

February 13, 2007

U.S. Nuclear Regulatory Commission Document Control Desk Washington, D.C. 20555

ATTN: Stephanie Coffin

SUBJECT: NuStart Bellefonte COL Project - <u>NRC Project No. 740</u> Standard Technical Report Submittal AP-TR-NS01, *Containment Leak Rate Test Program* 

In support of Combined License application pre-application activities, NuStart Energy, LLC (NuStart) is submitting Revision 0 of AP1000 Standard Combined License Technical Report Number AP-TR-NS01, *Containment Leak Rate Test Program*. This report completes and documents, on a generic basis, activities required for COL Information Item 6.2-1 in the AP1000 Design Control Document (DCD); it provides a description of the Containment Leak Rate Test (CLRT) Program for AP1000 Combined Construction and Operating License (COL) applicants. This report also identifies and justifies standard changes to Sections 6.2.5, 6.2.6, and 6.2.7 of the AP1000 DCD related to the CLRT Program. The changes identified in Technical Report AP-TR-NS01 are intended to be incorporated into FSARs referencing the AP1000 Design Certification, and may be incorporated into the design certification if 10 CFR Part 52 is revised to permit revision of the design certification.

This report is submitted as part of the NuStart Bellefonte COL Project (NRC Project Number 740). The information included in this report is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification.

The purpose for the submittal of this report is to close AP1000 COL Item 6.2-1. This COL item requires the applicant to develop a "Containment Leakage Rate Testing Program," which will identify the appropriate option to be implemented under 10 CFR 50, Appendix J. It is expected that upon completion of the NRC review of Technical Report AP-TR-NS01, the changes to the DCD identified in this topical report will be considered approved generically for COL applicants referencing the AP1000 Design Certification.

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U.S. Nuclear Regulatory Commission February 13, 2007 Page 2 of 2

If you have questions related to the content of Technical Report AP-TR-NS01, please contact Peter Hastings at (980) 373-7820.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on February 13, 2007.

Sincerely,

Manly Ckray

Marilyn C. Kray President

Enclosure: AP-TR-NS01, Revision 0, Containment Leak Rate Test Program

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Report

AP-TR-NS01 Revision 0 Date February 2007

# NuStart AP1000 Standard Combined License Technical Report

# CONTAINMENT LEAK RATE TEST PROGRAM

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# **Revision Page**

Revision	Date	Description
0	February 2007	Initial issue



# 1.0 INTRODUCTION

The purpose of this Technical Report (TR) is to provide a description of the Containment Leak Rate Test (CLRT) Program for those AP1000 Combined Construction and Operating License (COL) applicants who choose to implement the methodology described herein, and to close COL Information Item 6.2-1. Appendix A to this TR describes a CLRT Program that implements Option B (for performance-based requirements) of 10 CFR 50, Appendix J.

COL Information Item 6.2-1 in Revision 15 of the AP1000 Design Control Document (DCD, Reference 1) is found in Section 6.2.6, as follows:

# **"6.2.6 Combined License Information for Containment Leak Rate Testing**

The Combined License applicant is responsible for developing a 'Containment Leakage Rate Testing Program' which will identify which Option is to be implemented under 10 CFR 50, Appendix J. Option A defines a prescriptive-based testing approach whereas option B defines a performance-based testing program."

Pursuant to the DCD, the AP1000 reactor containment, containment penetrations, and isolation barriers are designed to permit periodic leak rate testing in accordance with General Design Criteria 52, 53, and 54. The containment leak rate test system is designed to verify that leakage from the containment remains within limits established in the AP1000 Technical Specifications, DCD Chapter 16. Leak rate testing requirements are defined by 10 CFR 50 Appendix J, "Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors," which classifies leak tests as Types A, B and C. The system design provides testing capability consistent with the testing requirements of ANSI/ANS-56.8-1994. The system design accommodates the test methods and frequencies consistent with requirements of 10 CFR 50 Appendix J, Option A (prescriptive requirements) or Option B (performance-based requirements). This TR describes an operational program implementing Option B as stated in Technical Specification Basis B3.6.1.

# 2.0 TECHNICAL BACKGROUND

# **Regulatory Bases**

10 CFR 50.54(o) requires that primary reactor containments for water cooled power reactors (except for licensees having permanently ceased operations) be subject to the requirements of 10 CFR 50 Appendix J. That appendix sets forth test requirements for preoperational and periodic verification of the leak-tight integrity of the primary reactor containment, and systems and components which penetrate containment of water-cooled power reactors, and establishes the acceptance criteria for such tests. The purposes of the tests are to assure that (a) leakage through the primary reactor containment and systems and components penetrating primary

AP-TR-NS01 Rev. 0 Page 3 of 11



containment shall not exceed allowable leakage rate values as specified in the technical specifications or associated bases and (b) periodic surveillance of reactor containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life of the containment, and systems and components penetrating primary containment.

10 CFR 50 Appendix J describes three types of tests: Types A, B, and C. "Type A" testing is intended to measure the primary reactor containment overall integrated leakage rate (1) after the containment has been completed and is ready for operation, and (2) at periodic intervals thereafter. "Type B" testing is intended to detect local leaks and to measure leakage across each pressure-containing or leakage-limiting boundary for certain penetrations, air lock and other door seals, and other components which must meet the acceptance criteria in III.B.3 of Appendix J. "Type C" testing is intended to measure containment isolation valve leakage rates. Two options are available under Appendix J: Option A contains prescriptive requirements, while Option B contains performance-based requirements.

The NRC Staff has concluded that the operational programs discussed in SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria" (Reference 3), can be fully described in a COL application. (The COL application would not call for ITAAC for an operational program if the program and its implementation are fully described<sup>1</sup> in a COL application.) The staff is proposing that each COL contain license conditions associated with the timing of implementation for these programs.

# **AP1000 Design Certification Bases**

The AP1000 DCD indicates in Section 6.2.5.1 that the system design accommodates the test methods and frequencies consistent with requirements of Option A or Option B. Subsequent sections of Chapter 6 set forth the design bases, system description, and system operation for the various test types.

Chapter 16 of the AP1000 DCD, in Section 5.5.8, prescribes administrative controls for the conduct of a CLRT program. These controls include: (a) that a program be established in accordance with 10 CFR 50, Appendix J, Option B, as modified by approved exemptions, and the guidelines contained in Regulatory Guide 1.163, "Performance-Based Containment Leak-Test Program" (September 1995) as modified by approved exceptions. Section 5.5.8 also sets

<sup>&</sup>lt;sup>1</sup> The Commission defined "fully described" in a May 14, 2004, SRM for SECY-04-0032, "Programmatic Information Needed for Approval of a Combined License Application Without Inspections, Tests, Analyses, and Acceptance Criteria." In this context, "fully described" should be understood to mean that the program is clearly and sufficiently described in terms of the scope and level of detail to allow a reasonable assurance finding of acceptability. Required programs should always be described at a functional level and at an increased level of detail where implementation choices could materially and negatively affect the program effectiveness and acceptability.



forth a number of specific acceptance criteria (e.g., peak internal pressure for design-basis loss of coolant accident, maximum allowable leak rate, etc.).

Option B will be employed for the licensees that choose to implement this TR. A program description is included as Appendix A to this TR; it identifies the specific test frequencies and test acceptance criteria for containment leakage rate tests.

#### Program Implementation

The CLRT program will be implemented prior to fuel load. This milestone will be reflected in Table 13.4-1 of Section 13.4 of the COL applications referencing this TR.

#### **Preoperational Testing**

The CLRT program for preoperational testing must be implemented prior to performing the tests. This milestone will be reflected in Table 13.4-1 of Section 13.4 of the COL applications referencing this TR.

#### Periodic Testing

The CLRT program for periodic testing must be fully implemented prior to entry into Mode 4 in accordance with Technical Specifications 3.6.1 and 3.6.2.

#### 3.0 REGULATORY IMPACT

The obligation to describe the CLRT program is contained in AP1000 DCD Section 6.2.6 (corresponding to COL Information Item 6.2-1), and Section 6.2.6 of NUREG-1793, "Final Safety Evaluation Report [FSER] Related to Certification of the AP1000 Standard Design" (Reference 2). This TR does not affect the DCD or FSER, except in providing information to close the COL Information Item.

This TR may be used as input to a revision to the DCD, or may be referenced by discrete COL applicants as a basis for the CLRT program and closure of COL Information Item 6.2-1.

There are no proposed departures from Tier 2 that would affect resolution of a severe accident issue identified in the DCD, and there are no changes that have an impact on the Severe Accident Criteria.

Information summarized in this TR will not alter barriers or alarms that control access to the protected areas of the plant. The closure of related COL Information Items will not alter requirements for security personnel. Therefore, this TR does not have an adverse impact on the security assessment of the AP1000.



#### 4.0 **REFERENCES**

- 1. APP-GW-GL-700, Revision 15, AP1000 Design Control Document.
- 2. NUREG-1793, Final Safety Evaluation Report Related to Certification of the AP1000 Standard Design, September 2004.
- SECY-05-0197, "Review of Operational Programs in a Combined License Application and Generic Emergency Planning Inspections, Tests, Analyses, and Acceptance Criteria," February 22, 2006.

#### 5.0 DCD MARKUP

The CLRT Program description revisions in Appendix A to this TR will be used as input to the COL application Final Safety Analysis Report for applicants implementing 10 CFR 50, Appendix J, Option B, unless the information in this TR is used as input to a future revision to the DCD.

In the event this TR is used as input to a future revision to the AP1000 DCD, the DCD markups provided in Appendix A identify how the AP1000 DCD will be modified.



NuStart AP-TR-NS01 REV 0

APPENDIX A

AP-TR-NS01 Rev. 0 Page 7 of 11



# Appendix A

# AP1000 Containment Leak Rate Test Program 10 CFR 50, Appendix J, Option B

# Introduction

The purpose of this Containment Leak Rate Test (CLRT) Program is to provide the information needed to describe the program for assuring that (a) leakage through the primary reactor containment and systems and components penetrating primary containment shall not exceed allowable leakage rate values as specified in the technical specifications or associated bases and (b) periodic surveillance of reactor containment penetrations and isolation valves is performed so that proper maintenance and repairs are made during the service life of the containment, and systems and components penetrating primary containment. The information below is presented in the context of the additional information needed in FSAR Section 6.2.5 for a COL application referencing the certified AP1000 design (and associated Westinghouse Technical Reports) and implementing Option B of 10 CFR 50, Appendix J.

The following DCD markup identifies how COL Application Final Safety Analysis Reports should be prepared to incorporate the subject change.

Revise Subsection 6.2.5.1 as follows:

# 6.2.5.1 Design Basis

Leak rate testing requirements are defined by 10 CFR 50 Appendix J, "Primary Reactor Containment Leakage Testing for Water Cooled Power Reactors," (Reference 14) which classifies leak tests as Types A, B and C. The system design provides testing capability consistent with the testing requirements of ANSI-56.8 (Reference 13). The system design accommodates the test methods and frequencies consistent with requirements of 10 CFR 50 Appendix J, Option A or Option B. <u>The Containment Leak Rate Test Program using Option B is established in accordance with NEI 94-01, Revision 0, as modified and endorsed by the NRC in RG 1.163 (Reference 201).</u>

Revise Subsection 6.2.5.2.2 as follows:

# 6.2.5.2.2 System Operation

#### Scheduling and Reporting of Periodic Tests

Replace this section in its entirety with the following:

Schedules for the performance of periodic Type A, B, and C leak rate tests are in accordance with NEI 94-01 as endorsed and modified by Regulatory Guide 1.163 and are described below:



#### Type A Tests

A preoperational Type A test is conducted prior to initial reactor operation. If initial reactor operation is delayed longer than 36 months after completion of the preoperational Type A test, a second preoperational Type A test shall be performed prior to initial reactor operations. The first periodic Type A test is performed within 48 months after the successful completion of the last preoperational Type A test. Periodic Type A tests are performed at a frequency of at least once per 48 months, until acceptable performance is established. The interval for testing begins at initial reactor operation. Each test interval begins upon completion of a Type A test and ends at the start of the next test.

Type A testing shall be performed during a period of reactor shutdown at a frequency of at least once per 10 years based on acceptable performance history. Acceptable performance history is defined as successful completion of two consecutive Type A tests where the calculated performance leakage rate was less than 1.0 La. A preoperational Type A test may be used as one of the two Type A tests that must be successfully completed to extend the test interval, provided that an engineering analysis is performed to document why a preoperational Type A tests can be treated as a periodic test. Elapsed time between the first and last tests in a series of consecutive satisfactory tests used to determine performance shall be at least 24 months.

#### Type B Tests (Except Containment Airlocks)

Type B tests are performed prior to initial reactor operation. Subsequent periodic Type B tests are performed at a frequency of at least once per 30 months, until acceptable performance is established. The test intervals for Type B penetrations may be increased based upon completion of two consecutive periodic as-found Type B tests where results of each test are within allowable administrative limits. Elapsed time between the first and last tests in a series of consecutive satisfactory tests used to determine performance shall be 24 months or the nominal test interval (e.g., refueling cycle) for the component prior to implementing Option B to Appendix J. An extended test interval for Type B tests may be increased to a specific value in a range of frequencies from greater than once per 30 months up to a maximum of once per 120 months. The specific test interval for Type B penetrations should be determined in accordance with NEI 94-01.

# Type B Tests (Containment Airlocks)

Containment airlock(s) are tested at an internal pressure of not less than Pac (Pac= Pa; Pa will be used) prior to a preoperational Type A test. Subsequent periodic tests are performed at a frequency of at least once per 30 months. In addition, equalizing valves, door seals, and penetrations with resilient seals (i.e., shaft seals, electrical penetrations, view port seals and other similar penetrations) that are testable, are tested at a frequency of once per 30 months.



For periods of multiple containment entries where the airlock doors are routinely used for access more frequently than once every 7 days (e.g., shift or daily inspection tours of the containment), door seals may be tested once per 30 days during this time period.

<u>Airlock door seals are tested prior to a preoperational Type A test. When containment integrity is required, airlock door seals are tested within 7 days after each containment access.</u>

# Type C Tests

Type C tests are performed prior to initial reactor operation. Subsequent periodic Type C tests are performed at a frequency of at least once per 30 months, until adequate performance has been established. Test intervals for Type C valves may be increased based upon completion of two consecutive periodic as-found Type C tests where the result of each test is within allowable administrative limits. Elapsed time between the first and last tests in a series of consecutive passing tests used to determine performance shall be 24 months or the nominal test interval (e.g., refueling cycle) for the valve prior to implementing Option B to Appendix J. Intervals for Type C testing may be increased to a specific value in a range of frequencies from 30 months up to a maximum of 60 months. Test intervals for Type C valves should be determined in accordance with NEI 94-01.

# Acceptance Criteria

Acceptance criteria for Type A, B & C Tests are established in Technical Specification 5.5.8.

# Reporting

A post-outage report is 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 report is available on-site for NRC review. The report shows that the applicable performance criteria are met, and serves as a record that continuing performance is acceptable.

Revise Subsection 6.2.6 as follows:

# 6.2.6 Combined License Information for Containment Leak Rate Testing

The Combined License applicant is responsible for developing a "Containment Leakage Rate Testing Program" which will identify which option is to be implemented under 10 CFR 50, Appendix J. Option A defines a prescriptive-based testing approach whereas Option B defines a performance-based testing program.



**Completed.** The Containment Leak Rate Test Program using Option B is established in accordance with NEI 94-01 Revision 0 as modified and endorsed by the NRC in Regulatory Guide 1.163.

Revise Subsection 6.2.7 by including the following reference:

#### 6.2.7 References

201. Regulatory Guide 1.163, Performance-Based Containment Leak-Test Program, September 1995.