

## APR 1400 DCD Chapter 11, "Radioactive Waste Management" Audit

### NRC Audit Team:

Stephen E. Williams (NRO, Technical Reviewer, Audit Lead)  
Zachary Gran (NRO, Technical Reviewer)  
John Vera (NRO, Project Manager)

### 1.0 SUMMARY

The Nuclear Regulatory Commission (NRC) staff conducted an audit of the Chapter 11, "Radioactive Waste Management," of the Korea Hydro & Nuclear Power Co., Ltd., (KHNP) Advanced Power Reactor (APR) 1400 Design Certification Application design control document (DCD). The audit was conducted at the Westinghouse Electric Co. facilities in Rockville, Maryland, and at the NRC Headquarters in Rockville, Maryland, from March 15, 2016, through May 31, 2016. The staff conducted the audit in accordance with the NRC's Office of New Reactors (NRO) Office Instruction NRO-REG-108. The audit plan, dated March 17, 2016, is available in the NRC Agencywide Document Access and Management System (ADAMS), under Accession Number ML16068A009.

### 2.0 BASIS

This audit was conducted in order for the staff to gain an understanding of the APR1400 supporting calculations and analysis to reach a reasonable assurance finding, and review related documentation and non-docketed information to evaluate conformance with the Standard Review Plan and other related guidance. The topics centered, as outlined in the audit plan, on the subjects of:

- 1) Request for additional information (RAI) 8144, Question 11.02-1; issued August 10, 2015 (ML15223B371), and KHNP's response dated January 18, 2016 (ML16008A153).
- 2) RAI 8143, Question 11.03-3; issued August 25, 2015 (ML15237A478), and KHNP's response dated December 14, 2015 (ML15348A337).
- 3) RAI 8087, Question 11.05-1; issued August 7, 2015 (ML15219A713), and KHNP's response dated December 8, 2015 (ML15342A499).
- 4) RAI 8088, Question 11.05-2; issued August 7, 2015 (ML15227A012), and KHNP's response letter dated February 3, 2016 (ML16034A350).
- 5) RAI 8203, Question 11.05-3; issued September 23, 2015 (ML15295A514), and KHNP's response letter dated December 8, 2015 (ML15342A505).

This regulatory audit is based on the following:

- 10 CFR Part 20
- 10 CFR 50, Appendix I
- Generic Design Criteria (GDC) 64

- NUREG-0800 - Chapter 11, Branch Technical Position (BTP) 11-5
- NUREG-0800 - Chapter 11, BTP 11-6

### 3.0 OBSERVATIONS AND RESULTS

#### 1. RAI 8144, Question 11.02-1

- a. After evaluating the applicant's RAI response in accordance with BTP 11-6, the staff did not understand how the applicant determined which tank had a conservative concentration and volume based on the available yard tanks. From the information provided in Table 1 of the RAI response, the staff identified the BAST as the tank with the actual highest effluent concentration comparing the three outside tanks. In addition, the staff reviewed the proposed DCD table inserts and determined that the applicants table continued to use a dilution factor of 2,762 for their analysis instead of the stated value of 3,564 modified factor to account for 80 percent tank volumes.
  - i. As an outcome of the audit discussions, the applicant recognized that the BAST was the limiting tank.
  - ii. The applicant provided updated source term calculations to verify the concentration of the BAST inventory and other CVCS yard tanks. The staff verified the adequacy of the calculations.
  - iii. The applicant provided the DAMSAM and Shield APR Codes to confirm the source term information provided for the CVCS yard tanks. The staff confirmed the adequacy of the codes for the calculations.
  - iv. The applicant committed to revise the response to RAI 8144, Question 11.02-1 to update it in light of the information discussed during the audit.

#### 2. RAI 8143, Question 11.03-3

- a. The applicant's response to RAI 8144, Question 11.03-3, did not completely address SRP 11.3, BTP 11-5, and the staff's concerns. The response to this RAI did not provide sufficient information to confirm the information provided by the applicant. The staff was unable to reproduce any of the release rates provided by the applicant.
  - i. During the audit the staff reviewed the RADTRAD input and output files for the release rate calculations. The staff's confirmatory calculations confirmed the results generated by the RADTRAD output files.
  - ii. As an outcome of the audit discussions the applicant committed to provide a revised response to Question 11.03-3. The updated response will include DCD text to enhance the description of the calculation performed for BTP 11-5. In addition, the applicant also will add DCD

tables to describe release rates for the normal and accident condition releases.

3. RAI 8087, Question 11.05-1 and RAI 8088, Question 11.05-2, for the Gaseous and Liquid process and effluent radiation monitoring and sampling systems
  - a. Regarding the response to RAI 8087, Question 11.03-3, the main concern was that there was no associated DCD text to describe the monitors in any significant detail.
    - i. The staff discussed the applicant's initial response to Question 11.05-1 and Question 11.05-2.
    - ii. The applicant presented draft information addressing the staff's concerns. The staff's main concern was that insufficient detail was provided on the description for the Liquid and Gaseous monitors. The staff audited the information provided by the applicant.
    - iii. The applicant committed to providing revised responses to Question 11.05-1 and Question 11.05-2 considering the discussions held during the audit.
4. RAI 8203, Question 11.05-3 SG Tube Integrity
  - a. The staff needed to audit calculations to understand the required instrumentation in place to monitor releases from the main steam atmospheric dump valves (MSADVs) for a Steam Generator Tube Rupture (SGTR).
    - i. In review of Appendix 11 B, the staff had questions on the calculations used to confirm compliance with monitoring steam generator leakage rates. The staff did not fully understand the parameters based on the descriptions provided in Appendix 11B.
    - ii. The staff discussed the applicant's initial response to Question 11.05-3.
    - iii. The applicant explained the parameters at the audit. As a result of the audit discussion, the applicant committed to providing updated DCD text to fully describe the parameters discussed during the audit and to provide the details needed for the staff to perform a confirmatory calculation. The applicant also committed to providing an updated response on monitoring releases from the MSADV during a SGTR and on the Main Steam Line Monitors in the revised responses to Question 11.05-1 and Question 11.05-2.

#### 4.0 CONCLUSION

The summary of observations, as indicated above, was communicated to KHNP during the audit and reiterated at the exit briefing. The staff verified the adequacy of codes and calculations associated with radioactive waste management. The audit did not identify a need for additional questions to supplement NRC RAIs. The issues discussed in the audit will be tracked through the associated existing RAIs outlined previously.