Request for Additional Information No. 137 (1348), Revision 0

12/2/2008

U. S. EPR Standard Design Certification
AREVA NP Inc.
Docket No. 52-020
SRP Section: 15.00.03 - Design Basis Accidents Radiological Consequence Analyses for Advanced Light Water Reactors
Application Section: 15.0.3

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

15.00.03-33

The information provided in the FSAR Tier 2 Chapter 15.0.3 Table 15.0.3-15 provides the data for parameters affecting the pH of the containment sump at one day after the LOCA. In order to ensure that the pH remains within the bounds of the pH required over the thirty day period of the event, the trend of these variables would need to be estimated and the pH calculated based on the changes in all the values affecting pH.

1. Provide the estimated pH over the thirty day period at reasonable intervals (once per two days).

2. Provide the data for the thirty day period on which these calculations are based.

15.00.03-34

Regulatory Guide 1.183, Appendix A, Item 2 identifies the performance characteristic of the containment sump water chemistry as being able to maintain pH greater than 7.0 to minimize the volatilization of iodines into the containment atmosphere and thus minimize dose offsite and to plant personnel.

The results of the calculation are presented in Tables 15.0-55 and 15.0-56, but the calculational methodology and assumptions (amount of HCl, HNO_3 the concentration of boric acid, lithium etc. at the start of the LOCA on pH) are not presented. The use of NUREG-CR/5950 as a guide does not address the specific parameters that may have been considered in calculating the final pH of the solution. What assumptions have been made for pH calculation regarding the concentration of contaminants in the Containment Building sump that may affect pH.?

1. What concentrations of the following species were used in the calculation, and what was the algorithm that was used? (No algorithm is present in the NUREG that identifies these parameters.)

    a. Chlorides (as a result of radiolysis of organic materials like cable coverings),

b. Boric acid in the IRWST water and the RCS

c. Nitrates

d. Sulfates

e. Silica

f. Calcium (especially as regards the precipitation of calcium phosphate)

g. Sodium

h. Phosphate (residual after the precipitation of calcium phosphate)

2. How was the temperature of the water and the ionic strength of the solution accounted for in the calculation as both these affect the acid constant for boric acid, as well as its ability to form polymeric species?

15.00.03-35

Technical Specification 3.6.8 identifies the minimum quantity of trisodium phosphate (TSP) as 5.97 m^3 (211 ft^3). Surveillance Requirement Basis 3.6.8.1 describes the reason that a volumetric measurement is used versus a gravimetric measurement. This assumption relies on a manufactured density of 0.97 g/mL (58 lbm/ft^3), which when multiplied by a volume of 5.97 m^3 (211 ft^3) yields the assumed mass of 5534 kg (12,200 lbm). This manufactured density differs significantly from the handbook density of TSP of 1.62 g/mL (96.4 lbm/ft^3). Additionally, there are no controls on the manufacturing process for chemical purity, nor are there any ITAAC requirements for verifying that the mass of TSP required is present in the volume identified.

1. Explain why manufactured density of 0.93 g/mL (58 lbm/ft^3) for trisodium phosphate dodecahydrate cited in Surveillance Requirement Basis 3.6.8.1 differs so significantly from the handbook density for trisodium phosphate dodecahydrate of 1.62 g/mL (96.4 lbm/ft^3).

2. What controls will be placed upon:

   a) The measurement of the volume of TSP-C located in containment?

   b) The purity of the TSP-C purchased?

   c) The manufactured density being significantly more or less than 0.93 g/mL (58 lbm/ft^3)?

   d) The purity of the TSP-C every 24 months assuring it has not had its neutralizing capability compromised?

   e) In addition, what changes may be necessary, if any, in the EPR FSAR and ANP-10293 based on the responses to the above questions?