REQUEST FOR ADDITIONAL INFORMATION 294-2129 REVISION 1

3/31/2009

US-APWR Design Certification

Mitsubishi Heavy Industries

Docket No. 52-021

SRP Section: 09.03.02 - Process and Post-Accident Sampling Systems
Application Section: 9.3.2

QUESTIONS for Component Integrity, Performance, and Testing Branch 1 (AP1000/EPR Projects) (CIB1)

09.03.02-1

Background

GDC 14 requires that the RCPB integrity be maintained, and SRP 9.3.2 mentions explicitly that EPRI guidelines "…are used to meet the requirements of the relevant GDC." Concentrations of both SO_4 and Li are specified as control parameters by the EPRI guidelines which requires strict adherence to limits (Table 3-3). However, DCD Table 9.3.2-1 does not mention any measurements of SO_4 or Li for any RCS location.

Requested Information

How are SO_4 and Li inventories measured in the RCS?

09.03.02-2

Background

SRP 9.3.2 recommends the sampling of chemical mixing tanks (see p. 9.3.2-6), in order to meet the requirements of GDC 13, 14, and 41. However, no mixing tank sample points are listed in the DCD Tables 9.3.2-1 through 9.3.2-6. These tables describe in detail all the sampling points for liquid, gas, and accident sampling systems, and includes both primary and secondary water. However, no mention is made of the chemical mixing tanks as recommended in SRP 9.3.2.

Requested Information

What are your plans for sampling various chemical mixing tanks which prepare and store various solutions for injection into primary and secondary systems (e.g., LiOH, hydrazine, NH_3)?

09.03.02-3

Background

In accordance with GDC 60 and 64, it is required that plants be able to monitor and control effluents both from normal operation and under accident conditions. To meet these requirements, RG 1.21 recommends that sampling include all possible release points (C.2) and include contributions from each phase when more than one phase is involved (C.7). In DCD Table 9.3.2-1, the pressurizer vapor space is mentioned as being sampled by liquid sample. However, such a sampling method is ambiguous and does not seem to meet the recommendations of RG 1.21. The applicant should discuss the equipment and procedures involved.

Requested Information

How is sampling of the pressurizer vapor space performed?

09.03.02-4

Background

In order to meet GDC 60 and 64, plants must be designed to monitor and control effluents both from normal operation and under accident conditions. To meet these requirements, RG 1.21 recommends that samples be representative and that particulates or sediments in a sampled location should be accurately represented in the sample analysis (C.6). Under accident conditions, NUREG-0737 recommends sampling free from plateout, blockage, or distortion of samples [p. II.B.3.1-3, note (11)]. The DCD does not discuss measurement of suspended solids in either gas or liquid lines (except for feedwater). However, it is possible that solids could be present (and might even settle in or plug sample lines) thereby distorting other measured quantities. The measurement of solids is specified by EPRI guidelines to be diagnostic (not required), and recommended to occur weekly. This measurement is especially important for the PGSS, since it also doubles as the PASS gas-sample line, and accident conditions could produce significant quantities of aerosol materials containing fission products.

Requested Information

Are suspended solids measured as part of the gas or liquid samples? What provisions are made to ensure that they do not settle or plate in the lines?

09.03.02-5

Background

To satisfy the requirements of GDC 60 and 64, RG 1.21 recommends prompt analysis to minimize decay of radionuclides (C.8). Also, NUREG-0737 recommends prompt sampling under accident conditions [p. II.B.3.1-2, note (1)]. In addition, GDC 14 requires strict chemistry controls to assure the integrity of the RCPB. Some of these controls require immediate action if limits are violated, so it is important to discover such violations promptly. Thus, SRP 9.3.2 recommends a review of operational procedures to

verify the capability to promptly obtain samples. The PSS (SRP 9.3.2 refers to the Process Sampling Systems or PSS. In this RAI, PSS is intended to include PGSS, PLSS, and PASS as applicable in the US-APWR design.) has a variety of sampling points and expected conditions, but the DCD makes no mention of processing time at all.

Requested Information

Provide estimates for the time needed to obtain, cool, and prepare samples, and to perform the sample analysis. There are a variety of sample points, and processing may vary for individual points.

09.03.02-6

Background

Staff review of DCD Tier 2 (Rev 1), Section 9.3.2 indicates insufficient information is provided in regards to representative sampling from liquid and gaseous process streams and tanks in the design of the process and post-accident sampling systems for compliance with 10 CFR 50, Appendix A, GDC 60, 63, and 64. GDC 60 and 64 require that plants be able to monitor and control effluents both from normal operation and under accident conditions. To meet these requirements, RG 1.21 C.6 recommends that provisions should be made to assure that representative samples are obtained from well-mixed streams or volumes of effluent by the selection of proper sampling equipment, the proper location of sampling points, and development and use of proper sampling procedures. Also, GDC 14 requires representative liquid sampling since accurate sampling is necessary to insure the integrity of the RCPB. The US-APWR Process and Post-Accident Sampling Systems have a variety of sampling points, and DCD Section 9.3.2.1 states that the representative samples for the different subsystems will be obtained. The DCD states that sample lines will be purged prior to sampling, but it does not describe how the sample stream enters the line or what part of the sampled volume this would represent. Thus, the ability to obtain representative samples using the provisions in RG 1.21 C.6 and principles in ANSI/HPS N13.1-1999 cannot be determined based on the information in the DCD. Table 1.9.2-9 of Section 1.9 in the DCD shows conformance with SRP 9.3.2 with no exceptions.

Requested Information

Please address the following items in Section 9.3.2 and revise the DCD to include this information, or justify their exclusion.

1. Describe how collection of representative samples for the applicable gaseous sampling systems is obtained using the principles in ANSI/HPS N13.1-1999.
2. Describe the provisions in RG 1.21 C.6 that are made to assure representative samples are collected for both liquid and gaseous process streams and tanks. Specifically, for liquid systems, describe provisions made to sample in turbulent flow zones of pipes and the bulk volume of tanks.
3. In Table 1.9.1-1 of Section 1.9, update the applicable information in the RG 1.21 “Status” and “Corresponding Chapter/Section/Subsection” columns for Section 9.3.2.

09.03.02-7

Background

GDC 60 and 64 require that plants be able to monitor and control effluents both from normal operation and under accident conditions. In order to meet these requirements, RG 1.21 recommends that samples be representative (C.6) and that gas samples containing particulates or condensed phases include them in the analysis (C.7). The DCD states that heat tracing and insulation of gas sample lines are used to eliminate condensation. However, once in a gas sample vessel, dew condensation is collected and routed to holdup tanks, but no mention is made of analysis for possible contaminants or fission products in the condensate. This consideration is especially important because the PGSS also doubles as the PASS gas-sample line.

Requested Information

Regarding the gas sampling system, is the dew condensation in gas sample vessels measured for contaminants including possible radioactive materials?

09.03.02-8

Background

GDC 60 and 64 require that plants be able to monitor and control effluents both from normal operation and under accident conditions. To satisfy these requirements, RG 1.21 recommends that measurements should be made at points which would be most representative of releases (C.2). Also, GDC 14 requires representative liquid sampling since accurate sampling is necessary to ensure the integrity of the RCPB. In addition, NUREG-0737 recommends that the sample analysis quantify nuclide inventories [p. II.B.3.1-3, note (9)(a)]. This can only be accomplished if a single sample is known to be representative of an entire volume, or if multiple samples are taken, reflecting how effluent concentrations vary in different locations. In the DCD, PASS measurements are mentioned for the RCS hot leg, RWSP, and containment, and suggests that these terms are singular. The containment is comprised of multiple rooms, the primary system contains many different regions, and the RWST - while a single tank - has multiple entry points and is hardly a well-mixed control volume. Hence, it would seem that one sample point may not be able to provide representative samples for these entire regions.

Requested Information

For the PASS, how many sample points are there in the RCS hot leg, the RWSP, and the containment, and where are they located?