph B.3 of this section) to the Director, Office of Nuclear Reactor Regulation or Director, ...
>
> 3. The regulatory guide 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 technical specifications. The submittal for technical specification

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previous test results to examine the performance history of the overall containment system to limit leakage. The tests must demonstrate that the sum of the leakage rates at accident pressure of Type B tests, and pathway leakage rates from Type C tests, is less than the performance criterion (L_a) with margin, as specified in the Technical Specification.

revisions must contain justification, including supporting analyses, if the licensee chooses to deviate from methods approved by the Commission and endorsed in a regulatory guide.

4. The detailed licensee programs for conducting testing under Option B must be available at the plant site for NRC inspection.

Per 10 CFR 50.90 "Application for amendment of license, construction permit, or early site permit," whenever a holder of a license desires to amend the license, application for an amendment must be filed with the Commission fully describing the changes desired, and following as far as applicable, the form prescribed for original applications.

The standards for issuing an initial operating license are in 10 CFR 50.57, and state in part that the Commission may issue an operating license upon finding that (i) there is reasonable assurance that the activities authorized by the operating license can be conducted without endangering the health and safety of the public, and (ii) there is reasonable assurance that such activities will be conducted in compliance with the regulations and (iii) the issuance of the license will not be inimical to the common defense and security or to the health and safety of the public. Per 10 CFR 50.36(b), each license authorizing operation of a utilization facility will include technical specifications, which will be derived from the analyses and evaluation included in the safety analysis report, and amendments thereto, submitted pursuant to 10 CFR 50.34. Further, the Commission may include such additional technical specifications as the Commission finds appropriate. As described in 10 CFR 50.36(c)(5), the technical specifications will include items in the category of "Administrative Controls," which are the provisions relating to organization and management, procedures, recordkeeping, review and audit, and reporting necessary to assure operation of the facility in a safe manner. Per 10 CFR 50.92(a), in determining whether an amendment to a license will be issued to the applicant, the Commission will be guided by the considerations which govern the issuance of initial licenses to the extent applicable and appropriate. Accordingly, the staff's review considered if the amended Administrative Controls TS met the standards of 10 CFR 50.57.

The Appendix J implementation document that is currently referenced in the Administrative Controls section of the DAEC TS is TS 5.5.12, "Containment Leakage Rate Testing Program," specifying RG 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995. RG 1.163 endorsed NEI 94-01, Revision 0, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," dated July 26, 1995 (Reference 7), as a document that provides methods acceptable to the NRC staff for complying with the provisions of Option B to Appendix J to 10 CFR Part 50, subject to four regulatory positions delineated in Section C of the RG. NEI 94-01, Revision 0 (Reference 8), 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.

NEI TR NEI 94-01, Revision 2-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," October 2008 (Reference 6), describes an approach for implementing the optional performance-based requirements of Option B of 10 CFR 50, Appendix J. It incorporates the regulatory positions stated in RG 1.163 (September 1995), and includes provisions for extending Type A test intervals to up to 15 years. In the NRC safety evaluation (SE), dated June 25, 2008 (Reference 9), the NRC staff concluded that NEI 94-01, Revision 2, describes an acceptable approach for implementing the optional performance-based requirements of Option B of 10 CFR 50, Appendix J, and is acceptable for referencing by licensees proposing to amend their TS in regards to containment leakage rate testing, subject to the specific limitations and conditions listed in Section 4.1 of the SE.

In accordance with the guidance in NEI 94-01, Revision 2-A, the licensee proposes to extend the DAEC interval for Type A test from 10 years to 15 years, based on acceptable performance. This would allow the next Type A test to be performed within 15 years from the last test, completed on March 13, 2007. Therefore, the next Type A will be due on or before March 13, 2022.

Guidance for extending containment isolation valve (Type C test) LLRT surveillance intervals beyond 60 months is provided in NEI TR NEI 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," July 2012 (Reference 5).

In accordance with the guidance in NEI 94-01, Revision 3-A, the licensee proposes to extend the containment Type C test interval from the current approved 60 months to 75 months, with a permissible extension period of 9 months (total of 84 months) for non-routine emergent conditions, based on acceptable performance. This would allow the next Type C test to be performed within 75 months from the last test, instead of the current 60-month interval.

10 CFR 50.55a, "Codes and Standards," contains the Containment In-Service Inspection (CISI) requirements that, in conjunction with the requirements of 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 industrywide operating experience."

3.0 TECHNICAL EVALUATION

3.1 Licensee's Proposed TS Changes

In the submittal dated August 15, 2015, section 2.1, page 3 of 30, the licensee stated that TS 5.5.12.b, "Primary Containment Leakage Rate Testing Program," states, in part:

> b. 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 exception to NEI 94-01, Rev. 0, "Industry Guideline for implementing Performance-Based Option of 10 CFR 50, Appendix J":

1. The first Type A test after the September 1993 Type A test shall be performed no later than September 2008.

The licensee's proposed amendment would revise TS 5.5.12.b, "Primary Containment Leakage Rate Testing Program," to remove the reference to RG 1.163 and replace it with a reference to NEI 94-01, Revision 3-A, and the conditions and limitations specified in NEI 94-01, Revision 2-A, and delete the previous date for the Type A test as follows:

b. This program shall be in accordance with the guidelines contained in NEI 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR 50, Appendix J," and conditions and limitations specified in NEI 94-01, Revision 2-A, as modified by the following exceptions:

1. DELETED

The NRC had previously approved License Amendment No. 219 for DAEC, on October 4, 1996, authorizing the implementation of 10 CFR Part 50, Appendix J, Option B, for Types A, B and C tests (Reference 10).

Type A test is an overall integrated leakage rate test (ILRT) of the containment structure. NEI 94-01, Revision 0, specifies an initial test interval of 48 months, but allows an extended interval of 10 years, based upon two consecutive successful tests. There is also a provision for extending the test interval an additional 15 months, but this "should be used only in cases where refueling schedules have been changed to accommodate other factors."

NextEra Energy Duane Arnold had previously submitted an amendment request for DAEC to extend the ILRT interval on a one-time basis from 10 to 15 years (Reference 11). This one-time extension was approved by the NRC, as license Amendment No. 249 to Facility Operating License No. DPR-49, on March 21, 2003 (Reference 12). However, the long term ILRT test interval requirement in DAEC TS 5.5.12 remained at 10 years. The proposed amendment would delete the listing of this one-time exception in TS 5.5.12.b.1 previously granted in Amendment No. 249.

3.2 Deterministic Considerations – Structural and Leak-Tight Integrity of the Containment

The proposed changes in the LAR would revise the aforementioned portion of DAEC TS 5.5.12 by replacing the reference to RG 1.163 with a reference to NEI TR NEI 94-01 Revision 3-A and the conditions and limitations specified in NEI 94-01, Revision 2-A, dated October 2008, as the documents used by DAEC to implement the performance-based leakage testing program in accordance with Option B of 10 CFR 50, Appendix J. Consistent with the guidance contained in both NEI 94-01, Revision 2-A ,and NEI 94-01, Revision 3-A, the licensee justified the proposed changes by demonstrating adequate performance of the DAEC containment based on: (a) the historical plant-specific containment leakage testing program results; (b) the CISI program results: and (c) a DAEC plant-specific risk assessment.

3.2.1 Description of the DAEC Primary Containment

In the submittal dated August 18, 2015, section 2.2, page 4 of 30, DAEC describes the primary containment structure as:

> ...a portion of the General Electric Mark I Primary Containment Pressure Suppression System. The complete pressure suppression system consists of the drywell which houses the reactor vessel and reactor coolant recirculation loops, the pressure suppression chamber, the connecting vent system between the drywell and pressure suppression chamber, isolation valves, vacuum relief system, and containment cooling systems.
>
> The drywell is a steel pressure vessel (0.75 to 3.0 inches thick), with a spherical lower portion and cylinder upper portion. It is enclosed in reinforced concrete, 4 to 7 feet thick, for shielding, and to provide additional structural support over areas where the concrete backs up the steel shell. Above the foundation transition zone, and below the flange, the drywell is separated from the reinforced concrete by a gap of approximately 2 inches to allow for thermal expansion. Shielding over the top of the drywell is provided by removable, segmented, reinforced concrete shield plugs.
>
> The drywell vessel is provided with a removable head to facilitate refueling, one combination double door personnel access lock/equipment lock, one equipment hatch, one personnel access hatch, and one control rod drive removal hatch. The head and hatches are all bolted in place and have double seals and test taps for leak tests.
>
> The pressure suppression chamber is a steel pressure vessel (0.50-0.534 inches thick) in the shape of a torus located below and encircling the drywell. The pressure suppression chamber contains the suppression pool and the gas space above the pool. The suppression chamber will transmit seismic loading to the reinforced concrete foundation slab of the Reactor Building. Space is provided outside the chamber for inspection. Access to the chamber is provided at two locations. There are two 4 foot diameter manhole entrances with double gasketed, leak testable, and bolted covers connected to the chamber by 4 foot diameter steel pipe inserts. These access ports will be closed when Primary Containment is required and will be opened only when the primary coolant temperature is below 212°F and the pressure suppression capability is no longer required.
>
> The pressure suppression pool serves as a heat sink for postulated transient or accident conditions. Energy is transferred to the pool by either the discharge piping from the reactor pressure safety/relief valves or the drywell vent piping, which discharge below the water level. The pool condenses the steam portion of the flow and collects any water carryover while non-condensable gases (including any gaseous fission products) are released to the suppression chamber gas space. The pool also acts as a heat sink for High Pressure Coolant Injection (HPCI) System and Reactor Core Isolation Cooling (RCIC) System

steam exhaust. Energy is removed from the suppression pool when the Residual Heat Removal (RHR) System is operating in the suppression pool cooling mode.

The suppression pool is also the primary source of water for the Core Spray System and the Low Pressure Coolant Injection (LPCI) mode of the RHR System and the secondary source of water for the RCIC and HPCI Systems. The quantity of water stored in the suppression pool is sufficient to condense the steam from a design basis accident and to provide adequate water for the emergency core cooling systems (ECCS). The suppression chamber is subject to the pressure associated with the storage of a minimum of 58,900 - 61,500 cubic feet of water distributed uniformly within the vessel during normal operation. Under accident conditions, the suppression chamber is designed for 61,500 cubic feet of water and a maximum containment pressure of 62 psig [pounds per square inch gauge].

Eight 4'9" diameter vent pipes connect the drywell and the pressure suppression chamber. Jet deflectors are provided in the drywell at the entrance of each vent pipe to prevent possible damage to the vent pipes from jet forces or projectiles that might accompany a pipe break in the drywell. The vent pipes are provided with two-ply expansion bellows to accommodate differential motion between the drywell and suppression chamber. These bellows have test connections that allow for leak testing and for determining that the passages between the two-ply bellows are not obstructed.

The drywell vents are connected to a 3'6" diameter vent header in the form of a torus, which is contained within the air space of the suppression chamber. Projecting downward from the header are 48 downcomer pipes, 24 inches in diameter and terminating 3 feet below the water surface of the pool and approximately 7 feet above the bottom of the Torus.

Containment penetrations are designed for the same integrity as the primary containment structure itself. They will not limit the capabilities of the Primary Containment System to act as a radiological barrier before, during, or subsequent to any design basis accident.

One combination personnel access lock/equipment lock is provided for access to the drywell. The personnel lock has two gasketed doors in series, with each door designed and constructed to withstand the drywell design differential pressure. The doors are mechanically interlocked to ensure that at least one door is locked at times when primary containment is required. The locking mechanisms are designed so that a tight seal will be maintained when the doors are subjected to either internal or external pressure. The seals on this access opening are capable of being tested for leakage. The personnel access lock is bolted to an equipment insert barrel approximately 12 feet in diameter, which, in turn, provides double testable seals and is welded to the drywell shell. The personnel access lock can be completely removed by an overhead monorail to increase the size of the opening should a larger access be required.

A personnel access hatch is provided in the drywell head. There is a separate equipment access hatch that provides access for larger equipment to pass though the containment. These hatches are bolted in place and provide double testable seals.

Personnel and equipment hatches are sized and located with full consideration of service required, accessibility for maintenance, and periodic testing programs. A 2-inch minimum gap is maintained around the barrel of the personnel and equipment hatches as they pass through the concrete shield wall.

A control rod drive [CRD] removal hatch with double, testable seals is provided. This hatch is bolted in place and permits removal of the drive mechanisms when required.

DAEC TS 5.5.12.d states that the maximum allowable primary containment leakage rate, L_a, shall be 2.0 percent of containment air weight per day at the calculated peak pressure, P_a. TS 5.5.12.c states that the peak calculated containment internal pressure for the design basis loss of coolant accident, P_a, is 45.7 psig.

3.2.2 Type A Integrated Leak Rate Test History

Since 1988 (Refueling Outage (RFO) 9) a total of four ILRTs have been performed on the DAEC Containment, all with "As Found" satisfactory results. These four ILRT results were documented in Reference 5, Attachment 1, Section 3.1.1. These test results are summarized in Table 1 below.

In the submittal dated August 18, 2015, section 3.1, page 6 of 30, the licensee stated that there are no anticipated repairs or modifications of the containment that could affect leak-tightness that would not be measured by local leak rate testing as required in Section 9.2.4 of NEI 94-01, Revision 0. The results of the last two tests are listed the Table 1 below:

Table 1
Integrated Leakage Rate Testing History

Test Completion Date	As Found Leak Rate (%wt/day)	As Found Acceptance Criteria (%wt/day)	Test Pressure During As Found ILRT* (psig)	As Left Leak Rate (%wt/day)	As Left Acceptance Criteria (%wt/day)
1988 (RFO 9)	1.353	≤ 2.0	43	0.229	≤ 1.5
1990 (RFO 10)	1.633	≤ 2.0	43	1.146	≤ 1.5
09/20/1993 (RFO 12)	0.511	≤ 2.0	44 to 45	0.254	≤ 1.5
03/13/2007 (RFO 20)	0.355	≤ 2.0	46**	0.342	≤ 1.5

%wt/day = percent primary containment air weight per day
*Data Source: RAI 3
**P_a increased from 42.7 psig to 45.7 psig in License Amendment No. 243, dated November 2001 (Reference 13).

The NRC staff notes that the last sentence of Section 9.2.3, "Extended Test Intervals" of NEI 94-01, Revision 3-A reads, "In 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)." Section 9.1.2 of the same NEI TR reads, in part, "The elapsed time between the first and the last tests in a series of consecutive passing tests used to determine performance shall be at least 24 months."

In response to a request for additional information (RAI) SCVB RAI-3 (Reference 2), the licensee confirmed that both Type A tests were performed consistent with the definition of P_a. Both Type A tests were successful in that the "As Found" test results were less than $1.0L_a$ and less than the DAEC TS 5.5.12.d limiting value. Both P_a and L_a are defined in DAEC, "Primary Containment Leakage Rate Testing Program," TSs 5.5.12.c and 5.5.12.d, respectively.

As can be seen in Table 1, the last two DAEC tests were performed at a pressure higher than the peak calculated design basis internal accident pressure, P_a, which per TS 5.5.12c for DAEC is the peak calculated containment internal pressure for the design basis loss of coolant accident.

The DAEC Appendix J, Option B, current TS 5.5.12b references NEI 94-01, Revision 0. Section 9.2.3 of this reference document reads in part:

> In reviewing past performance history, Type A test results may have been calculated and reported using computational techniques other than the Mass Point method from ANSI/ANS [American National Standards Institute/American Nuclear Society]-56.8–1994 (e.g., Total Time or Point–to–Point). Reported test results from these previously acceptable Type A tests can be used to establish the performance history. Additionally, a licensee may recalculate past Type A Upper Confidence Limit (UCL) (using the same test intervals as reported) in accordance with ANSI/ANS-56.8–1994 Mass Point methodology and its adjoining Termination criteria in order to determine acceptable performance history.

NEI 94-01, Revision 3-A, reads nearly identical except the test standard invoked is ANSI/ANS-56.8–2002. To this end, in SCVB RAI-7, the NRC staff inquired about the Type A test results of March 13, 2007 (i.e., 0.355 percent weight/day) and whether these results complied with the definition of "performance leakage rate" as defined in Section 5.0 of NEI 94-01, Revision 3-A.

The licensee responded by providing a comprehensive break down of the Type A tests results that demonstrated that the value of 0.355 percent weight/day equated to the sum of the Type A UCL and as–left minimum pathway leakage rate leakage rate for all Type B and Type C pathways that were in service, isolated, or not lined up in their test position (i.e., drained and vented to containment atmosphere) prior to performing the Type A test (Reference 2). The NRC staff notes that Section 9.2.3 does not mandate (i.e., "may" is used) that a licensee recalculate past Type A test results to demonstrate conformance with the definition of "performance leakage rate" contained in NEI 94-01, Revision 3-A. The NRC staff also notes that the IRLT results from 1998, 1990, and 1993 demonstrated ample margin (i.e., ≥ 18 percent) between each ILRT value and L_a. Accordingly, the staff did not request in SCVB RAI-7 that the licensee reconstitute the Type A test results conducted during RFOs 20-30 years in the past. Based on this, the staff finds the licensee's response to SCVB RAI-7 acceptable.

TS 5.5.12e.1 establishes the maximum limit for DAEC startup following completion of Type A testing at ≤ 0.75 L_a, which equals 1.50 percent of containment air weight per day.

The DAEC Containment was designed for a leakage rate L_a not to exceed 2.0 percent by weight of containment air per day at the calculated peak pressure, P_a. As displayed in Table 1, there has been adequate margin to the "As Found" performance limit as described in TS 5.5.12d of L_a equal to 2.0 percent weight/day for the historical ILRTs.

Past DAEC ILRT results have confirmed that the containment leakage rates are acceptable with respect to the design criterion of 2.0 percent leakage of containment air weight (L_a) per day at the design basis loss of coolant accident pressure (P_a). Since the last two Type A tests for DAEC had "as found" test results of less than 1.0L_a, a test frequency of 15 years in accordance with NEI 94-01 Revision 3-A, and the conditions and limitations of NEI 94-01, Revision 2-A, is acceptable for DAEC.

Based on the historical DAEC ILRT test results and the licensee's response to SCVB RAI-3, the NRC staff concludes that the requirements of Sections 9.1.2 and 9.2.3 of NEI 94-01, Revision 3-A, have been satisfied.

3.2.3 Types B and C Leak Rate Test History

Technical Specification 5.5.12e, "Primary Containment Leakage Rate Testing Program," reads in part:

> e. Leakage Rate acceptance criteria are:
>
> 1. Primary Containment leakage rate acceptance criterion is ≤1.0 L_a. During the first unit startup following testing in accordance with this program, the leakage rate acceptance criteria are: ≤ 0.60 L_a for the Type B and Type C tests; and, ≤ 0.75 L_a for the Type A tests; and

In the submittal dated August 18, 2015, section 3.1.2, page 7 of 30, the licensee stated that a review of the Type B and Type C test results from 2003 through 2014 has shown a large amount of margin between the actual as-found (AF) and as-left (AL) outage summations and the TS leakage rate acceptance criteria (that is, less than 0.6 L_a). The data contained in the LAR support the following conclusions:

- The AF minimum pathway leak rate for DAEC shows an average of 14.0 percent of 0.6 L_a with a high of 24.2 percent of 0.6 L_a (i.e., 0.146 L_a).
- The AL maximum pathway leak rate for DAEC shows an average of 23.8 percent of 0.6 L_a with a high of 35 percent of 0.6 L_a (i.e., 0.213 L_a).

Table 2
DAEC Type B and C LLRT As-Found/As-Left Trend Summary

Refueling Outage	AF Min. Path	Percentage of 0.6 La	AL max. Path	Percentage of 0.6 La
RFO 18 Spring 2003	40,136 sccm	18.3 %	55,148 sccm	25.1 %
RFO 19 Spring 2005	37,522 sccm	17.1 %	40,083 sccm	18.3 %
RFO 20 Winter 2007	22,543 sccm	10.3 %	77,918 sccm	35.5 %
RFO21 Winter 2009	18,212 sccm	8.3 %	44,995 sccm	20.5 %
RFO 22 Fall 2010	20,960 sccm	9.5 %	53,525 sccm	24.4 %
RFO 23 Fall 2012	53,212 sccm	24.2 %	47,003 sccm	21.4 %
RFO 24 Fall 2014	23,276 sccm	10.6 %	47,346 sccm	21.6 %

sccm = standard cubic centimeters per minute

Based on the review of the data contained in Table "DAEC Type B and Type C Leak Rate Summation History Since 2003," the NRC staff concludes that the aggregate results of the "As-Found Min Path" and "As-Left Min Path" for all the Type B and C tests from 2003 through 2014 demonstrates a history of successful tests since the aggregate test results were significantly less than the Type B and Type C test TS limit of ≤ 0.60 L_a contained in TS 5.5.12e.1.

In SCVB RAI-6, the NRC staff requested additional information about the current percentage of Type B components and of Type C center island vessels (CIVs) on the maximum allowed extended frequencies of 120 months and 60 months, respectively.

The licensee replied that for Type B testing, 58 of 65 (89.2%) components are on extended frequency. Six of the seven components not included are the containment airlock, the drywell head, the equipment hatch, the torus hatches (2), and the CRD hatch that are required to be opened every outage. The seventh is an instrument penetration that has become a spare penetration recently and has not been tested sufficiently to extend to 120 months. All components that can be extended have been extended. In Table 2 of the response to SCVB RAI-6, the licensee presented the two most recent "as found" Type B test results for each of the 65 penetrations (Reference 2).

The NRC staff reviewed these test results to ensure that the licensee adhered to the requirements of NEI 94-01, Revision 3-A, Section 10.2.1.2, "Extended Test Intervals (Except Containment Airlocks)." The staff confirmed that for each of the 58 penetrations on extended frequencies, that last two consecutive Type B performed tests during RFOs had leakage rates that were at or below the administrative limit at the time of test performance. In addition, the licensee, in Table 2, demonstrated conformance with NEI 94-01, Revision 3-A, Section 11.3.2, "Programmatic Controls," by reducing future administrative leakage rate limits for six of the penetrations based upon their review of the test program results.

For Type C testing, 71 of 84 (84.5 percent) eligible components are on extended frequency. This does not include the 35 components that are required to be tested on a 30-month frequency per RG 1.163. Of the 13 components not on extended frequency, 8 are well water valves that are discussed in part (2) of RAI-1. Also, CV2211 is not on extended frequency due to a leakage failure in RFO 24. The remaining four valves are in the containment monitoring system. These valves have each failed to close during inservice testing in the past 4 years. In Table 3 of the response to SCVB RAI-6, the licensee presented the two most recent "as found" Type C test results for each of DAEC's 119 Type C components (Reference 2). The NRC staff reviewed these test results to ensure that the licensee adhered to the requirements of NEI 94-01, Revision 3-A, Section 10.2.3.2, "Extended Test Intervals." The staff confirmed that for each of the 71 components on extended frequencies, that the last two consecutive Type C performed tests during RFOs had leakage rates that were at or below the administrative limit at the time of test performance. Furthermore, for the 13 eligible components not on extended frequency, the staff verified that there is a consistency with the licensee's responses to SCVB RAI-1 and SCVB RAI-6 and the LLRT results contained in Table 3. In conclusion, the NRC staff finds the licensee's response to RAI-6 acceptable since it demonstrated compliance with the requirements of NEI 94-01, Revision 3-A.

From the response to SCVB RAI-6, the NRC staff concludes that the percentage of Type B and Type C components on extended frequencies represents good performance and supports allowing an extended test interval of up to 75 months for Type C tested CIVs in accordance with the guidance of NEI 94-01, Revision 3-A.

The NRC staff noted in SCVB RAI-2 that the LAR provided little detail about how DAEC currently satisfies the NEI 94-01, Revision 0 (Reference 8), requirements of Section 11.3.1, "Performance Factors" and Section 11.3.2, "Programmatic Controls." Both of these sections pertain to determining and implementing extended test intervals for Types B and C components. The licensee's RAI response provided a copy (Attachment 1 to Reference 2) of Section 4 to DAEC's, "Performance Based Containment Testing Program Manual." Upon comparison of the requirements of Sections 11.3.1 and 11.3.2 in NEI 94-01, Revision 0, and in NEI 94-01, Revision 3-A to DAEC's Performance Based Containment Testing Program Manual (PBCTPM), the staff found consistency amongst the two TRs and the PBCTPM.

The NRC staff reviewed the corrective actions identified in LAR Attachment 1, Section 3.1.2, "Type B and C Testing," associated with the four valves that failed the most recent DAEC Type C LLRT program tests during the RFOs of Fall 2012 (RFO 23) and 2014 (RFO 24).

In SCVB RAI-1, the staff inquired about the causes of the failed "as-found" LLRTs (i.e., valves CV2211, CV5704B; CV4305; and CV4300) that occurred during RFO 23 and RFO 24. The licensee provided a comprehensive response about the cause of each of these LLRT failures and explained the corrective actions performed to prevent repetitive and/or common cause failures. The licensee concluded the response by stating that there have been no repetitive Type B penetration and no repetitive Type C CIV failures since 2003 (i.e., RFO 18). Based on the licensee's response to RAI-1, the staff concluded that adequate corrective actions had been performed during RFOs 23 and for the DAEC valves that failed their LLRTs (Reference 2).

Therefore, the NRC staff finds that the licensee is effectively implementing the Type B and Type C leakage rate test program, as required by Option B of 10 CFR 50, Appendix J.

The NRC staff also determined that the licensee's ILRT and LLRT containment examination programs to periodically examine, test, monitor, and manage age-related and environmental degradation of the DAEC containment support extending the ILRT (Type A test) out to a maximum of 15 years.

3.2.4 Containment Inspection Program

Inservice Inspection (ISI) Program for Concrete Containment - IWL

The containment concrete is used only to meet intended functions of shielding and structural support, it does not serve as a pressure retaining function, and therefore, IWL is not applicable to the boiling-water reactor (BWR) containment.

Containment ISI Program - IWE

In the submittal dated August 18, 2015, section 3.2.1, page 10 of 30, the licensee stated that the second interval was scheduled to end with the end of the original operating license on February 21, 2014. In December 2010, the licensee received an extension of the operating license for 20 years. The inspection interval has been modified to be parallel to the 4^{th} 10-year ISI program interval. The three inspection periods during the second inspection interval are as follows:

First Period: May 22, 2008 – May 21, 2010
Second Period: May 22, 2010 – October 31, 2013
Third Periods: November 1, 2013- May 21, 2017

The current containment inspection interval is summarized in the Table 2 below:

Table 3
Current IWE Interval

System Identification	**Examination Description**	**Item Number**	**Exam method**	**Period Scheduled**		
Examination Category E-A				1	2	3
Drywell/Torus/Downcomers	Accessible Surface Areas	E1.11	GV	1	1	1
Torus	Wetted Surfaces of Submerged Areas	E1.12	GV			1
Downcomers	BWR Vent System Accessible Surfaces	E1.20	GV	3	3	2
Drywell/Torus/Downcomers	Moisture barrier	E1.30	GV	1	1	1
Examination Category E-C				1	2	3
Torus	Visible Surfaces	E4.11	VT-3	1		1
Torus	Surface Area Grid Minimum Wall Thickness Location	E4.12	UTT			

Item Number refers to item numbers listed in American Society of Mechanical Engineers (ASME) Section XI, Table IWE-2500-1, *"Examination Categories,"* Exam Method GV – General Visual; UTT

– Ultrasonic Thickness Test (UTT); and VT-3 –Examination method defined in ASME, Section XI, Paragraph IWA-2213," *"VT-3 Examination"* Schedule.

In the submittal dated August 18, 2015, section 3.2.1, page 11 of 30, the licensee also stated that the submerged portion of the suppression pool at DAEC has been determined to be a surface area subject to augmented examination. In 2009, the general visual inspection frequency was increased to every outage. During the RFO in 2009 and 2010 only localized areas of corrosion (pitting) were observed and areas of significant depth were examined by UTT and determined to be acceptable. The licensee further stated that significant areas of loss of protection coatings resulted in the recoating of the submerged areas during the 2012 RFO. The entire surface exposed after coating removal was visually examined. Detailed evaluations were performed to determine the acceptable metal thickness after coating removal. Nineteen localized areas were identified that required weld repair to restore the shell to an acceptable thickness. The entire submerged surface was recoated. These 19 areas were inspected in the 2014 RFO and examination was satisfactory and these nineteen areas no longer require specific inspections.

Containment Coating Inspections

In Section 3.2.8, "Containment Coatings Inspections" of Attachment 1 to NG-15-0234, the licensee stated:

> The site Protective Coatings Program defines the requirements and responsibilities for a program to implement inspections during refueling outages for the purpose of assessing the condition of the protective coatings on structures and equipment in the primary containment. These inspections assure compliance with the DAEC commitments in response to NRC Generic Letter 98-04 ["Potential for Degradation of the Emergency Core Cooling System and the Containment Spray System after a Loss-of-Coolant Accident Because of Construction and Protective Coating Deficiencies and Foreign Material in Containment"]. DAEC is not committed to following the requirements of Regulatory Guide 1.54, "Quality Assurance Requirements for Protective Coatings Applied to Water-Cooled Nuclear Power Plants," but has developed a comparable program for monitoring and maintaining protective coatings inside primary containment. The DAEC program uses specific ASTM Standards that are acceptable to the NRC as stated in RG 1.54 Revision 1.
>
> Containment coatings inspections are a scheduled activity conducted during refueling outages. The examination areas are sleeted such that painted structures are inspected every outage. This is done to comply with the recommendations of ASTM D5163-96, "Establishing Procedures to Monitor the Performance of Service Level 1 Coating Systems in an Operating Nuclear Power Plant."

In the submittal dated August 18, 2015, section 3.2.2, page 12 of 30, the licensee also stated that the condition of the protective coatings in the primary containment air space inspected during fall 2014 RFO was typical and expected for the vintage of the coatings. A coating examination was completed of the submerged surfaces areas of the suppression pool during the fall 2014, RFO 24. This inspection identified delamination of the coating on the torus shell, structural steel and downcomers. The licensee also stated that the delamination was the result of inadequate bonding between coats during the torus recoat in the fall of 2012. The application was intended as a single coating application but failures in the control of the application process resulted in the need to apply a second coat in some areas to achieve the specified coating thickness. The initial coat and second coat did not fully bond resulting in the delamination observed in the fall of 2014. The licensee further stated that the operability of the primary containment and the ECCS were assessed prior to startup from the fall of 2014 RFO.

The evaluation of ECCS suction strainer loading was reassessed and sufficient margin was present to determine the as-found degraded condition as operable and the as-left condition was also determined to be operable.

3.2.5 NEI 94-01, Revision 2, Conditions Satisfied

As required by 10 CFR 50.54(o), the DAEC containment is subject to the requirements set forth in 10 CFR 50, Appendix J. Option B of Appendix J requires that test intervals for Types A, B, and C testing be determined by using a performance-based approach. Currently, the DAEC 10 CFR 50, Appendix J, Testing Program Plan is based on RG 1.163, which endorses NEI 94-01, Revision 0. The licensee proposes to revise the DAEC 10 CFR 50, Appendix J, Testing Program Plan by implementing the guidance contained in NEI 94-01 Revision 3-A, and the conditions and limitations of NEI 94-01, Revision 2-A.

By letter dated June 25, 2008, (Reference 9), the NRC published an SE with limitations and conditions for NEI 94-01, Revision 2. In the SE, the NRC concluded that NEI 94-01, Revision 2, describes an acceptable approach for implementing the optional performance-based requirements of 10 CFR 50, Appendix J, and is acceptable for referencing by licensees proposing to amend their TS in regards to containment leakage rate testing, subject to the limitations and conditions, noted in Section 4.0 of the SE. Section 4.1 of the SE establishes limitations and conditions pertaining to deterministic requirements, while Section 4.2 establishes limitations and conditions pertaining to the plant's probabilistic risk assessment (PRA) analysis. More explicitly, the SE included provisions for extending the ILRT Type A interval to a maximum of 15 years subject to the six limitations and conditions provided in the SE. The NRC noted in the SE that NEI 94-01, Revision 2, incorporates the regulatory positions stated in RG 1.163. The accepted version of NEI 94-01, Revision 2, was subsequently issued as Revision 2-A. The NEI issued Revision 2-A to NEI TR 94-01 on November 19, 2008 (Reference 6). With Revision 2-A, the TR was revised to incorporate the June 25, 2008, NRC final safety evaluation report (SER).

LAR, Section 3.4.1, which contains Table "June 25, 2008, NRC SE, Limitations and Conditions," indicates that DAEC will meet the limitations and conditions of Section 4.1 of the "NRC Safety Evaluation Report" contained in NEI 94-01, Revision 2-A. Accordingly, the DAEC intends to adopt the testing criteria of ANSI/ANS 56.8–2002 (Reference 14) in place of the criteria of ANSI/ANS 56.8–1994 (Reference 15).

The leakage rate testing requirements of 10 CFR 50, Appendix J, Option B (Types A, B and Type C) and the CISI requirements mandated by 10 CFR 50.55a together, ensure the continued leak-tight and structural integrity of the containment during its service life.

Type B testing ensures that the leakage rate of individual containment penetration components is acceptable. Type C testing ensures that individual CIVs are essentially leak tight. In addition, aggregate Type B and Type C leakage rates support the leakage tightness of primary containment by minimizing potential leakage paths.

In the LAR, the licensee proposes that DAEC invoke NEI 94-01, Revision 3-A, along with the conditions and limitations of NEI 94-01, Revision 2-A, as the reference documents for the DAEC, "Primary Containment Leakage Rate Testing Program," in TS 5.5.12. Therefore, the licensee is also applying to extend the frequencies of the Type C performance based test intervals beyond 60 months.

The NRC staff has found that the use of NEI TR 94-01, Revision 2-A, is acceptable for referencing by licensees proposing to amend their TSs to permanently extend the ILRT surveillance interval to 15 years, provided the following applicable six conditions are satisfied, as discussed below.

Condition 1

Enclosure, Page 19, condition 1 refers to Section 3.1.1.1 of the NRC letter dated June 25, 2008 (Reference 9) and stipulates that for calculating the Type A leakage rate, the licensee should use the definition in the NEI TR 94-01, Revision 2, in lieu of that in ANSI/ANS-56.8-2002.

NextEra Energy Duane Arnold Response to June 25, 2008, NRC SE Limitation and Condition 1

In its table captioned "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," in Section 3.4.1, on Page 18 of 30 of Attachment 1 to NG-15-0234, the licensee stated:

> DAEC will utilize the definition in NEI 94-01 Revision 3-A, Section 5.0. This definition has remained unchanged from Revision 2-A to Revision 3-A of NEI 94-01.

Staff Assessment

Section 3.2.9, "Type A test performance criterion," of ANSI/ANS-56.8-2002 defines the "performance leakage rate" and reads in part:

> The performance criterion for a Type A test is met if the performance leakage rate is less than L_a. The performance leakage rate is equal to the sum of the measured Type A test UCL and the total as-left minimum pathway leakage rate (MNPLR) of all Type B or Type C pathways isolated during performance of the Type A test.

NRC staff SE Section 3.1.1.1, for NEI 94-01 Revision 2, reads in part:

> ...Section 5.0 of NEI TR 94-01, Revision 2, uses a definition of "performance leakage rate" for Type A tests that is different from that of ANSI/ANS-56.8-2002. The definition contained in NEI TR 94-01, Revision 2, is more inclusive because it considers excessive leakage in the performance determination. In defining the minimum pathway leakage rate, NEI TR 94-01, Revision 2, includes the leakage rate for all Type B and Type C pathways that were in service, isolated, or not lined up in their test position prior to the performance of the Type A test. Additionally, the NEI TR 94-01, Revision 2, definition of performance leakage rate requires consideration of the leakage pathways that were isolated during performance of the test because of excessive leakage in the performance determination. The NRC staff finds this modification of the definition of "performance leakage rate" used for Type A tests to be acceptable.

Section 5.0 of the SE for NEI 94-01, Revision 2-A, reads:

> The performance leakage rate is calculated as the sum of the Type A upper confidence limit (UCL) and as-left minimum pathway leakage rate (MNPLR) leakage rate for all Type B and Type C pathways that were inservice, isolated, or not lined up in their test position (i.e., drained and vented to containment atmosphere) prior to performing the Type A test. In addition, leakage pathways that were isolated during performance of the test because of excessive leakage must be factored into the performance determination. The performance criterion for Type A tests is a performance leak rate of less than 1.0_{La}.

The NRC staff reviewed the definitions of "performance leakage rate" contained NEI 94-01, Revision 2, Revision 2-A, and Revision 3-A. The NRC staff concluded that the definitions contained in all three revisions are identical. Based on this, the NRC staff agrees with the licensee that "This definition has remained unchanged from Revision 2-A to Revision 3-A of NEI 94-01."

Therefore, the NRC staff concludes that DAEC will use the definition found in Section 5.0 of NEI 94-01, Revision 2 for calculating the Type A leakage rate in the DAEC "Primary Containment Leakage Rate Testing Program."

Based on the above review, the NRC staff finds that the licensee has adequately addressed "Condition 1."

<u>Condition 2</u>

Enclosure, Page 19, condition 2 refers to Section 3.1.1.3 of the NRC letter dated June 25, 2008 (Reference 9), and stipulates that the licensee submits a schedule of containment inspections to be performed prior to and between Type A tests.

NextEra Energy Duane Arnold Response to Condition 2

In its table captioned "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," in Section 3.4.1, on Page 18 of 30 of Attachment 1 to NG-15-0234, the licensee stated:

> Reference Section 3.2.1 and 3.2.2. General visual observations of the accessible interior and external surfaces of the containment structure shall continue to be performed in accordance with containment structural integrity test procedures to meet the requirements of the proposed revision to TS 5.5.12, the inspection requirements of ASME Code, Section XI, Subsection IWE and NEI 94-01, Revision 3.A, Sections 9.2.1 and 9.2.3.2.

Staff Assessment

NRC staff, SE, Section 3.1.1.3, for NEI 94-01, Revision 2, reads:

> 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 2-A, Section 9.2.3.2, "Supplemental Inspection Requirements," reads:

> 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.

The NRC staff reviewed LAR Attachment 1 Section 3.2.1, "Containment Inservice Inspection Program (IWE)." The IWE program was developed with an initial interval start date of May 22, 1998. The second interval was scheduled to end with the end of the original operating license on February 21, 2014. In December 2010, DAEC received an extension of the operating license for 20 years. The inspection interval has been modified to be parallel to the 4th 10-year ISI program interval.

The three inspection periods during the second inspection interval are as follows:

First Period:	May 22, 2008 - May 21, 2010
Second Period:	May 22, 2010 - October 31, 2013
Third Period:	November 1, 2013 - May 21, 2017

Currently, TS 5.5.12.b requires in part, visual examinations in accordance with the guidelines contained in RG 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995. Regulatory Position 3 of this RG requires that these examinations should be conducted prior to initiating a Type A test. As stated in the Licensee Compliance Statement, this examination requirement will be maintained in accordance with Section 9.2.1 of NEI 94-01, Revision 3-A.

Based on the above information, DAEC will meet the requirements of the proposed revision to TS 5.5.12, the inspection requirements of ASME Code, Section XI, Subsection IWE and NEI 94-01, Revision 3.A, Sections 9.2.1 and 9.2.3.2.

Based on the above review, the NRC staff finds that the licensee has adequately addressed "Condition 2."

Condition 3

In its table captioned "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," in Section 3.4.1, on Page 18 of 30 of Attachment 1 to NG-15-0234, the licensee stated:

> Reference Section 3.2.1 through 3.2.9. General visual observations of the accessible interior and external surfaces of the containment structure shall continue to be performed, in accordance with containment structural integrity test procedures to meet the requirements of the proposed revision to TS 5.5.12, the inspection requirements of ASME Code Section XI, subsection IWE and NEI 94-01, Revision 3.A, Sections 9.2.1 and 9.2.3.2.

Staff Assessment

The NRC staff reviewed the summary statements for the historical IWE containment inspections contained in LAR:

a) Section 3.2.1 "Containment Inservice Inspection Program (IWE)";
b) Section 3.2.2 "Containment Visual Inspections";
c) Section 3.2.3 "Containment Liner Test Channel Plugs";
d) Section 3.2.4 "Containment Corrosion";
e) Section 3.2.5 "Suppression Chamber Corrosion";
f) Section 3.2.6 "Suppression Chamber Cracking";

g) Section 3.2.7 "Inaccessible Areas";
h) Section 3.2.8 "Containment Coatings Inspections"; and
i) Section 3.2.9 "License Renewal Commitments."

Section 3.2, "Containment Inspections" reads that the DAEC primary containment examinations are conducted under two separate programs:

1) the "Primary Containment Inspection Program"; and
2) the "Containment Coatings Inspection and Assessment Program".

The first program satisfies the visual examination requirements of ASME Code Section XI, Subsection IWE and 10 CFR 50, Appendix J, Option. B.

In Section 3.2.2, "Containment Visual Inspections", the license stated that the current DAEC "Suppression Chamber and Drywell Visual Examination" procedure stipulates that containment visual examinations be conducted prior to initiating a Type A test and during two other refueling outages before the next Type A test if the interval for the Type A test has been extended to 10 years. This is in accordance with the current licensing basis for TS 5.5.12 (i.e., Regulatory Position 3 of Regulatory Guide 1.163).

The staff also notes that Section 3.2.4, "Containment Corrosion" indicates that while these visual inspections are required to be performed three times in a 10 year period, DAEC has performed these visual inspections five times in a 10 year period (i.e., every refueling outage).

Furthermore, the licensee stated in Section 3.2.2 that (Attachment I to NG-15-0234, page 12 of 30):

> With the implementation of the proposed change, TS 5.5.12 will be revised by replacing the reference to Regulatory Guide 1.163 with reference to NEI 94-01, Revision 3-A. A general visual examination of accessible interior and exterior surfaces of the containment for structural deterioration that may affect the containment leak-tight integrity is required by NEI 94-01, Revision 3-A, 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.

The staff found that the above extracted information, contained in Sections 3.2, 3.2.2, and 3.2.4, completely supports the "NextEra Energy Duane Arnold Response to Condition 3."

The staff notes that "NRC Staff SE," Section 3.1.3, for NEI 94-01, Revision 2 (Enclosure Page 9), reads, 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). ...

The DAEC "Primary Containment Inspection Program" is based on ASME Code Section XI, Subsection IWE and applies to the containment vessel. Section 3.2.1, "Containment Inservice Inspection Program (IWE)" reads in part (Attachment I to NG-15-0234, page 10 of 30):

> ASME Code Section XI, Subsection IWE specifies that examinations will be performed on the pressure retaining boundary of the containment vessel, which includes the accessible surfaces of the liner plate, integral attachments and structures that are part of the reinforcing structure, surfaces of pressure retaining welds, pressure retaining bolted connections, and the moisture barrier, which prevents moisture intrusion at the concrete-to-metal interface at the basement floor. Also, the containment surfaces that may require augmented examination are included in this program.

The licensee indicated, in Section 3.2.7, "Inaccessible Areas," that DAEC evaluates the acceptability of inaccessible areas of the containment when conditions exist in accessible areas that may indicate the presence of or could result in degradation to such inaccessible areas. At the time of LAR submission, DAEC had not needed to implement any new technologies to perform inspections of any inaccessible areas. As required by 10 CFR 50.55a(b)(2)(ix)(A), the licensee indicated its intent to provide an "ISI Summary Report" for each future inaccessible areas identified (if any).

The staff concludes that, based on the information contained in LAR Sections 3.2, 3.2.1, 3.2.2, 3.2.4, and 3.27, the licensee has established its complete intent to satisfy the issues of SE Section 3.1.3 and "Condition 3."

<u>Condition 4</u>

Enclosure, page 19, condition 4 refers to Section 3.1.4 of the NRC letter dated June 25, 2008 (Reference 9), and stipulates that the licensee addresses any tests and inspections performed following major modifications to the containment structure, as applicable.

<u>NextEra Energy Duane Arnold Response to Condition 4</u>

In its table captioned "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," in Section 3.4.1, on page 19 of 30 of Attachment 1 to NG-15-0234, the licensee stated:

> Engineering Change (EC) 281991 is to install a new Hardened Containment Vent System (HCVS). The design will remove the existing 8" containment isolation control valve CV-4357. The new cap installed on the remaining 8"-HBC-140 piping within the SE corner room will be the containment boundary. The modification adds two new 10" PCIVs [primary containment isolation valve] and actuators and a new rupture disk. The two new PCIVs provide a containment isolation function. The rupture disk prevents the use of this system prior to the containment pressure exceeding 50 psig, unless the rupture disk is manually ruptured. The new pipe and valves are the containment penetration boundaries. The system is manually operated from the control room or remote location.

> Associated tests and inspections will confirm the leak tightness of the abandon penetration, the new PCIVs, and the piping from the containment to the new PCIVs. Testing procedures have yet to be developed.

Staff Assessment

The NRC staff, SE, Section 3.1.4, for NEI 94-01 Revision 2, reads, in part:

> 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 NRC staff notes that the licensee's response to "Condition 4" is based on a future DAEC Containment modification project, the HCVS. In RAI SCVB-5 (Reference 2), the staff requested that the licensee provide a discussion that demonstrates how DAEC the guidance of SE, Section 3.1.4, for any containment modifications (major or minor) that may have affected containment integrity since the pre-operational phase of DAEC.

The licensee response to RAI SCVB-5 indicated that DAEC has not performed any major repairs or modifications of the containment. Furthermore, the HCVS will use an existing spare 12" penetration. The existing cap will be removed and piping welded to the penetration. The final configuration will be local leakage rate tested. All non-major containment modifications have been tested as required by the 10 CFR 50 Appendix J, NEI 94-01, Revision 0, and ASME, Section XI, Subsection IWE. Modifications and repairs that affected the containment leakage integrity were tested by local leakage rate testing or were deferred to the RFO with a scheduled ILRT (i.e., 2007) as allowed by NEI 94-01, Revision 0, Paragraph 9.2.4. These activities included:

1. Replacement of two canisters for low voltage power and control penetrations.
2. Installation of lifting lugs by attachment weld to the drywell shell and drywell head.
3. Installation of the hardened wetwell vent modification.

Based on DAEC's past performance as reflected in the response to RAI SCVB-5, the NRC staff concludes that it is most likely that the licensee will adequately address the issues of SE Section 3.1.4 and "Condition 4" to maintain the Containment's integrity in the future.

Condition 5

Enclosure, page 19, condition 5 refers to Section 3.1.1.2 of the NRC letter dated June 25, 2008 (Reference 9), and stipulates that 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.

NextEra Energy Duane Arnold Response to Condition 5

In its table captioned "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," in Section 3.4.1, on page 19 of 30 of Attachment 1 to NG-15-0234, the licensee stated:

> DAEC will follow the requirements of NEI 94-01, Revision 3-A, Section 9.1. This requirement has remained unchanged from Revision 2-A to Revision 3-A of NEI 94-01. In accordance with section 3.1.1.2 of the NRC SE dated June 25, 2008 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML081140105), NextEra Energy Duane Arnold 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. Justification for such an extension request will be in accordance with the staff position in Regulatory Issue Summary (RIS) 2008-27.

Staff Assessment

Section 3.1.1.2, "Deferral of Tests Beyond The 15-Year Interval," of the NRC staff, SE, dated June 25, 2008, reads:

> 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 TR NEI 94-01, Revision 2, the licensee will have to demonstrate to the NRC staff that an unforeseen emergent condition exists.

The NRC staff notes that the licensee has acknowledged the requirements of NEI 94-01 Revision 2-A, SER, Section 3.1.1.2, and accepted the NRC staff position discussed in Condition 5. By referencing RIS 2008-27, the licensee has 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 review, the NRC staff finds that the licensee has adequately addressed "Condition 5."

Condition 6

Enclosure, page 19, condition 6 of the NRC letter dated June 25, 2008 (Reference 9), stipulates that 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 [Electric Power Research Institute] Report No. 1009325, Revision 2, including the use of past containment ILRT data.

NextEra Energy Duane Arnold Response to Condition 6

In its table captioned "June 25, 2008 NRC Safety Evaluation (SE) Limitations and Conditions," in Section 3.4.1, on page 19 of 30 of Attachment 1 to NG-15-0234, the licensee stated:

> Not applicable. DAEC was not licensed under 10 CFR Part 52.

Staff Assessment

"Condition 6" does not apply.

Summary

Based on the above evaluation of each condition, the NRC staff determined that the licensee has adequately addressed the six conditions identified in Section 4.1 of the NRC SE for TR NEI 94-01, Revision 2-A (Reference 6). Therefore, the staff finds it acceptable for DAEC to adopt the "conditions and limitations" of TR NEI 94-01, Revision 2-A, as part of the implementation documents in TS 5.5.12, "Primary Containment Leakage Rate Testing Program."

3.2.6 NEI 94-01, Revision 3-A Conditions Satisfied

As required by 10 CFR 50.54(o), the DAEC Containment is subject to the requirements set forth in 10 CFR 50, Appendix J. Option B of Appendix J allows that test intervals for Types A, B, and C testing be determined by using a performance-based approach. Currently, TS 5.5.12, "Primary Containment Leakage Rate Testing Program," is implemented in accordance with the guidelines contained in RG 1.163, "Performance-Based Containment Leak-Test Program," dated September 1995. The licensee proposes to revise the DAEC TS 5.5.12 by replacing Option B implementation document RG 1.163 with NEI 94-01, Revision 3-A, along with the conditions and limitations of NEI 94-01, Revision 2-A to govern the test frequencies and the grace periods for Types A, B and C tests.

By letter dated June 8, 2012, the NRC published an SE, with limitations and conditions for NEI 94-01, Revision 3. In the SE the NRC concluded that NEI 94-01, Revision 3, describes an acceptable approach for implementing the optional performance-based requirements of 10 CFR 50, Appendix J, and is acceptable for referencing by licensees proposing to amend their TS in regards to containment leakage rate testing, subject to the limitations and conditions identified in SE Section 4.0 and summarized in SE Section 5.0. The accepted version of NEI 94-01, Revision 3 was subsequently issued as Revision 3-A. The NEI issued Revision 3-A to

NEI TR 94-01 on July 31, 2012. With Revision 3-A, the TR report was revised to incorporate the June 8, 2012, NRC final SER.

The licensee indicated in the LAR that DAEC will meet the limitations and conditions of NEI 94-01, Revision 3-A, Section 4.0. Accordingly, the DAEC will be adopting in part the testing criteria ANSI/ANS 56.8–2002, as part of its licensing basis. As stated in Section 2.0 of NEI 94-01 Revision 3-A, where technical guidance overlaps between NEI 94-01, Revision 3-A and ANSI/ANS 56.8–2002, the guidance of NEI 94-01, Revision 3-A, takes precedence.

In the LAR the licensee proposes to invoke NEI 94-01, Revision 3-A, as the implementation document for the DAEC "Primary Containment Leakage Rate Testing Program" TS 5.5.12 to govern its Types B and C LLRT program.

The NRC staff has found that the use of NEI TR 94-01, Revision 3, is an acceptable reference for Types B and C test intervals beyond 60 months, provided the following two conditions are satisfied:

Condition 1

Section 4.0 of Enclosure, page 10 of 13, condition 1 of the NRC letter dated June 8, 2012 (Reference 17), stipulates 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 [to] 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 must be 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 [main steam isolation valves]), 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 presents three separate issues that are required to be addressed:

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

NextEra Energy Duane Arnold LAR Statement:

In LAR Section 3.4.2, "Response to Condition 1, Issue 1", on page 20 of 30 of Attachment 1 to NG-15-0234, the licensee stated:

> The post-outage report shall include the margin between the Type B and Type C minimum pathway leak rate summation value, as adjusted to include the estimate of applicable Type C leakage understatement, and its regulatory limit of 0.60 L_a.

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

NextEra Energy Duane Arnold LAR Statement:

In LAR Section 3.4.2, "Response to Condition 1, Issue 2," on page 20 of 30 of Attachment 1 to NG-15-0234, the licensee stated:

> When the potential leakage understatement adjusted Type B and C minimum pathway leak rate total is greater than the DAEC administrative 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 DAEC administrative limit. The corrective action plan shall focus on those components which have contributed the most to the increase in the leakage summation value and the manner of timely corrective action (as deemed appropriate) that best focuses on the prevention of future component leakage performance issues.

(3) Use of the allowed 9-month extension for eligible Type C valves is only authorized for non-routine emergent conditions.

NextEra Energy Duane Arnold LAR Statement:

In LAR Section 3.4.2, "Response to Condition 1, Issue 3," on page 21 of 30 of Attachment 1 to NG-15-0234, the licensee stated:

> DAEC will apply the 9 month grace period only to eligible Type C components and only for non-routine emergent conditions. Such occurrences will be documented in the record of tests.

Staff Assessment

The NRC staff has reviewed the requirements of NEI TR 94-01, Revision 3, against the licensee's statements of compliance for Condition 1. Based on this review, the staff concludes that NextEra Energy Duane Arnold acknowledges all the requirements of Condition 1 and that the licensee has established its intent to comply with these requirements.

Condition 2

Section 4.0 of Enclosure, pages 10 and 11 of 13, condition 2 of the NRC letter dated June 8, 2012 (Reference 17), stipulates that:

> The basis for acceptability of extending the ILRT interval out to once per 15 years was the enhanced and robust primary containment inspection program and the local leakage rate testing of penetrations. Most of the primary containment leakage experienced has been attributed to penetration leakage and penetrations are thought to be the most likely location of most containment leakage at any time. The containment leakage condition monitoring regime involves a portion of the penetrations being tested each RFO, nearly all LLRT's being performed during plant outages. For the purposes of assessing and monitoring or trending overall containment leakage potential, the as-found minimum pathway leakage rates for the just tested penetrations are summed with the as-left minimum pathway leakage rates for penetrations tested during the previous 1 or 2 or even 3 RFOs. Type C tests involve valves which, in the aggregate, will show increasing leakage potential due to normal wear and tear, some predictable and some not so predictable. Routine and appropriate maintenance may extend this increasing leakage potential. Allowing for longer intervals between LLRTs means that more leakage rate test results from farther back in time are summed with fewer just tested penetrations and that total used to assess the current containment leakage potential. This leads to the possibility that the LLRT totals calculated understate the actual leakage potential of the penetrations. Given the required margin included with the performance criterion and the considerable extra margin most plants consistently show with their testing, any understatement of the LLRT total using a 5-year test frequency is thought to be conservatively accounted for. Extending the LLRT intervals beyond 5 years to a 75-month interval should be similarly conservative provided an estimate is made of the potential understatement and its acceptability determined as part of the trending specified in NEI 94-01, Revision 3, Section 12.1.
>
> 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 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 extension, demonstrating that the LLRT totals calculated represent the actual leakage potential of the penetrations.

Condition 2 presents two separate issues that are required to be addressed:

(1) Extending the Type C, LLRT intervals beyond 5 years to a 75-month interval should be similarly conservative provided an estimate is made of the potential understatement and its acceptability determined as part of the trending specified in NEI TR 94-01, Revision 3, Section 12.1.

<u>NextEra Energy Duane Arnold LAR Statement</u>:

In LAR Section 3.4.2, "Response to Condition 2, Issue 1," on pages 21 and 22 of 30 of Attachment 1 to NG-15-0234, the licensee stated in part:

> The change in going from a 60 month extended test interval for Type C tested components to a 75 month interval, as authorized under NEI 94-01, Revision 3-A, represents an increase of 25 percent in the local leak rate test periodicity. As such, NextEra Energy Duane Arnold will conservatively apply a potential leakage understatement adjustment factor of 1.25 to the as-left leakage total for each Type C component currently on the 75 month extended test interval. This will result in a combined conservative Type C total for all 75 month local leak rate tests being carried forward and included following an outage). When the potential leakage understatement adjusted leak rate total for those Type C components being tested on a 75 month extended interval is summed with the non-adjusted total of those Type C components being tested at less than the 75 month interval and the total of the Type B tested components, if the minimum pathway leak rate is greater than the DAEC administrative leakage summation limit of 0.50 L_a, but less than the regulatory limit of 0.60 L_a, then an analysis and corrective action plan shall be prepared to restore the leakage summation value to less than the administrative leakage limit. The corrective action plan shall focus on those components that have contributed the most to the increase in the leakage summation value and the manner of timely corrective action (as deemed appropriate) that best focuses on the prevention of future component leakage performance issues.

From section 4.0 of Enclosure, pages 10 and 11 of 13, condition 2 of the NRC letter dated June 8, 2012 (Reference 17), the staff again notes the following:

> 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 total.

In SCVB RAI-4, the staff noted that the licensee's response to Condition 2, Issue 1 could be interpreted to mean that a component tested at 70 months would not be adjusted for the understatement adjustment factor of 1.25. The staff requested that the Licensee clarify the meaning of its response to Condition2, Issue 1.

In the response to SCVB RAI-4, provided on page 8 of Enclosure to NG-16-0029 (Reference 2), the license stated that:

> Duane Arnold will adjust the test results for any Type C component tested at a frequency of greater than 60 months by the understatement adjustment factor of 1.25.

The staff found the response to SCVB RAI-4 acceptable since the licensee acknowledged the error contained in the response to Condition 2, Issue 1 and indicated an intent to follow the guidance of NEI 94-01, Revision 3-A.

(2) 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 Types B and C 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 extension, demonstrating that the LLRT totals calculated represent the actual leakage potential of the penetrations.

NextEra Energy Duane Arnold LAR Statement:

In LAR Section 3.4.2, "Response to Condition 2, Issue 2," on page 22 of 30 of Attachment 1 to NG-15-0234, the licensee stated:

> If the potential leakage understatement adjusted leak rate minimum pathway leak rate is less than the administrative leakage summation limit of 0.50 L_a, then the acceptability of the 75-month LLRT extension for all affected Type C components has been adequately demonstrated and the calculated local leak rate total represents the actual leakage potential of the penetrations.
>
> In addition to Condition 1, Issues 1 and 2, which deal with the minimum pathway leak rate Type B and C summation margin, NEI 94-01, Revision 3-A also has a margin related requirement as contained in Section 12.1, "Report Requirements."
>
> A post-outage report shall be prepared presenting results of the previous cycle's Type B and Type C tests, and Type A, Type B and Type C tests, if performed during that outage. The technical contents of the report are generally described in ANSI/ANS-56.8-2002 and shall be available on-site for NRC review. The report shall show that the applicable performance criteria are met, and serve as a record that continuing performance is acceptable. The report shall also include the combined Type B and Type C leakage summation, and the margin between the Type B and Type C leakage rate summation and its regulatory limit. Adverse trends in the Type B and Type C leakage rate summation shall be identified in the report and a corrective action plan developed to restore the margin to an acceptable level.
>
> In the event an adverse trend in the potential leakage understatement adjusted Type B and C summation is identified, an analysis and a corrective action plan shall be prepared to restore the margin to an acceptable level thereby eliminating the adverse trend. The corrective action plan shall focus on those components that have contributed the most to the adverse trend 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.
>
> An adverse trend is defined as three consecutive increases in the final pre-reactor coolant system Mode change Type B and C minimum pathway leak rate summation value adjusted to include the estimate of applicable Type C leakage understatement, as expressed in terms of L_a.

Staff Assessment

The NRC staff has reviewed the requirements of NEI TR 94-01, Revision 3-A, and the licensee's response to SCVB RAI-4, the staff concludes that NextEra Energy Duane Arnold acknowledges Condition 2 and that the licensee has established its intent to meet those conditions.

Summary

Based on the above evaluation of each condition, the NRC staff determines that the licensee has adequately addressed both conditions in Section 4.0 of the NRC SE for TR NEI 94-01, Revision 3-A. Therefore, the staff finds it acceptable for DAEC to adopt TR NEI 94-01, Revision 3-A, as the implementation document in TS 5.5.12, "Primary Containment Leakage Rate Testing Program."

3.2.7 Summary of Deterministic Considerations – Structural and Leak-Tight Integrity of the Containment

The NRC staff reviewed the Types A, B, and C leakage test results related to the licensee's proposal to extend 10 CFR 50, Appendix J, test intervals.

The ILRT results provided in LAR, Section 3.1.1, "Type A Testing," indicate that the previous two consecutive Type A tests at DAEC were successful with containment performance leakage rates less than the maximum allowable containment leakage rate of 2.0 percent containment air weight per day (1.0 L_a at P_a) and less than the Type A test TS limit of ≤ 0.75 L_a contained in TS 5.5.12e.1. Therefore, the staff finds that the performance history of Type A tests supports extending the current ILRT interval on a permanent basis to 15 years as permitted by NEI 94-01, Revision 3-A, and the conditions and limitations of NEI 94-01, Revision 2-A.

The NRC staff reviewed the local leak rate summaries contained in LAR Attachment 1 Table "DAEC Type B and Type C Leak Rate Summation History Since 2003," and notes that the aggregate results of the "As-Found Min Path" and "As-Left Min Path" for all the recent Type B and C tests are less than the Type B and Type C test TS limit of ≤ 0.60 L_a contained in TS 5.5.12e.1. The staff reviewed the corrective actions identified in LAR Attachment 1 Section 3.1.2, "Type B and C Testing" taken for the valves that failed the most recent DAEC Type C LLRT Program tests during the RFOs of fall 2012 (RFO 23) and fall 2014 (RFO 24) and concludes that adequate corrective action for the failed valves has been performed. Therefore, the staff finds that the licensee is effectively implementing the Type B and Type C leakage rate test program, as required by 10 CFR 50, Appendix J, Option B. Accordingly, the staff finds that the performance history of Types B and C tests supports extending the current Type C test interval to 75 months as permitted by NEI 94-01, Revision 3-A.

3.3 Probabilistic Risk Assessment

3.3.1 Background

Section 9.2.3.1, "General Requirements for ILRT Interval Extensions beyond Ten Years," of NEI 94-01, Revision 2-A (Reference 6), 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 TR 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 SE, dated June 25, 2008 (Reference 9), the NRC staff found the methodology in EPRI TR-1009325, Revision 2, acceptable for referencing by licensees proposing to amend their TSs to extend the ILRT interval to 15 years, provided certain conditions are satisfied. These conditions, set forth in Section 4.2 of the SE for EPRI TR-1009325, Revision 2, stipulate that:

1. The licensee submit documentation indicating that the technical adequacy of their Probabilistic Risk Assessment (PRA) is consistent with the requirements of Regulatory Guide (RG) 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," dated March 2009 (Reference 18) 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[4] of the SE for EPRI TR-1009325, Revision 2 (Reference 19).

3. The methodology in EPRI TR-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 35 L_a.

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

3.3.2 Plant-Specific Risk Evaluation

The licensee performed a risk impact assessment for extending the Type A containment ILRT interval from 10 years to 15 years. The risk analysis for DAEC was provided in Attachment 4 of the LAR (Reference 1). Additional information was provided by the licensee in its letters dated January 29, 2016 (Reference 2), April 14, 2016 (Reference 3), and May 31, 2016 (Reference 4), in response to NRC RAIs.

In Section 1.1 of Attachment 4 to the LAR, the licensee stated that the plant-specific risk assessment for DAEC follows the guidance in

- NEI 94-01, Revision 2-A (Reference 6).

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[4] The SER 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.

- EPRI TR-104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals," dated August 1994 (Reference 20).
- NEI Interim Guidance for Performing Risk Impact Assessments In Support of One-Time Extensions for Containment Integrated Leakage Rate Test Surveillance Intervals, November 2001 (Reference 21).
- RG 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 2, March 2009 (Reference 18).
- RG 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 2, May 2011 (Reference 22).
- EPRI 1009325, Revision 2-A (Reference 23).
- Calvert Cliffs Nuclear Plant (CCNP) liner corrosion analysis described in a letter to the NRC dated March 27, 2002 (Reference 24).

The licensee addressed each of the four conditions for the use of EPRI TR-1009325, Revision 2-A, which are listed in Section 4.2 of the NRC SE. A summary of how each condition has been met is provided in the sections below.

3.3.3 Technical Adequacy of the PRA

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

In Regulatory Issue Summary 2007-06, "Regulatory Guide 1.200 Implementation," the NRC clarified that for all risk-informed applications received after December 2007, the NRC staff will use Revision 1 of RG 1.200 (Reference 18) to assess technical adequacy of the PRA used to support risk-informed applications. Revision 2 of RG 1.200 will be used for all risk-informed application received after March 2010. In Section 3.2.4.1 of the SE for EPRI TR-1009325, Revision 2, the 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/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 stated that Capability Category (CC) I of ASME PRA standard shall be applied as the standard for assessing PRA quality for ILRT extension applications, as approximate values of core damage frequency (CDF) and large early release frequency (LERF) and their distribution among release categories are sufficient to support the evaluation of changes to ILRT frequencies.

Per Attachment 5, "Documentation of Probabilistic Risk Assessment Technical Adequacy," of the LAR, the DAEC internal events PRA includes both Level 1 and Level 2 models for internal initiating events. The PRA technical adequacy for DAEC is discussed in Section 3.5.2 of the LAR and LAR Attachment 5. The licensee stated that a full-scope peer review of the internal events, at-power PRA, was conducted in December 2007 under the auspices of the Boiling Water Reactor Owners Group (BWROG), using the NEI 05-04 PRA peer review process and the ASME PRA Standard ASME RA-Sb-2005 (along with the NRC clarifications provided in RG 1.200, Revision 1). The licensee further stated that in March 2011, a focused PRA Peer Review assessed previous 2007 full scope peer review facts and observations (F&Os), including the adequacy or their dispositions. This focused Scope review was primarily performed to assess the internal events PRA model adequacy in support of the fire PRA and transition to National Fire Protection Association (NFPA) Standard 805. As stated in NRC SE for DAEC NFPA 805 submittal dated September 10, 2013 (Reference 25), a gap assessment was also performed, as given in the response to PRA RAI 65 for NFPA 805 review (Reference 26), for the supporting requirements (SRs) not within the scope of the focused scope peer review by comparing the SRs in the two standards. In response to PRA RAI-1, dated January 29, 2016 (Reference 2), the licensee clarified that the focused scope peer-review of DAEC PRA model conducted in 2011 utilized ASME RA-Sa-2009 as endorsed and clarified by RG 1.200, Revision 2. Finally, the staff notes that Section 3.4.2.1 of NRC SE for DAEC NFPA 805 submittal (Reference 25) concluded that the internal events PRA was reviewed against the applicable SRs in ASME/ANS-RA-Sa-2009 as endorsed and clarified by RG 1.200, Revision 2.

In response to PRA, RAI-1, dated January 29, 2016, the licensee identified five SRs (associated with four F&Os), IE-B3, IE-C6, HR-A1, HR-A2, and HR-C1, which were found not to meet CC I requirements of ASME/ANS Standard by the focused scope peer review, and discussed the impact of gaps associated with those SRs on application for extending the ILRT test interval. The staff reviewed the disposition of those SRs and concluded that findings associated with HR-A1 and HR-A2, which stated that requirements for review of procedures and practices to identify misalignments and miscalibrations were not followed, have no impact on this application because a systematic approach that involved review of all procedures was used but not documented. The NRC staff determined that findings associated with IE-B3, IE-C6 and HR-C1 were not resolved and their impact was not appropriately considered in estimating the risk associated with extending the ILRT test interval. In the letter dated April 14, 2016 (Reference 3), the licensee provided results of an evaluation, which estimated the impact of findings associated with those SRs on both fire and interval events models. According to licensee's estimates, the finding associated with HR-C1 increased values of fire CDF and LERF by approximately 3 percent and the combined impact from findings associated with IE-B3, IE-C6, and HR-C1 was estimated to increase internal events CDF and LERF by approximately 17 percent and 19 percent, respectively.

In Section 3.2.4.2 of the SE for NEI 94-01, Revision 2, and EPRI TR-1009325, Revision 2 (Reference 9), 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."

Section 3.5.2 of Attachment 1 to the LAR (Reference 1) stated that DAEC has Level 2 models that include both internal and external events. In Section 7.3 of Attachments 4, the licensee stated they performed an analysis of the external events contribution to risk and assessed the impact on the ILRT extension application. The licensee stated that the DAEC individual plant examination of external events (IPEEE) considered internal fires, seismic events, external flood, high winds and tornadoes, transportation and nearby facility hazards, and other plant-unique hazards.

Regarding seismic risk estimates, the licensee stated while the seismic margins assessment (SMA) methodology used for the IPEEE does not estimate seismic CDF, in 2008 the DAEC assessment of severe accident mitigation alternatives developed a seismic CDF estimate of 6.99×10^{-7} per year. The NRC staff also considered results of the NRC study published in "Results of Safety/Risk Assessment of Generic Issue 199, Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants" (Reference 27). Generic Issue (GI)-199 analysis estimated CDF of 1.7×10^{-5} for DAEC using a simple average, which is more than one order of magnitude larger than the licensee's estimate. In response to PRA RAI-2, dated January 29, 2016 (Reference 2), the licensee stated that seismic risk results from GI-199 are not reflective of the most up-to-date seismic hazard estimates, which were performed in 2013. The licensee further stated that a simplified, site-specific and conservative approach was used to provide an assessment of seismic CDF by integrating the DAEC's median capacity with the mean hazard curve for the site and resulted in an estimated seismic CDF of 5.88×10^{-6} per year. The NRC staff noted and communicated to the licensee that using the seismic CDF of 5.88×10^{-6} per year and considering the impact of unmet SRs, RG 1.174 acceptance guidelines would only be met if LERF from seismic events is assumed to be greater than approximately 65 percent of the seismic CDF value. In the letter dated May 31, 2016 (Reference 4), the licensee stated that the seismic CDF value of 6.99×10^{-7} per year provided in the original submittal and obtained through a site-specific seismic PRA (which does not use the latest hazard curves) is more realistic and that the seismic CDF of

5.71 x 10^{-6} per year estimated by integrating recent seismic hazard curves with a plant-level fragility curve is bounding. The licensee also described some conservative attributes of the site-specific seismic PRA. Finally, for comparison purposes and by integrating seismic hazards curves with a plant-level fragility curve, the licensee stated that the seismic CDF estimated using the older seismic hazard curve (which used in the site-specific seismic PRA model) was found to be higher than the seismic CDF estimated using recent seismic hazard curves. For the purpose of estimating an order of magnitude estimate for contribution of seismic events on risk of extending the ILRT intervals, the staff finds using seismic CDF values in the range of low 10^{-6} per year acceptable for this application. The impact of the updated seismic CDF estimates on the risk results used to support the application for extending the Type A test interval is discussed in Section 3.3.4 of this SE.

The licensee stated that DAEC completed a comprehensive fire PRA update in support of transition to NFPA 805. As a part of NRC's review of DAEC NFPA 805 application, the NRC performed a detailed review of the scope and quality of DAEC fire PRA model and documented the review findings in SE dated September 10, 2013 (Reference 25). For application to extend the ILRT testing to 15 years, the licensee reported fire CDF and LERF estimates from the current DAEC fire PRA quantification notebook, which includes the NFPA 805 implementation items.

In Section 7.3 of Reference 1, the licensee reported the results of IPEEE for external flooding, high winds, transportation and nearby facilities, and other plant-unique hazards. The licensee updated the LAR risk estimates for those hazards in April 14, 2016 letter (Reference 3), and stated that the revised estimates more accurately characterize the risk for DAEC. The results of IPEEE, as updated with new information, provide an order of magnitude estimate for contribution of the external events, as required for the application. Therefore, the information used to estimate the effect on total LERF due to external flooding, high winds, transportation and nearby facilities, and other plant-unique hazards is considered acceptable for this application.

In summary, the licensee has evaluated its internal events PRA against the currently endorsed ASME PRA standard (i.e., ASME/ANS RA-Sa-2009) and the currently implemented version of RG 1.200 (i.e., Revision 2), evaluated the findings developed during the peer review of its internal events PRA for applicability to the ILRT interval extension, addressed the findings or evaluated their impact, and included a quantitative assessment of the contribution of external events. The NRC staff reviewed the internal events peer review findings and agrees that the dispositioned findings have been adequately addressed for this application and the cumulative impact of all open findings from the peer reviews is considered in the ILRT interval extension application. Furthermore, the staff concludes that the impact from external events is appropriately considered by an order of magnitude estimate. Based on the above, the NRC staff concludes that the PRA used by the licensee is of sufficient technical adequacy to support the evaluation of changes to ILRT frequency. Accordingly, the first condition is met.

3.3.4 Estimated Risk Increase

The second condition 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 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. As discussed further in Section 3.2.4 of this SE, DAEC does not credit containment over-pressure. Thus, for this application, the associated risk metrics include LERF, population dose, and CCFP.

The licensee reported the results of the plant-specific risk assessment in Section 3.5.3 of Reference 1 and in later supplements (References 3 and 4). Details of the risk assessment for DAEC are provided in Attachment 4 of the LAR. The reported risk impacts are risk impact from baseline, which estimates the impact of 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 Type A ILRT frequency:

1. The increase in LERF for a change in test frequency from three tests in 10 years to one test in 15 years was reported as 8.72×10^{-8} per year for DAEC (Reference 4). This estimate includes both internal and external events (internal fires, seismic events, high winds, and external flood) and the impacts from corrosion. As discussed earlier, the reported seismic risk estimate is considerably lower than GI-199 estimates and the NRC staff was not able to determine the quality of the licensee's seismic PRA model. Nevertheless, the sensitivity analysis presented in letter dated May 31, 2016, indicated that assuming the same LERF to CDF ratio for internal events and seismic events, the increase in LERF is less than 1×10^{-7} per year with higher than reported seismic CDF estimates up to values in range of the low 10^{-6} per year, which NRC staff found to be acceptable for this application, as discussed in Section 3.3.3 of this SE. Therefore, the NRC staff considers the total change in LERF to be about 1×10^{-7} per year. This change in internal and external events risk is considered to be "very small" (i.e., less than or equal to 1×10^{-7} per year) per acceptance guidelines in RG 1.174. According to RG 1.174, an assessment of baseline LERF is not required for a "very small" change in risk.

2. The increase in population dose risk from changing Type A ILRT frequency from three in 10 years to once in 15 years is reported as 1.55×10^{-2} person-rem/year (Section 8 of LAR Attachment 4). The reported increase in total population dose is below the values provided in EPRI TR-1009325, Revision 2-A, and defined in Section 3.2.4.6 of the NRC SE for NEI 94-01, Revision 2. Thus, this increase in the total population dose for the proposed change is considered small and supportive of the proposed change.

3. The increase in CCFP due to change in test frequency from three in 10 years to once in 15 years is 0.61 percent for DAEC. This value is below the acceptance guideline of 1.5 percentage points for a small increase in CCFP in Section 3.2.4.6 of the NRC SE for NEI 94-01, Revision 2.

Based on the risk assessment results, the NRC staff concludes that, for DAEC, the increase in LERF is small and consistent with the acceptance guidelines of RG 1.174, and the increase in the total population dose and the 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. Accordingly, the second condition is met.

3.3.5 Leak Rate for the Large Pre-Existing Containment Leak Rate Case

The third condition stipulates that in order to make the methodology in EPRI TR-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.

As noted by the licensee in Section 3.5.1 of the LAR, the methodology in EPRI TR-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 DAEC plant-specific risk assessments. Accordingly, the third condition is met.

3.3.6 Applicability if Containment Over-Pressure is Credited for ECCS Performance

The fourth condition stipulates that in instances where containment over-pressure is relied upon for ECCS performance, an LAR is required to be submitted. In Section 3.5.1 of Attachment 1 to the LAR, the licensee stated that DAEC does not rely on containment overpressure for ECCS performance. Accordingly, the fourth condition is not applicable.

4.0 STAFF CONCLUSION

The NRC staff determined that the licensee's containment inspection programs support extension of the ILRT frequency as requested in the licensee's submittal of August 18, 2015, as supplemented by letters dated January 29, April 14, and May 31, 2016. The NRC staff finds that there is reasonable assurance that the structural and leak-tight integrity of the DAEC primary containment will continue to be monitored and maintained with the performance-based Type A test interval extended up to one test in 15 years, without undue risk to public health and safety. The next Type A test may, therefore, be conducted no later than March 13, 2022.

Therefore, the NRC staff concludes that the licensee's containment inspection programs support the proposed license amendment to change TS 5.5.12, to extend integrated leakage rate test frequency to 15 years for Type A on a permanent basis. The NRC staff finds that there is reasonable assurance that the licensee has addressed the 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 also finds that the licensee adequately implemented its primary containment leakage rate testing program (i.e., Types A, B, and C leakage tests), for the DAEC containment. The results of past ILRTs and recent LLRTs demonstrate acceptable performance of the DAEC containment and demonstrate that the structural and leak-tight integrity of the containment structure is being adequately maintained. The NRC staff also finds that the structural and leak-tight integrity of the DAEC containment will continue to be monitored and maintained if DAEC adopts 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. Accordingly, the NRC staff determined that there is reasonable assurance that the structural and leak-tight integrity for the DAEC 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.

The NRC staff concludes that it is acceptable for the DAEC to: (i) revise TS 5.5.12, "Primary Containment Leakage Rate Testing Program," to adopt NEI 94-01 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; (ii) extend on a permanent basis the Type A test interval up to 15 years; and (iii) extend the Type C test intervals up to 75-months.

5.0 STATE CONSULTATION

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

6.0 ENVIRONMENTAL CONSIDERATIONS

The Commission has previously issued a proposed finding that the amendment involves no significant hazards consideration and there has been no public comment on such finding (80 FR 65814). Accordingly, the amendment meets 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.

7.0 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 amendment will not be inimical to the common defense and security or to the health and safety of the public.

8.0 REFERENCES

1. NextEra Energy Duane Arnold, LLC letter (NG-15-0234) to NRC, "Duane Arnold Energy Center, Docket No. 50-331, Renewed Facility Operating License No. DPR-49, License Amendment Request (TSCR-143) to Extend Containment Leakage Test Frequency," August 18, 2015 (ADAMS Accession No. ML15246A445).

2. NextEra Energy Duane Arnold, LLC letter (NG-16-0029) to NRC, "Duane Arnold Energy Center, Docket No. 50-331, Renewed Facility Operating License No. DPR-49, Response to Request for Additional Information, License Amendment Request (TSCR-143) to

Extend Containment Leakage Test Frequency," January 29, 2016 (ADAMS Accession No. ML16034A031).

3. NextEra Energy Duane Arnold, LLC letter (NG-16-0076) to NRC, "Duane Arnold Energy Center, Docket No. 50-331, Renewed Facility Operating License No. DPR-49, Response to Request for Additional Information, License Amendment Request (TSCR-143) to Extend Containment Leakage Test Frequency," April 14, 2016 (ADAMS Accession No. ML16106A303).

4. NextEra Energy Duane Arnold, LLC letter (NG-16-0118) to NRC, "Duane Arnold Energy Center, Docket No. 50-331, Renewed Facility Operating License No. DPR-49, Supplemental Response to Request for Additional Information, License Amendment Request (TSCR-143) to Extend Containment Leakage Test Frequency," May 31, 2016 (ADAMS Accession No. ML16154A067).

5. Nuclear Energy Institute (NEI) TR NEI 94-01, Revision 3-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," July 2012 (ADAMS Accession No. ML12221A202).

6. NEI TR 94-01, Revision 2-A, "Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J," November 19, 2008 (ADAMS Accession No. ML100620847).

7. NRC RG 1.163, "Performance-Based Containment Leak-Test Program," September 1995 (ADAMS Accession No. ML003740058).

8. NEI TR 94-01, Revision 0, "Industry Guideline for Implementing Performance Based Option of 10 CFR Part 50, Appendix J," July 21, 1995 (ADAMS Accession No. ML11327A025).

9. NRC Staff Safety Evaluation, "Final Safety Evaluation for Nuclear Energy Institute Topical Report (TR) 94-01, Revision 2, 'Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J,' and Electric Power Research Institute (EPRI) Report No. 1009325, Revision 2, August 2007, 'Risk Impact Assessment Of Extended Integrated Leak Rate Testing Intervals' (TAC No. MC9663)," June 25, 2008 (ADAMS Accession No. ML081140105).

10. Letter from G. B. Kelly (NRC) to L. Liu (IES Utilities Inc.), "Amendment No. 219 to Facility Operating License No. DPR-49 -Duane Arnold Energy Center (TAC No. M94455)," October 4, 1996, (ADAMS Accession No. ML021920104).

11. Nuclear Management Company, LLC, Letter NG-02-0232 to NRC, "Technical Specification Change Request (TSCR-055): Deferral of Type A Containment Integrated Leak Rate Test (ILRT)," March 29, 2002 (ADAMS Accession No. ML020990431).

12. NRC Letter to Nuclear Management Company, LLC, "Duane Arnold Energy Center - Issuance of Amendment Re: One-Time Extension of Containment Integrated Leak-Rate

Test Interval (TAC No. MB4752)," March 21, 2003 (ADAMS Accession No. ML030700243).

13. NRC Letter to Nuclear Management Company, LLC, "Duane Arnold Energy Center – Issuance of Amendment Regarding Extended Power Uprate (TAC No. MB0543)," November 6, 2001 (ADAMS Package Accession No. ML013050389).

14. ANSI/ANS-56.8-2002, "Containment System Leakage Testing Requirements," Reaffirmed August 9, 2011.

15. ANSI/ANS-56.8-1994, "Containment System Leakage Testing Requirements," Approved August 4, 1994.

16. NEI TR 94-01, Revision 2, "'Industry Guideline for Implementing Performance-Based Option of 10 CFR Part 50, Appendix J' and Electric Power Research Institute Report No. 1009325, Revision 2, August 2007, 'Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals,'" August 31 2007 (ADAMS Accession No. ML072970206).

17. Letter from S. Bahadur (NRC) to B. Bradley (NEI), "Final Safety Evaluation of Nuclear Energy Institute (NEI) Report 94-01, Revision 3, Industry Guideline for Implementing Performance- Based Option of 10 CFR Part 50, Appendix J (TAC No. ME2164)," June 8, 2012, (ADAMS Accession No. ML121030286).

18. Regulatory Guide 1.200, "An Approach for Determining the Technical Adequacy of Probabilistic Risk Assessment Results for Risk-Informed Activities," Revision 2, March 2009 (ADAMS Accession No. ML090410014)

19. EPRI TR 1009325, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals," Revision 2, Final Report, August 2007 (ADAMS Accession No. ML072970208).

20. EPRI TR-104285, "Risk Impact Assessment of Revised Containment Leak Rate Testing Intervals," dated August 1994 (available for free at www.EPRI.com)

21. "Interim Guidance for Performing Risk Impact Assessments In Support of One-Time Extensions for Containment Integrated Leakage Rate Test Surveillance Intervals," developed for NEI by John M. Gisclon, et al., October 2001 (ADAMS Accession No. ML012990239).

22. Regulatory Guide 1.174, "An Approach for Using Probabilistic Risk Assessment in Risk-Informed Decisions on Plant-Specific Changes to the Licensing Basis," Revision 2, May 2011 (ADAMS Accession No. ML100910006).

23. EPRI 1009325, "Risk Impact Assessment of Extended Integrated Leak Rate Testing Intervals," Revision 2-A, October 2008 (available for free at www.EPRI.com).

24. Constellation Nuclear Letter to NRC, "Calvert Cliffs Nuclear Plant, Unit No. 1; Docket No. 50-317, Response to Request for Additional Information Concerning the License

Amendment Request for a One-Time Integrated Leakage Rate Test Extension," March 27, 2002 (ADAMS Accession No. ML020920100).

25. NRC letter to NextEra Energy, Duane Arnold Energy Center, "Duane Arnold Energy Center -Issuance of Amendment Regarding Transition to a Risk-Informed, Performance-Based Fire Protection Program in Accordance with 10 CFR 50.48(c) (TAC No. ME6818)," September 10, 2013 (ADAMS Accession No. ML13210A449).

26. Letter from NextEra Energy to NRC, "Response to Request for Additional Information, License Amendment Request to Adopt National Fire Protection Association Standard 805, Performance-Based Standard For Fire Protection For Light Water Reactor Generating Plants," February 12, 2013 (ADAMS Accession No. ML13046A031).

27. NRC Memo from Patrick Hiland to Brian Sheron, "Safety/Risk Assessment Results for Generic Issue 199, 'Implications of Updated Probabilistic Seismic Hazard Estimates in Central and Eastern United States on Existing Plants,'" September 2, 2010 (ADAMS Package Accession No. ML100270582).

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Date of issuance: August 30, 2016

August 30, 2016

Mr. Thomas A. Vehec
Vice President
NextEra Energy
Duane Arnold Energy Center
3277 DAEC Road
Palo, IA 52324-9785

SUBJECT: DUANE ARNOLD ENERGY CENTER - ISSUANCE OF AMENDMENT TO EXTEND CONTAINMENT LEAKAGE TEST FREQUENCY (CAC NO. MF6619)

Dear Mr. Vehec:

The U.S. Nuclear Regulatory Commission has issued the enclosed Amendment No. 296 to Renewed Facility Operating License No. DPR-49 for the Duane Arnold Energy Center. The amendment consists of changes to the technical specification (TS) in response to your application dated August 18, 2015, as supplemented by letters dated January 29, April 14, and May 31, 2016.

The amendment revises TS 5.5.12, "Primary Containment Leakage Rate Testing Program," to state that the program shall be in accordance with Nuclear Energy Institute 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."

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

Sincerely,
/RA SGoetz for/
Mahesh L. Chawla, Project Manager
Plant Licensing Branch III-1
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-331

Enclosures:
1. Amendment No. 296 to License No. DPR-49
2. Safety Evaluation

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RidsNrrDeEmcb Resource

ADAMS Accession No.: ML16210A008 ***SE provided by memorandum**

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OFFICE	DSS/STSB/BC	OGC	DORL/LPL3-1/BC	DORL/LPL3-1/PM	
NAME	AKlein	DRoth	DWrona	MChawla(SGoetz for)	
DATE	08/30/16	08/24/16	08/30/16	08/30/16	

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