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SOUTHERN COMPANY
Energy to Serve Your World℠

August 22, 2008

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NL-08-1228

U. S. Nuclear Regulatory Commission
ATTN: Document Control Desk
Washington, D. C. 20555-0001

Vogtle Electric Generating Plant
Supplemental Response to NRC Generic Letter 2004-02

Ladies and Gentlemen:

By letter dated May 22, 2008 (NL-08-0818), Southern Nuclear Operating Company (SNC) requested an extension for the final response to Generic Letter 2004-02 for the completion of:

- Downstream Effects evaluations in accordance with WCAP-16406-P Rev. 1, "Evaluation of Downstream Sump Debris Effects in Support of GSI-191," and WCAP-16793-NP, "Evaluation of Long-Term Cooling Considering Particulate, Fibrous and Chemical Debris in the Recirculating Fluid."
- Chemical Effects testing and evaluation of test results.

An extension was granted to SNC by the NRC to July 31, 2008, in a letter dated May 29, 2008. (TAC NOs. MC4727, MC4728)

By letters dated July 31, 2008, SNC provided the Downstream Effects answers for Components and In-Vessel (NL-08-1155) and requested an extension for the Generic Letter 2004-02 Supplemental Response for Chemical Effects (NL-08-1195). The Enclosure to this letter provides the Chemical Effects answers. The Enclosure also contains a revised answer to question 3.g.15, originally submitted in SNC letter dated May 21, 2008 (NL-08-0670). This completes SNC analyses and corrective actions to address Generic Letter 2004-02.

(Affirmation and signature are provided on the following page.)

Mr. M. J. Ajluni states he is Nuclear Licensing Manager for Southern Nuclear Operating Company and is authorized to execute this oath on behalf of Southern Nuclear Operating Company and to the best of his knowledge and belief, the facts set forth in this letter are true.

This letter contains no NRC commitments. If you have any questions, please advise.

Respectfully submitted,

SOUTHERN NUCLEAR OPERATING COMPANY

Mark J Ajluni

M. J. Ajluni
Manager – Nuclear Licensing

Sworn to and subscribed before me this 22 *day of* August*, 2008.*

Patricia H. Raymond
Notary Public

My commission expires: 7-21-2012

MJA/DWM/daj

Enclosure: Vogtle Electric Generating Plant Supplemental Response to NRC GL 2004-02

cc: Southern Nuclear Operating Company
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U. S. Nuclear Regulatory Commission
Mr. L. A. Reyes, Regional Administrator
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Mr. G. J. McCoy, Senior Resident Inspector – Vogtle

State of Georgia
Mr. N. Holcomb, Commissioner – Department of Natural Resources

Vogtle Electric Generating Plant
Supplemental Response to NRC Generic Letter 2004-02

Enclosure

The answer to Question 3.g.15, originally submitted in NL-08-0670, dated May 21, 2008, has been revised as follows:

15) Specify whether the containment accident pressure is set at the vapor pressure corresponding to the sump liquid temperature.

SNC Response to 3.g.15:

For sump temperatures greater than 212°F, the containment accident pressure was conservatively set at the vapor pressure corresponding to the sump liquid temperature. For sump temperatures less than 212°F, pre-accident containment pressure is credited.

3.o Chemical Effects

1) Provide a summary of evaluation results that show that chemical precipitates formed in the post-LOCA containment environment, either by themselves or combined with debris, do not deposit at the sump screen to the extent that an unacceptable head loss results, or deposit downstream of the sump screen to the extent that long-term core cooling is unacceptably impeded. Content guidance for chemical effects is provided in Enclosure 3 to a letter from the NRC to NEI dated September 27, 2007 (ADAMS Accession No. ML0726007425).

SNC Response to 3.o.1:

Chemical precipitates that form in the VEGP post-LOCA containment environment combined with debris generated by a large break LOCA do not result in an unacceptable head loss. The effects of the sump chemical environment were evaluated in an integrated chemical effects head loss test by Alion at the VUEZ test facility.

2) 1.d.i Sufficient 'Clean' Strainer Area: Those licensees performing a simplified chemical effects analysis should justify the use of this simplified approach by providing the amount of debris determined to reach the strainer, the amount of bare strainer area and how it was determined, and any additional information that is needed to show why a more detailed chemical effects analysis is not needed.

SNC Response to 3.o.2:

Not applicable. VEGP did not use a simplified chemical effects analysis.

3) 2.d.i Debris Bed Formation: Licensees should discuss why the debris from the break location selected for plant-specific head loss testing with chemical precipitate yields the maximum head loss. For example, plant X has break location 1 that would produce maximum head loss without consideration of chemical effects. However, break location 2, with

chemical effects considered, produces greater head loss than break location 1. Therefore, the debris for head loss testing with chemical effects was based on break location 2.

SNC Response to 3.o.3:

VEGP utilized the break locations that yield maximum screen debris loading. The debris loading is primarily coatings and NUKON insulation. A loading that corresponds to the highest NUKON debris generation location was used in conjunction with a location that yields the highest coating generation. A small amount of fiber is assumed to originate primarily from latent debris and is assumed to transport to the screen regardless of the assumed break location. Non design basis accident (DBA) qualified labels and coatings are also assumed to transport to the screen regardless of location of breaks. At VEGP the maximum postulated screen debris loading was demonstrated through testing to produce the maximum head loss. No chemical effects testing was done with a lesser loading of debris, since previous test results demonstrated that reduced debris resulted in reduced head loss, and there is no mechanism expected with VEGP conditions whereby chemical effects could produce a higher head loss with reduced debris loading.

4) **3.d.i Plant Specific Materials and Buffers: Licensees should provide their assumptions (and basis for the assumptions) used to determine chemical effects loading: pH range, temperature profile, duration of containment spray, and materials expected to contribute to chemical effects.**

SNC Response to 3.o.4:

The pH range assumed was the maximum case calculated for the large break LOCA and is based upon parameters that yield the maximum pH. This pH value of 8.1 ensures a maximum aluminum dissolution rate. Containment spray is assumed to operate for 24 hours. The sump temperature profile that corresponds to the design basis large break LOCA was used. Plant specific values of the quantities of materials that contribute to chemical effects were utilized. Aluminum, concrete, NUKON insulation, INTERAM, and TSP were utilized as inputs to the analysis.

5) **4.d.i Approach to Determine Chemical Source Term (Decision Point): Licensees should identify the vendor who performed plant-specific chemical effects testing.**

SNC Response to 3.o.5:

Alion Science and Technology performed plant-specific chemical effects testing. The testing protocol is the VUEZ 30 day integrated chemical effects testing.

6) **5. Separate Effects Decision (Decision Point): State which method of addressing plant-specific chemical effects is used.**

SNC Response to 3.o.6:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

7) **6.d.i AECL Model: Since the NRC is not currently aware of the testing approach, the NRC expects licensees using it to provide a detailed discussion of the chemical effects evaluation process along with head loss test results.**

SNC Response to 3.o.7:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

8) **6.d.ii AECL Model: Licensees should provide the chemical identities and amounts of predicted plant-specific precipitates.**

SNC Response to 3.o.8

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

9) **7d.i WCAP Base Model: For licensees proceeding from block 7 to diamond 10 in the Figure 1 flow chart [in Enclosure 3 to a letter from the NRC to NEI dated September 27, 2007 (ADAMS Accession No. ML0726007425)], justify any deviations from the WCAP base model spreadsheet (i.e., any plant specific refinements) and describe how any exceptions to the base model spreadsheet affected the amount of chemical precipitate predicted.**

SNC Response to 3.o.9:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

10) **7.d.ii WCAP Base Model: List the type (e.g., AlOOH) and amount of predicted plant-specific precipitates.**

SNC Response to 3.o.10:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

11) **8.d. WCAP Refinements: State whether refinements to WCAP-16530-NP were utilized in the chemical effects analysis.**

SNC Response to 3.o.11:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

12) **9.d.i Solubility of Phosphates, Silicates and Al Alloys: Licensees should clearly identify any refinements (plant-specific inputs) to the base WCAP-16530 model and justify why the plant-specific refinement is valid.**

SNC Response to 3.o.12:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

13) **9.d.ii Solubility of Phosphates, Silicates and Al Alloys: For crediting inhibition of aluminum that is not submerged, licensees should provide the substantiation for the following: (1) the threshold concentration of silica or phosphate needed to passivate aluminum, (2) the time needed to reach a phosphate or silicate level in the pool that would result in aluminum passivation, and (3) the amount of containment spray time (following the achieved threshold of chemicals) before aluminum that is sprayed is assumed to be passivated.**

SNC Response to 3.o.13:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

14) **9.d.iii Solubility of Phosphates, Silicates and Al Alloys: For any attempts to credit solubility (including performing integrated testing), licensees should provide the technical basis that supports extrapolating solubility test data to plant-specific conditions. In addition, licensees should indicate why the overall chemical effects evaluation remains conservative when crediting solubility given that small amount of chemical precipitate can produce significant increases in head loss.**

SNC Response to 3.o.14:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

15) **9.d.iv Solubility of Phosphates, Silicates and Al Alloys: Licensees should list the type (e.g., AlOOH) and amount of predicted plant specific precipitates.**

SNC Response to 3.o.15:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

16) **10. Precipitate Generation (Decision Point): State whether precipitates are formed by chemical injection into a flowing test loop or whether the precipitates are formed in a separate mixing tank.**

SNC Response to 3.o.16:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

17) **11.d.i Chemical Injection into the Loop: Licensees should provide the one-hour settled volume (e.g., 80 ml of 100 ml solution remained cloudy) for precipitate prepared with the same sequence as with the plant-specific, in-situ chemical injection.**

SNC Response to 3.o.17:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

18) **11.d.ii Chemical Injection into the Loop: For plant-specific testing, the licensee should provide the amount of injected chemicals (e.g.,**

aluminum), the percentage that precipitates, and the percentage that remains dissolved during testing.

SNC Response to 3.o.18:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

19) **11.d.iii Chemical Injection into the Loop: Licensees should indicate the amount of precipitate that was added to the test for the head loss of record (i.e., 100 percent 140 percent).**

SNC Response to 3.o.19:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

20) **12.d.i Pre-Mix in Tank: Licensees should discuss any exceptions taken to the procedure recommended for surrogate precipitate formation in WCAP-16530.**

SNC Response to 3.o.20:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

21) **13. Technical Approach to Debris Transport (Decision Point): State whether near-field settlement is credited or not.**

SNC Response to 3.o.21:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

22) **14.d.i Integrated Head Loss Test with Near-Field Settlement Credit: Licensees should provide the one-hour or two-hour precipitate settlement values measured within 24 hours of head loss testing.**

SNC Response to 3.o.22:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

23) **14.d.ii Integrated Head Loss Test with Near-Field Settlement Credit: Licensees should provide a best estimate of the amount of surrogate chemical debris that settles away from the strainer during the test.**

SNC Response to 3.o.23:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

24) **15.d.i Head Loss Testing Without Near Field Settlement Credit: Licensees should provide an estimate of the amount of debris and precipitate that remains on the tank/flume floor at the conclusion of the test and justify why the settlement is acceptable.**

SNC Response to 3.o.24**:**

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

25) **15.d.ii Head Loss Testing Without Near Field Settlement Credit: Licensees should provide the one-hour or two-hour precipitate settlement values measured and the timing of the measurement relative to the start of head loss testing (e.g., within 24 hours).**

SNC Response to 3.o.25:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

26) **16.d. Test Termination Criteria: Provide the test termination criteria.**

SNC Response to 3.o.26:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

27) **17.d.i Data Analysis: Licensees should provide a copy of the pressure drop curve(s) as a function of time for the testing of record.**

SNC Response to 3.o.27:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

28) 17.d.ii Data Analysis: Licensees should explain any extrapolation methods used for data analysis.

SNC Response to 3.o.28:

VEGP does not use the WCAP or AECL based models for testing. Additionally, near field settling was not credited and the test was run for 30 days. Therefore, responses to items 3o.6 through 3o.28 are not applicable.

29) 18.d. Integral Generation (Alion): Licensees should explain why the test parameters (e.g., temperature, pH) provide for a conservative chemical effects test.

SNC Response to 3.o.29:

Alion's VUEZ CE Test Program is designed to replicate the potential corrosive interactions of the spray and pool fluid chemistry with those materials and debris sources in containment and resident on the sump screen. These potential interactions may cause additional precipitates and/or impacts on debris head loss over the 30-day mission time. To provide a representative experiment, certain scaled parameters are selected to ensure that the reactions take place in the correct quantity and environment and that the resulting debris head losses satisfactorily reflect any chemical effects. Critical plant parameters include sump screen area, recirculation fluid volume, recirculation flow rate, containment debris, and recirculation pool chemistry (temperature and pH).

The test tank and setup represent the containment parameters to replicate the corrosion potential of the structural materials inside containment. The experiment preserves the material surface area to pool volume similar to the integrated chemical effects testing (ICET) experiments; past experience with these types of corrosion experiments have shown that the release rate is based on surface area of the material and not necessarily the mass.

Submerged materials are insulation, debris or other material that are below the sump water level and not transported to the sump. These materials do not directly contribute to sump screen head loss but can affect pool pH and chemical properties. Unsubmerged materials are materials within containment that undergo coolant spray but are above the pool volume. These materials do not contribute to head loss or pool chemistry directly but can affect the pool pH and chemistry due to coolant spray corrosion and run off that enters the containment pool. Materials that reach the sump screen are insulation and debris that are created by the line break and transported to the sump screen via the containment pool recirculation. These materials contribute to the sump screen head loss via bed thickness and porosity.

The containment materials included are divided into the three categories that correspond to exactly where the materials will lie within the test tank: submerged, unsubmerged, and on the sump screen. Each category is scaled according to either pool volume ratio or screen area ratio of the plant versus the test apparatus based on the transport characteristics or residence of the debris within the containment.

Chemical loads that are present in the containment pool were conserved by using the same concentration (ppm by weight value) in testing as is present in containment. The temperature and pH curves that would be present in the containment pool were represented during testing.

The chemical effects testing parameters are derived from the containment parameters and are conservative for the following reasons:

1. The quantities of materials that contribute to chemical effects are provided by the plant personnel based on the design documents, walkdowns or

conservative estimates. The materials included in the experiments are concrete, aluminum, zinc, carbon steel, dirt/dust and LOCA generated debris. Metallic coatings are represented by sheet materials.

2. The scale between the containment material to pool volume and experiment material to pool volume is preserved to the extent possible.

3. Although the experiment was limited to a maximum temperature of 190^o F, the release of materials expected in containment at temperatures greater than 190^oF was accounted for through an increase in materials (additional coupons).

4. The test fluid pH profile throughout the test is based on design basis containment sump pH profile or quantities of buffer in containment.

The following sections discuss the selection of the test parameters.

Temperature Adjustment/Temporary Material

The test program was designed to replicate the potential corrosive interactions of the spray and pool fluid chemistry with those materials and debris sources in containment and resident on the sump screen. To provide a representative experiment, it was necessary to ensure that the quantity of corrosion products released in the plant containment environment were reproduced in the test environment such that the resulting debris head losses satisfactorily reflected the plant's chemical effects. Since the experiment has a limit of 190^oF, an adjustment is required to ensure the quantity of material released at 190^o F in the experiment equals the quantity of materials released at temperatures above 190^oF.

The elemental release rates were determined based on the method and equations in WCAP-16530-NP and are based on the Arrhenius principle. The release rates from the plant and test profiles were correlated to determine material adjustments or dwell adjustments for the chemical effects testing to conservatively generate the chemical effects products that would not otherwise be generated, since the post LOCA containment and sump temperatures are higher than the maximum operating temperature that can be attained in the test apparatus.

The test method focuses on the pre-recirculation time period and on the post recirculation time period up to the time the sump temperature drops to 190°F. In these time periods, the plant's temperature profile is higher than the test apparatus temperature profile, and therefore, the higher the plant's temperature, the higher chemical release rates and consequently the higher the total releases. To match the plant's total releases during this period above 190^oF, the quantity of material in the test apparatus was increased until such time as the temperature fell below 190^oF. The method used to determine the additional quantity of materials was based on the method and equations in WCAP-16530-NP.

The WCAP-16530-NP method first evaluates the elemental release rates of Al, Si and Ca as a function of time for the time period that the plant sump temperature is higher than 190°F for the respective plant and test temperature and pH profiles. The elemental release rates of Al, Si and Ca as a function of time for these time periods are then calculated and the ratio of the elemental releases (sump/VUEZ test) as a function of time is determined. These elemental ratios of the release rates are integrated as a function of time. The integrated ratios of the release rates in effect show the relationship between the plant and test time that would result in the generation of equal releases of Al, Si and Ca within a time interval of interest. The results of this evaluation are used to increase the test material to generate the same integrated releases within any time period that the plant temperature exceeds the test temperature.

Acids and Bases (pH)

The experiment began with the addition of the requisite amount of boron through the addition of boric acid. The pH during this phase was approximately 5.5. Reviewing the industry experiments, ALION benchtop experiments and VUEZ results have revealed that the primary release during this phase is calcium and it is not overly sensitive to small changes in pH units. It has been noted that debris in demineralized water will raise the pH of the water due to the alkalinity of the fiberglass and calcium silicate.

This test was designed to maximize the pH and temperature of the experiment to promote corrosion while ensuring the minimum containment sump temperature was realized to ensure any potential precipitation could be evaluated for impact on head loss.

30)19.c.i Tank Scaling / Bed Formation: Explain how scaling factors for the test facilities are representative or conservative relative to plant-specific values.

SNC Response to 3.o.30:

The testing was conducted with scaled, representative material surface areas, sump volumes and chemical constituents to provide conditions closely simulating the post-LOCA sump environment. In order to promote the reactions that would be expected in this environment, the experimental vessel contained the proportions of non-metallic, metallic, and construction materials similar to those present in the VEGP containment environments.

Structural and debris materials were obtained from plant surveys or documents and scaled for input into the 30 day chemical experiment. In several cases, debris materials were determined to be inert and suitable surrogates were selected for development of the debris bed. The materials considered in the experiment were:

- NUKON
- Aluminum
- Carbon Steel
- Zinc
- Concrete

The scale testing was configured to achieve the following conditions:

The test apparatus screen average fluid approach velocity should be greater than or equal to the containment sump screen representative average approach velocity within the limits of the test equipment.

The temperature and pH conditions of the tests should be as representative as possible of the actual containment conditions.

The ratio of the test material surface area to tank volume should be equal to that of the containment materials surface area to containment pool volume.

The fibrous debris bed thickness on the screen of the test apparatus should be equal to the containment sump screen equivalent debris bed thickness.

The control of the parameters defined above ensured that the corrosion/leaching conditions and debris head loss characteristics that occur during the experiment were representative of the containment conditions during the postulated LOCA.

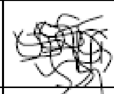
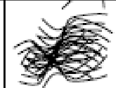
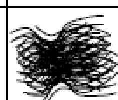
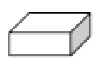
31) 19.c.ii Tank Scaling / Bed Formation: Explain how bed formation is representative of that expected for the size of materials and debris that is formed in the plant specific evaluation.

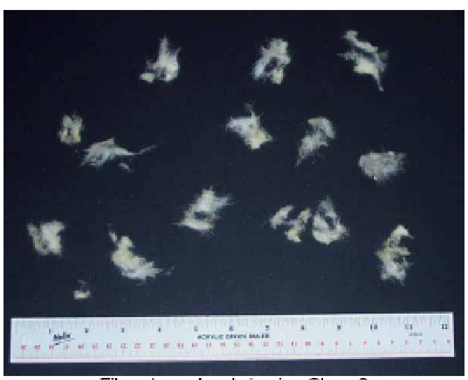
SNC Response to 3.o.31:

The VUEZ 30-day debris head loss testing represents a combination of ICET and vertical loop debris head loss testing. The screen installed in the experiment is a horizontally oriented flat plate on which the plant specific debris bed was developed and head loss measured. The screen is slightly spherical on the bottom to inhibit the formation of voids that may build up underneath the debris bed. The sump solution is circulated in the areas outside the suction plenum and drawn down through the debris bed and recirculated.

The debris bed developed in the VUEZ test loop provided a representative, average debris bed (bed thickness and composition) on which the impact of chemical effects was measured over the 30-day mission time. The debris bed composition and thickness selected for the VUEZ chemical effects experiments is based on the range of plant specific debris loads and size characteristics determined in the plant-specific debris generation, transport, head loss analysis and prototype testing. Based on the results of the plant specific debris generation and transport analysis, the expected debris characteristics on the sump screen contain all three (3) sizes of fibrous debris: fines, small pieces (< 6" on a side), and large pieces (> 6" on a side). While prototype screen testing uses a debris mixture that includes both fines and small pieces, for the VUEZ experiments, a smaller size distribution was selected that is primarily represented by Classes 1 through 5 in Table 3-2 and Figure 3-3 (NUREG/CR-6808). This ensures that the characteristic size of the debris is small compared to the characteristic size of the VUEZ screen. Further, this leads, on average, to a higher debris density, which is expected to maximize the impact of any chemical precipitates that might form.

Table 3-2 Size Classification Scheme for Fibrous Debris[3-2]

No.	Description	
1		Very small pieces of fiberglass material; "microscopic" fines that appear to be cylinders of varying L/D.
2		Single, flexible strands of fiberglass; essentially acts as a suspending strand.
3		Multiple attached or interwoven strands that exhibit considerable flexibility and that, because of random orientations induced by turbulent drag, can exhibit low settling velocities.
4		Fiber clusters that have more rigidity than Class 3 debris and that react to drag forces as a semi-rigid body.
5		Clumps of fibrous debris that have been noted to sink when saturated with water. Generated by different methods by various researchers but easily created by manual shredding of fiber matting.
6		Larger clumps of fibers lying between Classes 5 and 7.
7		Fragments of fiber that retain some aspects of the original rectangular construction of the fiber matting. Typically precut pieces of a large blanket to simulate moderate-size segments of original blanket.



Fiberglass shreds in size Class 3

Fiberglass shreds in size Class 5

Figure 3-3. Fiberglass Insulation Debris of Two Example Size Classes

The fibrous materials are boiled to remove the oils or gasses trapped within the fibers. This process helps to ensure that the materials do not agglomerate, float and simulates aging (loss of resiliency). The material is then shredded consistent with standard head loss testing practices (leaf shredder, cuisenart, etc.) to resemble the size distribution presented in Table 3-2 and Figure 3-3. The particulate surrogates are procured with an average size distribution near 10 micron.

The fiber and particulate mixture is thoroughly mixed in a beaker containing the test solution. The mixture is slowly added through a funnel to ensure an even distribution across the test screen area while the pump is circulating. The bed is constructed to be uniform (minimal clumps, unevenness, etc.) to the extent possible by the technicians.

32) 20.c.i Tank Transport: Explain how the transport of chemicals and debris in the testing facility is representative or conservative with regard to the expected flow and transport in the plant-specific conditions.

SNC Response to 3.o.32:

The circulation of fluid is essential to the development of a homogenous chemical solution by which corrosion and subsequent precipitation can occur. The experiment is not a transport experiment; therefore, comparing plant floor velocities to test tank velocities is not a requirement. The test tank has sufficient turbulence to ensure the solution is passed by all metallic, concrete and fibrous surfaces and carries those dissolved species and any subsequent hydrated precipitates through the debris bed. The circulation in the test tank is approximately 1.0 liter/min. The loop is approximately 59 liters and therefore, the fluid is turned over approximately once every 59 minutes. The minimum VEGP sump pool volume is 65,500 ft^3. This would produce a pool turnover of 64 minutes at the design flow rate of 7700 gpm which is slightly lower than that of the test tank.

33) 21.d.i 30-Day Integrated Head Loss Test: Licensees should provide the plant-specific test conditions and the basis for why these test conditions and test results provide for a conservative chemical effects evaluation.

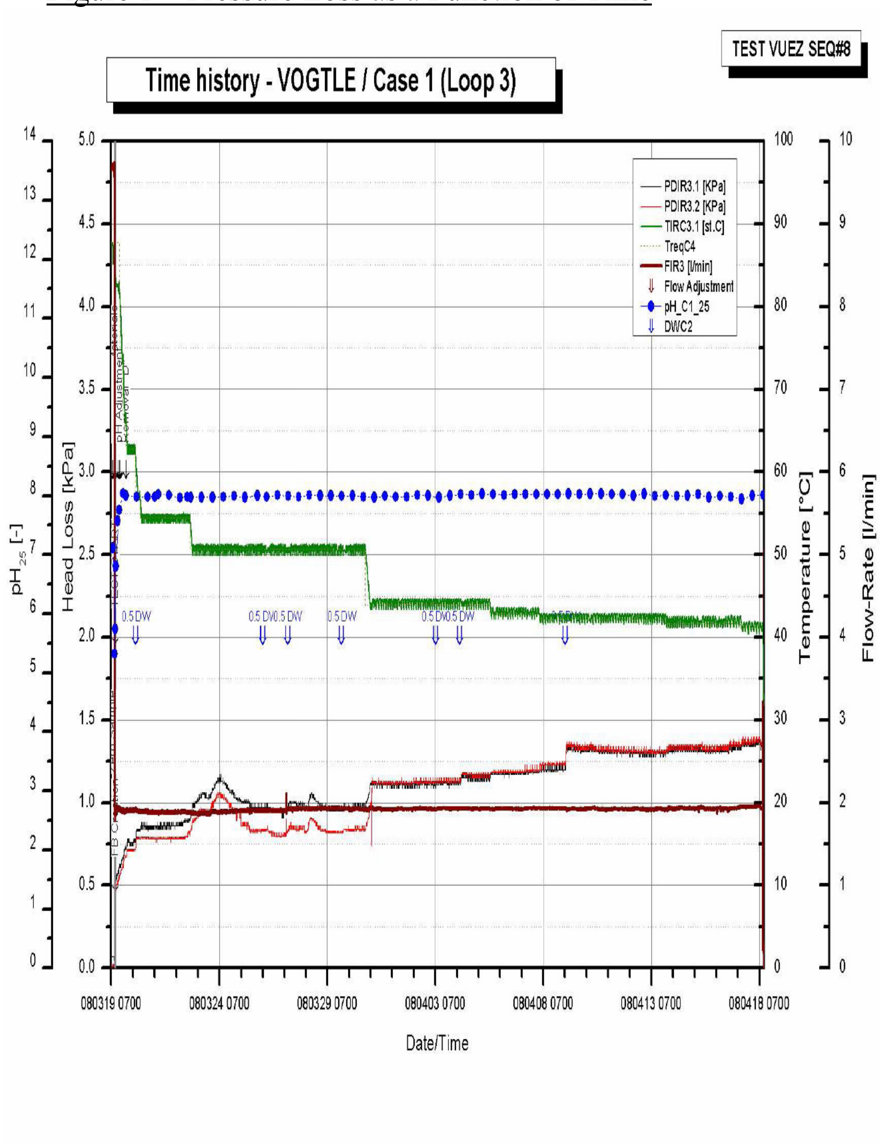
SNC Response to 3.o.33:

The testing and analyses performed in support of this assessment have made every attempt at balancing realistic conditions while maintaining a level of conservatism. The sump chemistry (pH) and quantity of materials were selected to maximize corrosion products or dissolution. The temperature profile was selected to be high early in the experiment to promote corrosion

and lower later in the experiment to promote precipitation. Although the aluminum solubility limit is much lower at lower pH, combining a high pH corrosion rate with a lower pH solubility limit is overly conservative and not possible. This analysis has compared the effects of corrosion and solubility of aluminum at the limits of the pH and has concluded that higher pH conditions result in greater aluminum dissolution rates. The testing at pH 8.1
has provided results which support an understanding of the chemical effects impact on head loss. The results derived from the flat plate screen used during the 30-day testing are considered conservative in that the flat plate is expected to have a uniform debris bed thickness and approach velocity, while prototype systems will have non-uniform debris deposition as a result of a non-uniform approach velocity along the surfaces of the full screen. In this manner, the underlying and reasonable assumption is that geometry effects associated with the complex screen can be factored out of the analysis and the debris head loss increase associated with chemical effects is primarily a function of the debris load only. In conclusion, this chemical assessment has performed a thorough identification of the plant specific inputs contributing to chemical effects which can lead to the increase in pressure drop through a plant specific debris bed. The results of this assessment can be applied to the screen vendor testing to develop the total debris head loss including chemical effects.

The following Figure 1 is the pressure loss curve as a function of time for the Vogtle VUEZ 30 day experiment.

Figure 1 – Pressure Loss as a Function of Time



34) 22.d.i Data Analysis Bump Up Factor: Licensees should provide the details and the technical basis that show why the bump-up factor from the particular debris bed in the test is appropriate for application to other debris beds.

SNC Response to 3.o.34:

Vogtle evaluated the impact of chemical effects on the limiting debris bed. The non-chemical head loss testing at CDI confirmed that the maximum debris head loss provided higher head losses over the thin bed debris load. The chemical effects testing performed by Alion evaluated the maximum debris bed to ensure the maximum impact of chemical effects was realized. The increase in head loss due to chemical effects for this test was for the most part negligible as expected. Figure 2 illustrates the beginning of the experiment. The reference or non-chemical head loss is at 12:10:24 on 3/19/2008, right after the acid addition and TEST START.

Figure 2 – Test Start Data

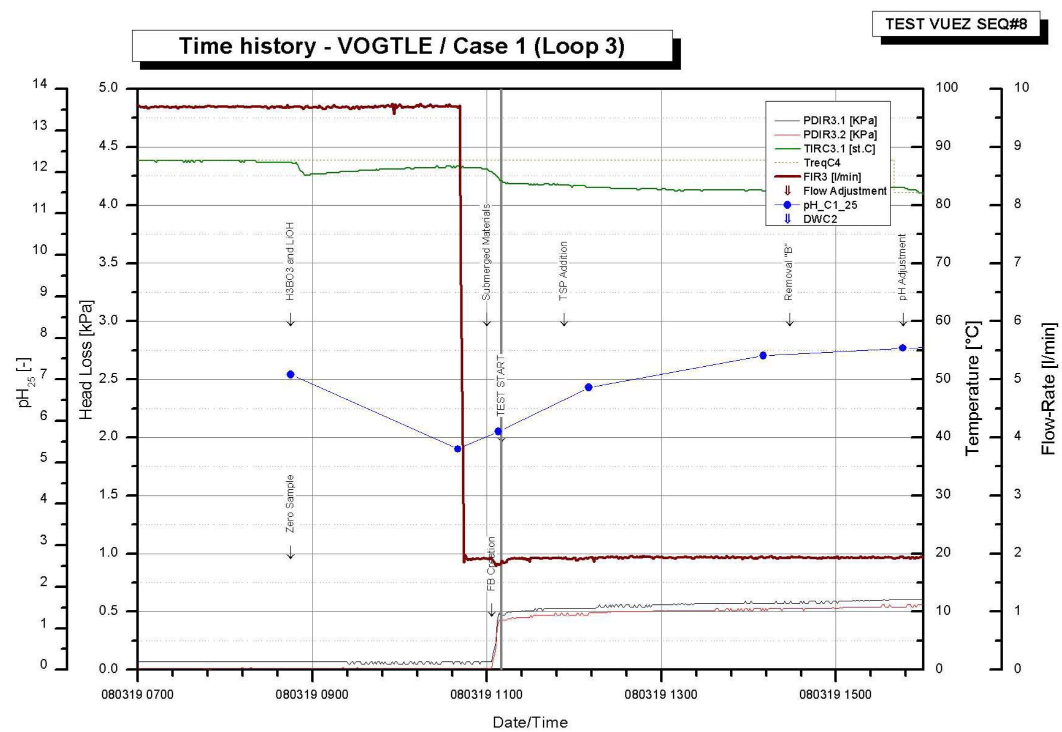
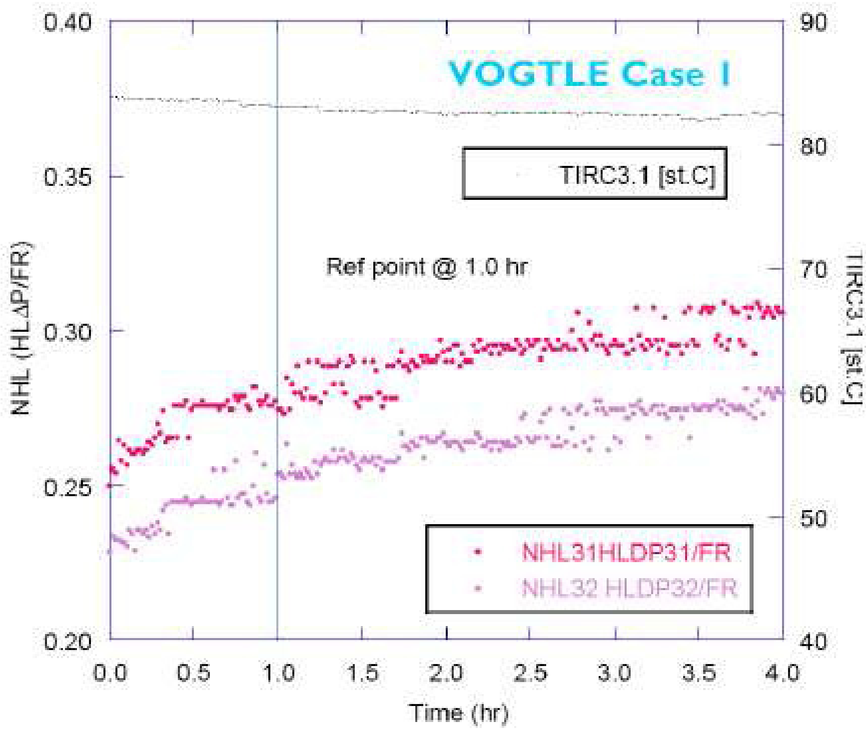


Figure 3 shows the normalized head loss after the debris bed formation. Redundant pressure probes were utilized to ensure data gathering capability. Figure 3 shows that the probes are slightly offset throughout the test; therefore, CBU results for both probes are presented.

Figure 3 – Normalized Head Loss



The chemical effect bump-up factor over the 30-day event is presented in Figure 4. Figure 4 shows that the CBU (w/o Temperature) for Probe 1 ranges from 1.0 to 1.4 at the end of the 30 days. Figure 4 also shows that the CBU (w/o Temperature) for Probe 2 ranges from 1.0 to 1.5 at the end of the 30 days. A maximum bump up factor of 1.5 developed from the test results was conservatively applied to the limiting non-chemical debris head losses to determine the maximum chemical effects head loss for plant conditions.

Figure 4- Chemical Bump Up Factor

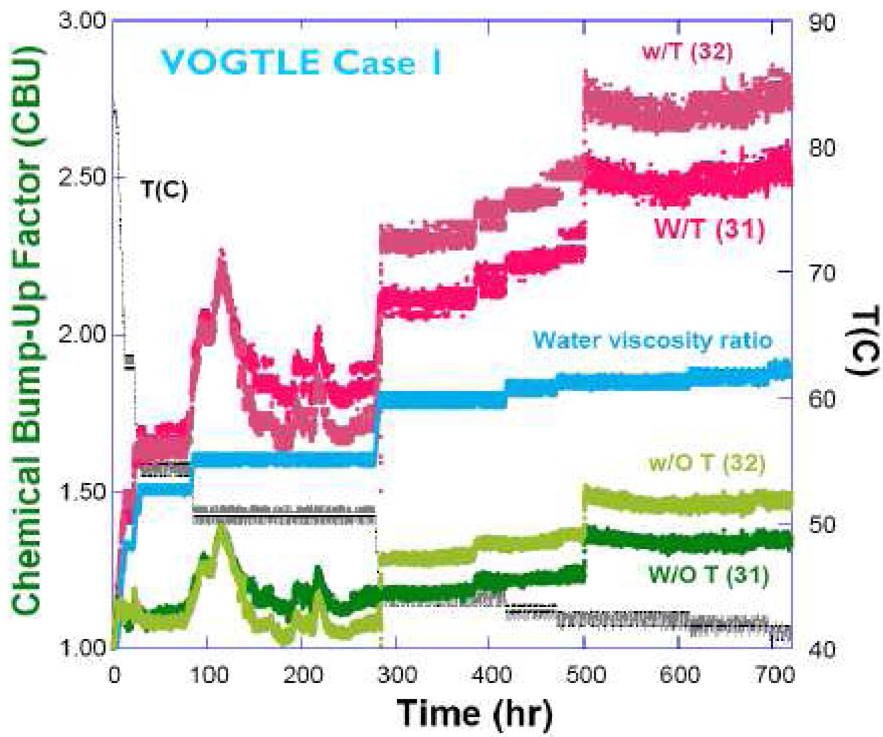


Table 1 provides the NPSH Margins available to the limiting RHR pump and Containment Spray Pump when the CBU is added to the maximum debris head loss. Only the lowest NPSH margin is provided for Containment Spray.

Table 1: Calculation of NPSH Margin

Temperature (°F)	NPSHA (Ft)	NPSH Required (Ft)	NPSH Margin
RHR Pump			
120	48.6	19.0	29.6
140	48.5	19.0	29.5
160	46.2	19.0	27.2
180	41.2	19.0	22.2
210.96	26.5	19.0	7.5
212	26.6	19.0	7.6
Greater than 212	26.6 (Increasing)	19.0	7.6 (Increasing)
CS Pump			
210.96	36.0	19.5	16.5