Request for Additional Information No. 105 (1243, 1378, 1246, 1379, 1380), Revision 0

11/05/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 11.01 - Source Terms
SRP Section: 11.02 - Liquid Waste Management System
SRP Section: 11.03 - Gaseous Waste Management System
SRP Section: 11.04 - Solid Waste Management System
Application Section: FSAR Ch 11

QUESTIONS for Health Physics Branch (CHPB)
QUESTIONS for Balance of Plant Branch 2 (ESBWR/ABWR) (SBPB)

11.01-4

Section 11.1 of the Tier 2 FSAR states in part:

"The design basis source term is obtained by applying conservative assumptions . . . The realistic source term represents the expected average concentrations of radionuclides in the primary and secondary coolant under normal operating conditions. . . ."

NUREG 0800, "Standard Review Plan," Section 2.4.13 states in part:

"The staff provides, to the organization responsible for review of the effectiveness of radwaste systems and to the organization responsible for review of radiation protection, the locations, dilutions, and travel times corresponding to the bounding set of plausible surface and subsurface pathways for radionuclides in the accident scenarios leading to the most adverse contamination. . . . The staff should, in consultation with the organization responsible for review of solid waste and liquid and gaseous effluents, choose the accident scenarios leading to the most adverse contamination of the groundwater or the surface water."

Regulatory Guide 1.183, "Alternative Radiological Source Terms for Evaluating Design Basis Accidents at Nuclear Power Reactors," (July 2000), lists technetium (under "noble metals") as a nuclide which should be considered.

Tc-99 is produced in the reactor core in quantities significantly greater than I-129. This may become an important contributor to dose from groundwater due to the long half life and low retardation in soil by comparison with some of the nuclides already identified in the source term. Pursuant to SRP sections 2.4.13, 11.1, 11.2, and Branch Technical Position (BTP) 11-6, please identify the Tc-99 concentrations in the primary and secondary coolant under design basis and realistic conditions. Please include these concentrations and the associated technical basis in FSAR Section 11.1, or justify their exclusion, and of any other source term nuclides that behave similarly with respect to half-life and interaction with soil.

11.02-1

10 CFR 50.34a requires sufficient design information to demonstrate that design objectives for equipment necessary to control releases of radioactive effluents to the environment are met. SRP 11.2 provides guidance related to provisions for standby equipment, alternate processing routes, and/or interconnections to meet anticipated demands imposed by major processing equipment downtime or waste volume surges resulting from anticipated operational occurrences. FSAR Tier 2 Table 11.2-2 (Liquid Waste Management System Component Data; Sheet 2 of 7) states that there is only one Concentrate Pump and one Sludge Pump. The FSAR also states that the LWMS has storage capacity for approximately one week of expected waste and that processing times are such that one week of waste can be processed in less than half of a week. However, any sustained down-time on non-redundant components could have a severe impact on system capacity. Provide information related to system capability with equipment downtime or failure with only one pump in each system.

11.02-2

10 CFR 52 indicates that significant plant parameters should be included in Tier 1. FSAR Tier 2 Chapter 14, Table 14.3-8, "ITAAC Screening Summary," (sheet 5 of 7) states that the LWMS is within the scope of Tier 1; however, FSAR Tier 1 Section 2.9.1 states that there are no Tier 1 entries for the liquid waste management system (LWMS).

The LWMS is relied upon to maintain concentrations of radioactive wastes released to the environment below the limits of 10 CFR Part 20 Appendix B (Column 1 to Table 2) and Appendix I. The ability to maintain concentrations below the 10 CFR Part 20 limitations depends upon the basic LWMS process, including the number and sizing of storage tanks, processing equipment, and dilution of release streams.

In view of the above, appropriate Tier 1 entries should be proposed by the applicant for the liquid waste management system (LWMS). The Tier 1 items should include appropriate ITAAC entries for the LWMS to confirm functional arrangements of the system, quality group and seismic classifications, and controls for the release of radioactive materials. Where key system components are not included in Tier 1, appropriate justifications for exclusion should be provided.

11.02-3

RG 1.143 Regulatory Position 1.2.1 specifies that all tanks should have provisions to monitor tank levels. Designated high liquid level conditions should actuate alarms both locally and in the control room. This information was not found in Section 11.2 of the application. Verify in FSAR Section 11.2 that all tanks have the proper Instrumentation based on the guidance in RG 1.143.

11.03-1

Pursuant to 10 CFR 50, Appendix A, "General Design Criteria for Nuclear Power Plants," criterion 60, "sufficient holdup capacity shall be provided for retention of gaseous . . . effluents containing radioactive materials . . ."

These effluents include noble gases such as krypton and xenon. Final Safety Analysis Report (FSAR) Tier 2, Section 11.3.2.3.9, “Delay Beds,” states in part

“The holdup time for xenon is 27.7 days and the holdup time for krypton is 40 hours.”

However, the level of detail in FSAR Tier 2 Section 11.1, “Source Term,” and in Section 11.3, “Gaseous Waste Management Systems,” (GWMS) was not sufficient for an independent calculation of the holdup times in support of SRP Section 11.3, which specifies evaluation of “Equipment and ventilation system design capacities, expected flows, source terms and radionuclide concentrations, expected decontamination factors or removal efficiencies for radionuclides, and holdup or decay time.”

FSAR Tier 2 Table 11.3-1 contains details of normal operational parameters of the GWMS, but without the input data as to wastes to be processed, the information is not sufficient for staff review. While the staff acknowledges that currently-used computer codes as used by the applicant and approved by NRC are under review at this time, it has also been observed that some of the values contained in FSAR Tier 2 Table 11.3-4, “Gaseous Release (Ci/yr) Calculated by GALE Code,” do not appear to be fully consistent with a comparative calculation of the EPR thermal power capacity stated in FSAR Tier 1 Chapter 1, FSAR Tier 2 Section 11.1 “Source Terms,” and that used in the original GALE code default parameters.

As such, the staff was unable to determine whether effluents will be within release limits and consistent with ALARA principles under 10 CFR 50, Appendix I, without this information. Please provide sufficient details on expected production of fission product gases to be processed by the gaseous waste management system and on the methods used to hold up or otherwise process gaseous wastes, so as to allow independent verification of the adequacy of the systems under normal operational conditions, including anticipated operational occurrences. Please include sufficient information for comparison with NUREG 0017, Rev 1, "Calculation of Releases of Radioactive Material in Gaseous and Liquid Effluents from Pressurized Water Reactors," including comparative values of capacity factor, thermal power, and any variations from the default values used therein.

11.03-2

SRP Section 11.3, Acceptance Criteria 3 states “The design should include precautions to stop continuous leakage paths…during normal operation and anticipated operation occurrences.” The FSAR describes several design provisions of the GWMS to reduce or minimize explosive mixtures. However, the FSAR does not describe any provisions for isolation of continuous gaseous leakage paths. Justify in the FSAR that such provisions are included in the design of the GWMS.

11.03-3

10 CFR 52, “Licenses, Certifications, and Approvals for Nuclear Power Plants,” indicates that significant plant parameters should be included in Tier 1. FSAR Tier 2 Chapter 14, Table 14.3-8, “ITAAC Screening Summary,” (sheet 5 of 7) states that the GWMS is within the Scope of Tier 1; however, FSAR Tier 1 Section 2.9.3 states that there are no Tier 1 entries for the gaseous waste management system (GWMS).

The GWMS is relied upon to maintain releases of gaseous waste radioactive concentrations below the limits of 10 CFR Part 20 Appendix B (Column 1 to Table 2) and Appendix I. The ability to maintain concentrations below the 10 CFR Part 20 limitations depends upon the basic GWMS process, including the design of the delay beds (three pressure vessels connected in series) that provide sufficient hold-up times for decay of noble gases such as krypton and xenon. Furthermore, certain system design features, such as nitrogen purges and upstream and downstream gas analyzers, are critical to prevention of flammable or explosive mixtures of gases.

In view of the above, appropriate Tier 1 entries should be proposed by the applicant for the GWMS. The Tier 1 items should include appropriate ITAAC entries for the GWMS to confirm functional arrangements of the system, quality group and seismic classifications, and controls for the release of radioactive materials. Where key system components (such as the number and connection of delay beds) are not included in Tier 1, appropriate justifications for exclusion should be provided.

11.04-1

10 CFR 50.34a requires the applicant for design approval to submit a description of the equipment for the control of gaseous and liquid effluents and for the maintenance and use of equipment installed in radioactive waste systems. Although general descriptions of the components were provided, the adequacy of the design could not be evaluated because no system P&ID was provided. Provide a system P&ID or additional detail in figure 11.4-1, “Solid Waste Management Flow Diagram,” for the SWMS in the FSAR.

11.04-2

10 CFR 50.34a requires the applicant for design approval to submit a description of the equipment for the control of gaseous and liquid effluents and for the maintenance and use of equipment installed in radioactive waste systems. Although general descriptions of the components were provided, the adequacy of the design could not be evaluated because no equipment design parameters were provided. Additionally compliance to RG 1.143 has specific design standards and material requirements. Provide in the FSAR general equipment design parameters such as pump capacity, crane capacity, and tank volume as well as design and material standards for the SWMS components.

11.04-3

10 CFR 52 indicates that significant plant parameters should be included in Tier 1. FSAR Tier 2 Chapter 14, Table 14.3-8, “ITAAC Screening Summary,” (sheet 5 of 7) states that solid waste processing is within the Scope of Tier 1; however, FSAR Tier 1 Section 2.9.2 states that there are no Tier 1 entries for the solid waste management system (SWMS).

The SWMS is relied upon to maintain releases of radioactive effluents below the limits of 10 CFR Part 20 Appendix B and Appendix I. The ability to maintain concentrations below the 10 CFR Part 20 limitations depends upon the basic SWMS process, including the design of the radioactive concentrates processing system which treats evaporator concentrates generated in the liquid waste processing and storage system, as well as spent resins generated in the coolant purification system.

In view of the above, appropriate Tier 1 entries should be proposed by the applicant for the SWMS. The Tier 1 items should include appropriate ITAAC entries for the SWMS to

confirm functional arrangements of the system, quality group and seismic classifications, and controls for the release of radioactive materials. Where key system components are not included in Tier 1, appropriate justifications for exclusion should be provided.

11.04-4

GDC 63 requires that radioactive waste systems be able to detect conditions that may result in excessive radiation levels in waste storage locations and to initiate appropriate safety actions. In FSAR Tier 2 Section 11.4.1.2.4 stated area radiation monitors throughout the RWPB detect excessive radiation levels and alert the operators to this condition. FSAR Tier 2 Table 12.3-4 lists the airborne radiation detectors, however, Table 12.3-3 does not list any area radiation monitors for the RWPB. The applicant is requested to incorporate the area radiation monitors for the RWPB in FSAR Table 12.3-3.