
RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

APR1400 Design Certification

Korea Electric Power Corporation / Korea Hydro & Nuclear Power Co., LTD

Docket No. 52-046

RAI No.: 306-8240
SRP Section: 06.02.06 - Containment Leakage Testing
Application Section: 6.2.6
Date of RAI Issue: 11/16/2015

Question No. 06.02.06-3

10 CFR Part 50, Appendix J, requires preoperational and periodic containment leakage rate testing in accordance with the prescriptive requirements in Option A or the performance-based requirements in Option B. DCD Tier 2, Section 6.2.6, specifies the use of Option B for Type A, B, and C containment leakage rate testing. Regulatory Guide (RG) 1.163, "Performance-Based Containment Leak-Test Program," endorses NEI 94-01, Revision 0 for an acceptable method for complying with Option B. DCD Tier 2, Section 6.2.8 "Combined License Information", COL 6.2(1) states that the COL applicant is to identify the implementation milestone for the containment integrated leakage rate test (CILRT) program. Also, in DCD Tier 2, Chapter 1, Table 1.9-7, item II.H "Containment Leak Rate Testing", it states that the maximum interval between Type C leakage rate tests, which is stated in the policy, is not addressed in the APR1400 DCD Tier 2. This policy is closely related to plant operation, so the maximum Type C test interval will be considered in the course of developing operator's containment leak rate testing program.

Please clarify what aspects of the containment leak rate testing program are to be certified as part of the design certification of the APR1400 and what are to be left for the COL Applicant (COLA). Proposed COL item 6.2(1) states that essentially the entire program is the responsibility of the COLA. However, DCD Tier 2, Table 1.9-1 states that the APR1400 conforms with RG 1.163 (thus, by reference, to NEI 94-01 and ANSI/ANS 56.8) and DCD Tier 2, Chapter 16 Technical Specifications (TS) Sections 3.6.1 and 5.5.16 describe a CILRT program. Further, there seem to be implied exceptions to RG 1.163 (e.g. not Type C testing all containment isolation valves (CIVs); insufficient test, vent and drain valves to properly test the CIVs; and not committing to the version of ANS referenced in RG 1.163). If there are exceptions to the standards and regulatory guidance, please specifically identify them in the DCD.

Response

DCD Tier 2, Section 6.2.6 states that the reactor containment, containment penetrations, and containment isolation barriers are designed to permit periodic leakage rate testing, and that the

containment integrated leakage rate testing (CILRT) program of the APR1400 conforms with the requirements of 10 CFR Part 50, Appendix J, Option B and follows the guidance of Regulatory Guide (RG) 1.163. The section also states that program tests are performed in accordance with NEI 94-01 and ANSI/ANS 56.8. Sub-sections 6.2.6.1 through 6.2.6.3 describe the Type A, B, and C testing which is to be performed, respectively. Sub-section 6.2.6.4 describes the scheduling and reporting of the periodic tests, and Sub-section 6.2.6.5 describes special testing requirements.

The aforementioned information is provided in DCD Tier 2 in order to describe, at a high level, the CILT program which must be developed by the combined license (COL) applicant who selects the APR1400 standard design. DCD Tier 2, Section 13.4, "Operational Program Implementation," COL 13.4(1) requires the development of the CILT program by stating, "The COL applicant is to develop operational programs and provide schedules for implementation of the programs, as defined in SECY-05-0197 (Reference 1). The COL applicant is to provide commitments for the implementation of operational programs that are required by regulation. In some instances, the programs may be implemented in phases, where practical, and the applicant is to include the phased implementation milestones." COL 6.2(1) will be deleted in order to avoid redundancy with COL 13.4(1) and provide clarity with regard to the COL's responsibility in developing the CILRT program.

DCD Tier 2, Chapter 16, "Technical Specifications" (TS), Sections 3.6.1, Surveillance Requirement (SR) 3.6.1.1 requires that visual examination and leakage rate testing be performed in accordance with the CILRT program. TS Section 5.5.16 describes the CILRT program to which SR 3.6.1 refers, and has been modified in response to RAI 306-8240, Question 06.02.06-4 to clarify that there are no deviations or exemptions from 10 CFR, Appendix J or RG 1.163. As required by COL 13.4(1), the program is to be developed by the COL applicant.

DCD Tier 2, Chapter 1, Table 1.9-7, item II.H "Containment Leak Rate Testing," is to be revised to refer to Sections 6.2.6 and TS Section 5.5.16, and to indicate that containment leak rate testing is to be performed in accordance with RG 1.163. Please refer to the attachment associated with this response.

Impact on DCD

DCD Tier 2, Table 1.8-2, Table 1.9-7, Sub-section 6.2.6.1, and Section 6.2.8 will be revised, as indicated in the attachment associated with this response.

Impact on PRA

There is no impact on the PRA.

Impact on Technical Specifications

There is no impact on the Technical Specifications.

Impact on Technical/Topical/Environmental Reports

There is no impact on any Technical, Topical, or Environmental Report.

APR1400 DCD TIER 2

Table 1.8-2 (9 of 29)

Item No.	Description
COL 6.1(1)	The COL applicant is to identify the implementation milestones for the coatings program.
COL 6.2(1)	The COL applicant is to identify the implementation milestone for the CILRT program.
COL 6.3(1)	The COL applicant is to prepare operational procedures and maintenance programs as related to leak detection and contamination control.
COL 6.3(2)	The COL applicant is to maintain complete documentation of system design, construction, design modifications, field changes, and operations.
COL 6.4(1)	The COL applicant is to provide automatic and manual operating procedures for the control room HVAC system, which are required in the event of a postulated toxic gas release.
COL 6.4(2)	The COL applicant is to provide the details of specific toxic chemicals of mobile and stationary sources and evaluate the MCR habitability based on the recommendations in NRC RG 1.78 to meet the requirements of TMI Action Plan Item III.D.3.4 and GDC 19.
COL 6.4(3)	The COL applicant is to identify and develop toxic gas detection requirements to protect the operators and provide reasonable assurance of the MCR habitability. The number, locations, sensitivity, range, type, and design of the toxic gas detectors are to be developed by the COL applicant.
COL 6.5(1)	The COL applicant is to provide the operational procedures and maintenance program as related to leak detection and contamination control.
COL 6.5(2)	The COL applicant is to maintain the complete documentation of system design, construction, design modifications, field changes, and operations.
COL 6.6(1)	The COL applicant is to identify the implementation milestones for ASME Section XI inservice inspection program for ASME Code Section III Class 2 and 3 components.
COL 6.6(2)	The COL applicant is to identify the implementation milestone for the augmented inservice inspection program.
COL 6.8(1)	The COL applicant is to provide the operational procedures and maintenance program for leak detection and contamination control.
COL 6.8(2)	The COL applicant is to provide the preparation of cleanliness, housekeeping, and foreign materials exclusion program.
COL 6.8(3)	The COL applicant is to maintain the complete documentation of system design, construction, design modifications, field changes, and operations.
COL 6.8(4)	The COL applicant is responsible for the establishment and implementation of the Maintenance Rule program in accordance with 10 CFR 50.65.
COL 7.5(1)	The COL applicant is to provide a description of the site-specific AMI variables such as wind speed, and atmosphere stability temperature difference.
COL 7.5(2)	The COL applicant is to provide a description of the site-specific EOF.

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Table 1.9-7 (4 of 5)

Item No.	Title	Discussion
II.H	Containment Leak Rate Testing	<p>The maximum interval between Type C leakage rate tests, which is stated in the policy, is not addressed in the APR1400 DCD Tier 2. This policy is closely related to plant operation, so the maximum Type C test interval will be considered in the course of developing plant operator's containment leak rate testing program.</p>
II.I	Post-Accident Sampling System	Conformance is described in Subsection 9.3.2.
II.J	Level of Detail	The APR1400 has the level of detail of information required to acquire design certification.
II.K	Prototyping	Not applicable (information only)
II.L	ITAAC	Development guidance for ITAAC is addressed in Section 14.3 and ITAAC for each system is described in Tier 1 of this DCD.
II.M	Reliability Assurance Program	The APR1400 reliability assurance program, addressing the requirements appropriate for design certification is presented in the DCD Tier 2, Section 17.4.
II.N	Site-Specific Probabilistic Risk Assessments and Analysis of External Events	Addressed for the APR1400 in DCD Tier 2, Section 19.1. PRA covers seismic events, internal fire events, and internal flooding events as well as internal events. The COL applicant is to perform site-specific PRA evaluations to address any site-specific hazards.
II.O	Severe Accident Mitigation Design Alternatives	Addressed for the APR1400 in DCD Tier 2, Subsection 19.2.6.
II.P	Generic Rulemaking Related to Design Certification	Not applicable (information only)

Not applicable. Containment Leakage Rate Testing conforms to NRC RG 1.163 (refer to Subsection 6.2.6 and TS 5.5.16).

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During the test, ventilation inside the containment is operated as necessary to enhance an even air temperature distribution. The test data are processed at periodic intervals during the test to determine test status and leak-tight confidence level. If it appears that the leakage is excessive, the pressure plateau is either maintained on the test or aborted to perform repairs. After a prescribed period, a precisely measured leak-rate is imposed on containment. The known leakage is compared to the leakage data obtained before imposition of the leak rate. The correlation between the two leakages establishes the validity of the containment leakage rate. Containment is then slowly depressurized. Formulas used in computing the integrated leakage rate are based on the formulas in NEI 94-01 and ANSI/ANS 56.8, "Containment System Leakage Testing Requirement."

If the CILRT fails to meet acceptance criteria, the reasons for failure are identified and the test schedule for subsequent tests is adjusted in accordance with CFR 50, Appendix J, Option B, and the guidance of NRC RG 1.163.

The test methods that are used for preoperational and periodic Type A tests are the same except for possible minor differences in the post-operational system alignments.

The operator can perform a periodic check for gross leakage of containment atmosphere during normal operation.

~~The combined license (COL) applicant is to identify the implementation milestone for the CILRT program (COL 6.2(1)).~~

6.2.6.2 Containment Penetration Leakage Rate Test (Type B)

Type B leakage rate tests are performed in accordance with NEI 94-01 and ANSI/ANS-56.8. The test pressure, test frequencies, and acceptance criteria are specified. Leakage rates are determined by pressure loss or makeup flow methods.

The following containment penetrations are tested with a Type B test:

- a. Personnel airlocks
- b. Equipment hatch

APR1400 DCD TIER 2~~6.2.8 Combined License Information~~

~~COL 6.2(1) The COL applicant is to identify the implementation milestone for the CILRT program.~~

6.2.9 References

1. APR1400-E-N-NR-14001-P (Proprietary) & NP (Non-Proprietary), "Design Features to Address GSI-191," Rev. 0, KHNP, December 2014.
2. GOTHIC Thermal Hydraulic Analysis Package User Manual, Version 8.0(QA), NAI 8907-02, Rev. 20, Numerical Applications, Inc., January 2012.
3. APR1400-Z-A-NR-14007-P (Proprietary) & (Non-Proprietary), "LOCA Mass and Energy Release Methodology," Rev. 0, KHNP, November 2014.
4. Final Safety Evaluation For FRAMATOME ANP Topical Report BAW-10252(P), "Analysis of Containment Response to Postulated Pipe Ruptures Using GOTHIC" (TAC NO. MC3783), Rev. 0, August 31, 2005.
5. APR1400-F-A-NR-14002-P (Proprietary) & NP (Non-Proprietary), "The Effect of Thermal Conductivity Degradation on APR 1400 Design and Safety Analyses," Rev. 0, KHNP, September 2014.
6. COMPARE-MOD1A Code Addendum, NUREG/CR-1185, Scientific Los Alamos Laboratory, June 1980.
7. J. Moody, "Maximum Two-Phase Vessel Blowdown from Pipes," Journal of Heat Transfer, Volume 88, August 1966.
8. H.K. Fauske, "Contribution to the Theory of Two-Phase, One-Component Critical Flow," ANL-6633, Argonne National Laboratory, Argonne, Illinois, 1962.
9. CENPD-133P (Proprietary), "CEFLASH-4A, A FORTRAN-IV Digital Computer Program for Reactor Blowdown Analysis," Combustion Engineering, Inc., August 1974.