Omaha Public Power District

444 South 16th Street Mall
Omaha NE 68102-2247

October 10, 2006
LIC-06-0116

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

References:
1. Docket No. 50-285
2. Letter from OPPD (J. A. Reinhart) to NRC (Document Control Desk), "Fort Calhoun Station, Unit No. 1, License Amendment Request, Change of Containment Building Sump Buffering Agent from Trisodium Phosphate to Sodium Tetraborate," dated August 21, 2006 (LIC-06-0088)
3. Letter from NRC (A. B. Wang) to OPPD (R. T. Ridenoure), "Fort Calhoun Station, Unit No. 1 Request for Additional Information Related to the Replacement of Trisodium Phosphate" (TAC No. M02864) (NRC-06-0136)

SUBJECT: Response to Request for Additional Information (RAI) Related to the Replacement of Trisodium Phosphate

Attached please find the Omaha Public Power District (OPPD) response to Reference 3, which requested additional information concerning OPPD's License Amendment Request (LAR) (Reference 2) seeking to replace Trisodium Phosphate (TSP) with Sodium Tetraborate (NaTB).

Reference 2 included a revised Basis for Technical Specification 3.6. Attached is a correction to that Basis concerning the representative sample mass of NaTB tested to determine its solubility and buffering ability after exposure to the containment environment.

As a result of testing conducted in accordance with the revised surveillance test (Reference 2, Attachment 2, 3.6 – Page 6) it was determined that the calculation that determined the representative sample mass of NaTB was incorrect. The correct representative sample mass of NaTB is 1.24 to 1.27 grams. Revised markup and clean pages of 3.6 – Page 6 are provided in Attachments 2 and 3 respectively to supersede the pages submitted with Reference 2.

No commitments to the NRC are made in this letter. I declare under penalty of perjury that the foregoing is true and correct. (Executed October 10, 2006)

A001

If you have any questions or require additional information, please contact Mr. Thomas C. Matthews at 402-533-6938.

Sincerely,

J. A. Reinhart
Site Director
Fort Calhoun Station

JAR/mle

Attachments: 1) Response to Request for Additional Information
2) Technical Specification 3.6 – Page 6 (Markup)
3) Technical Specification 3.6 – Page 6 (Clean)

Enclosure: 1) OPPD Chemical Model Spreadsheets

c: B. S. Mallett, NRC Regional Administrator, Region IV (w/o enclosure)
A. B. Wang, NRC Project Manager (w/o enclosure)
J. D. Hanna, NRC Senior Resident Inspector (w/o enclosure)
Director of Consumer Health Services, Department of Regulation and Licensure, Nebraska Health and Human Services, State of Nebraska (w/o enclosure)

Attachment 1

Response to Request for Additional Information (RAI) Related to the Replacement of Trisodium Phosphate

NRC Question 1:

Provide an electronic copy of the PWR Owners Group (PWROG) chemical model spreadsheet for Fort Calhoun that shows the precipitates formed with trisodium phosphate (TSP) buffer and sodium tetraborate buffer.

OPPD Response to Question 1:

The requested spreadsheets are enclosed.

NRC Question 2:

The summary report for Testing of Alternate Buffering Agents for Fort Calhoun Station (Page 3 of 8) indicates the corrosion rate of aluminum in solution buffered with sodium tetraborate is significantly higher than the corrosion rate in solution buffered with TSP. Table 1 in the summary report provides the PWROG chemical model predictions that show an equal amount of $NaAlSi_3O_8$ *precipitate is predicted at Fort Calhoun with sodium tetraborate and TSP buffered environments. Discuss why the predicted amount of aluminum based precipitate is equal in these environments when the amount of dissolved aluminum in the containment pool would presumably be much greater with sodium tetraborate.*

OPPD Response to Question 2:

The predicted amount of aluminum based precipitate is equal in both environments because the chemical model does not take into account phosphate inhibition of aluminum corrosion. This effect is not included in the model because the broad conditions for this inhibition have not been well characterized. Therefore, the model predicts the same quantity of aluminum corrosion for both TSP buffer environments and NaTB buffer environments.

The testing results reflect the fact that the phosphate from the TSP buffer inhibits the amount of aluminum corrosion. This reduction in the amount of aluminum corrosion occurs due to the formation of a phosphate conversion coating which protects the aluminum metal.

Attachment 2

Technical Specification 3.6 – Page 6 Markup

3.0 SURVEILLANCE REQUIREMENTS

3.6 Safety injection and Containment Cooling Systems Tests (Continued)

Operation of the system for 10 hours every month will demonstrate operability of the filters and adsorbers system and remove excessive moisture build-up on the adsorbers.

Demonstration of the automatic initiation capability will assure system availability.

Determination of the volume of buffering agent in containment must be performed due to the possibility of leaking valves and components in the containment building that could cause dissolution of the buffering agent during normal operation.

A refueling frequency shall be utilized to visually determine that the volume of buffering agent contained in the buffering agent baskets is within the area of acceptable operation based on the buffering agent volume required by Figure 2-3. A measured value or the Technical Data Book (TDB) II, "Reactivity Curves" may be used to obtain a hot zero power (HZP) critical boron concentration (CBC). The "as found" volume of buffering agent must be within the area of acceptable operation of Figure 2-3 using this HZP CBC value. Prior to exiting the refueling outage, visual buffering agent volume determination is performed to ensure that the "as-left" volume of buffering agent contained in the baskets is ≥72.5 ft^3. This requirement ensures that there is an adequate quantity of buffering agent to adjust the pH of the post-LOCA sump solution to a value ≥ 7.0 for HZP CBC up to 1800 ppm.

Testing must be performed to ensure the solubility and buffering ability of the NaTB after exposure to the containment environment. A representative sample of 1.24 to 1.27 grams of NaTB from one of the baskets in containment is submerged in 0.99 – 1.01 liters of water at a boron concentration of 2436 – 2456 ppm (equivalent to a RCS boron concentration of 1800 ppm - Figure 2-3) using boric acid. At a standard temperature of 115 – 125°F, without agitation, the solution must be left to stand for 4 hours. The liquid is then decanted and mixed, the temperature is adjusted to 75 – 79°F and the pH measured. At this point, the pH must be ≥ 7.0. The representative sample weight is based on the minimum required NaTB weight of 4301 pounds, less the quantity required to account for acidic radiolysis products (758 pounds), and maximum possible post-LOCA sump volume of 398,445 gallons, normalized to a 1.0 liter sample. At a manufactured density of 59.3 lb_m/ft^3, 4301 pounds corresponds to the minimum volume of 72.5 ft^3.

For dissolution testing, the boron concentration of the test water is representative of the maximum possible boron concentration corresponding to the maximum possible post-LOCA sump volume. The post-LOCA sump volume originates from the Reactor Coolant System (RCS), the Safety Injection Refueling Water Tank (SIRWT), the Safety Injection Tanks (SITs) and the Boric Acid Storage Tanks (BASTs). The maximum post-LOCA sump boron concentration is based on a cumulative boron concentration in the RCS, SIRWT, SITs and BASTs of 2446 ppm. The cumulative boron concentration is based on a maximum RCS HZP CBC with no Xenon at Beginning of Cycle conditions, SIRWT and SIT boron concentrations at maximum allowed values of 2,350 ppm and maximum BAST concentration of 4.5 % wt. Agitation of the test solution is prohibited since an adequate standard for the agitation intensity cannot be specified. The test time of 4 hours is necessary to allow time for the dissolved NaTB to naturally diffuse through the sample solution. In the post-LOCA containment sump, rapid mixing would occur, significantly decreasing the actual amount of time before the required pH is achieved. This would ensure achieving a pH ≥ 7.0 by the onset of recirculation after a LOCA.

~~Periodic determination of the volume of TSP in containment must be performed due to the possibility of leaking valves and components in the containment building that could cause dissolution of the TSP during normal operation.~~

~~A refueling frequency shall be utilized to visually determine that the volume of TSP contained in the TSP baskets is within the area of acceptable operation based on the TSP volume required by Figure 2-3. A measured value or the Technical Data Book (TDB) II, "Reactivity Curves" may be used to obtain a hot zero power (HZP) critical boron concentration (CBC). The "as found" volume of TSP must be within the area of acceptable operation of Figure 2-3 using this HZP CBC value. Prior to exiting the refueling outage, another visual TSP volume determination is performed to ensure that the "as-left" volume of TSP contained in the baskets is ≥128.3 ft^3. This requirement ensures that there is an adequate quantity of TSP to adjust the pH of the post-LOCA sump solution to a value ≥ 7.0 for HZP CBC up to 1800 ppm.~~

~~The periodic pH verification is also required on a refueling frequency. Operating experience has shown this surveillance frequency acceptable due to margin in the volume of TSP placed in the containment building.~~

~~An "as left" representative sample of 1.78 - 1.81 grams of TSP from one of the baskets in containment is submerged in 0.99-1.01 liters of water at a boron concentration of 2439 - 2459 ppm (equivalent to a RCS boron concentration of 1800 ppm - Figure 2-3). At a standard temperature of 115-125°F, without agitation, the solution should be left to stand for 4 hours. The liquid is then decanted and mixed, the temperature adjusted to 75 - 79°F and the pH measured. At this point the pH must be ≥ 7.0. The representative sample weight is based on the minimum required TSP weight at the beginning of cycle of 6,800 lbs$_m$, which, at a manufactured density of at least 53.0 lb$_m$/ft^3 corresponds to the minimum volume of 128.3 ft^3, and maximum possible post-LOCA sump volume of 397,183 gallons, normalized to buffer a 1.0 liter sample.~~

Attachment 3

Technical Specification 3.6 – Page 6 Clean

3.0 SURVEILLANCE REQUIREMENTS

3.6 Safety injection and Containment Cooling Systems Tests (Continued)

Operation of the system for 10 hours every month will demonstrate operability of the filters and adsorbers system and remove excessive moisture build-up on the adsorbers.

Demonstration of the automatic initiation capability will assure system availability.

Determination of the volume of buffering agent in containment must be performed due to the possibility of leaking valves and components in the containment building that could cause dissolution of the buffering agent during normal operation.

A refueling frequency shall be utilized to visually determine that the volume of buffering agent contained in the buffering agent baskets is within the area of acceptable operation based on the buffering agent volume required by Figure 2-3. A measured value or the Technical Data Book (TDB) II, "Reactivity Curves" may be used to obtain a hot zero power (HZP) critical boron concentration (CBC). The "as found" volume of buffering agent must be within the area of acceptable operation of Figure 2-3 using this HZP CBC value. Prior to exiting the refueling outage, visual buffering agent volume determination is performed to ensure that the "as-left" volume of buffering agent contained in the baskets is ≥72.5 ft^3. This requirement ensures that there is an adequate quantity of buffering agent to adjust the pH of the post-LOCA sump solution to a value ≥ 7.0 for HZP CBC up to 1800 ppm.

Testing must be performed to ensure the solubility and buffering ability of the NaTB after exposure to the containment environment. A representative sample of 1.24 to 1.27 grams of NaTB from one of the baskets in containment is submerged in 0.99 – 1.01 liters of water at a boron concentration of 2436 – 2456 ppm (equivalent to a RCS boron concentration of 1800 ppm - Figure 2-3) using boric acid. At a standard temperature of 115 – 125°F, without agitation, the solution must be left to stand for 4 hours. The liquid is then decanted and mixed, the temperature is adjusted to 75 – 79°F and the pH measured. At this point, the pH must be ≥ 7.0. The representative sample weight is based on the minimum required NaTB weight of 4301 pounds, less the quantity required to account for acidic radiolysis products (758 pounds), and maximum possible post-LOCA sump volume of 398,445 gallons, normalized to a 1.0 liter sample. At a manufactured density of 59.3 lb_m/ft^3, 4301 pounds corresponds to the minimum volume of 72.5 ft^3.

For dissolution testing, the boron concentration of the test water is representative of the maximum possible boron concentration corresponding to the maximum possible post-LOCA sump volume. The post-LOCA sump volume originates from the Reactor Coolant System (RCS), the Safety Injection Refueling Water Tank (SIRWT), the Safety Injection Tanks (SITs) and the Boric Acid Storage Tanks (BASTs). The maximum post-LOCA sump boron concentration is based on a cumulative boron concentration in the RCS, SIRWT, SITs and BASTs of 2446 ppm. The cumulative boron concentration is based on a maximum RCS HZP CBC with no Xenon at Beginning of Cycle conditions, SIRWT and SIT boron concentrations at maximum allowed values of 2,350 ppm and maximum BAST concentration of 4.5 % wt. Agitation of the test solution is prohibited since an adequate standard for the agitation intensity cannot be specified. The test time of 4 hours is necessary to allow time for the dissolved NaTB to naturally diffuse through the sample solution. In the post-LOCA containment sump, rapid mixing would occur, significantly decreasing the actual amount of time before the required pH is achieved. This would ensure achieving a pH ≥ 7.0 by the onset of recirculation after a LOCA.