ALION
SCIENCE AND TECHNOLOGY

4525 Weaver Parkway, Suite 230
Warrenville, Illinois 60555
tel: 630.393.1215 fax: 630.393.1235
www.alionscience.com

February 22, 2008
261-4779-LTR-03

Mr. Michael L. Scott
Chief, Safety Issues Resolution Branch
Office of Nuclear Reactor Regulation
United States Nuclear Regulatory Commission
Mail Stop O-11A11
Washington, DC 20555-0001

Subject: Resolution of NRC Questions Regarding ALION VUEZ 30 Day Testing Program Status of Responses

Reference:
1. Alion Letter 261-4779-LTR-01, Dated February 8, 2008 entitled Resolution of NRC Questions Regarding ALION VUEZ 30 Day Testing Program Status of Responses.
2. NRC Questions – Alion Follow Up Issues – Corrected-Bolded, sent February 13, 2008.

Dear Mr. Scott:

As stated in the Reference 1 letter, the attached is our response to Alion Problem Statement No. 12. A table has been included indicating the status of each open item. The NRC comments and questions are taken from Reference 2.

Alion Problem Statement No. 12

What is the basis for representing failed metallic coatings as metallic sheets?

This response encompasses NRC comment No. 17.

17. Alion should demonstrate that it is acceptable to model the corrosion of metallic coatings (e.g., zinc and aluminum) based on their mass or volume rather than by their exposed surface area.

Response:

Alion does not specify the metallic constituents of its experiments based upon mass or volume, but on surface area. The surface area for metals coatings is based upon the surface area of the failed coating, which is provided by the debris generation calculation. This number is then adjusted, conservatively, to take into consideration the following:

1. Both sides of the failed coating chips are available for chemical attack,

2. The potentially small size of the failed coating (10 micron sphere) in a post-LOCA environment,
3. The actual solids content and metallic concentration in the final dried coating material.

The use of this methodology results in surface areas used to represent the metal in failed coatings to be at least an order of magnitude higher than that given for the failed coating by the debris generation report.

With respect to differences in the shape or form of the material, there is no reason to suggest that this would have any impact on the corrosion rates. The metallic particles like Zn or Al in the coatings are all electronically connected each other regardless of size and shape. Since the metallic particles are electronically connected to each other, the local charge distribution is evenly distributed by the electron flow under any charge developed during the corrosion progress. Therefore, the corrosion rate will be the same for different sizes of materials.

An example is provided below to demonstrate how the surface area of a metallic sheet is calculated to equal the quantity of additional zinc from unqualified IOZ coatings.

Example: From the debris generation input, the failed surface area of Unqualified IOZ coatings is 155 ft^2 with a coating thickness of 3 mils. Hence, the total volume of failed IOZ coatings is:

$$155\ ft^2 * (.003\ in. / 12\ in/ft) = 0.0388\ ft^3 = 1.097 \times 10^{15}\ micron^3$$

Since the coatings are assumed to fail to 10 micron size particulates, the volume of a 10-micron sphere is given by:

$$4/3\pi r^3 = 4/3 * (3.14) * 5^3 = 524\ micron^3$$

which yields,

$$1.097 \times 10^{15}\ micron^3 / (524\ micron^3 / 10\text{-micron sphere}) = 2.094 \times 10^{12}\ spheres.$$

The surface area of a 10-micron sphere is given by:

$$4\ \pi\ r^2 = 4 * (3.14) * 5^2 = 314\ micron^2$$

Therefore,

$$314\ micron^2/sphere * 2.094 \times 10^{12}\ spheres = 6.575 \times 10^{14}\ micron^2$$

$$\approx 7077.6\ ft^2\ of\ failed\ zinc\ surface\ in\ containment.$$

Taking the actual zinc content and assuming the % solids ≈ % volume and assuming Zn is uniformly distributed,

$$7077.6\ ft^2 \times 85\% \times 79\% = 4752.6\ ft^2,$$

where 85% is Zn% content and 79% is the actual solids% by weight from Carboline Carbozinc 11 MSDS

The VUEZ experiment models the 155 ft^2 of 3 mil Zinc coatings as 4752.6 ft^2 of infinitely thick plate. Clearly this is conservative. In reality, the 155 ft^2 of 3 mil Zinc coatings, assuming full dissolution, represents about 2 ~ 3 ppm of zinc in solution which is relatively insignificant.

If you have any questions or require additional information please contact me at (630) 846-6787 or Steven Unikewicz at (703) 439-7133.

Sincerely,

Robert Choromokos
Manager, Energy Services Division

cc: P. Mast
S. Unikewicz
Owner's Group Distribution

Table 1: ALION VUEZ CE Testing Questions

No.	NRC Issue/Comment	No.	ALION Problem Statement	Completion Date	Status
1 3 4	Prototypicality of poured debris bed Prototypicality of poured debris bed Representativeness of debris size distribution	1	Provide the basis for the debris bed preparation, including the size characteristics and method of formation relative to the prototype debris bed.	Feb 29 2008	
5 6	Maximum load versus thin-bed testing Maximum load versus thin-bed testing	2	How are the chemical effects captured for the range of debris loadings possible in the plant specific analysis given the impact of chemical effects could be different for different debris loading conditions?	Feb 15 2008	Sent
7	Flat plate representative of filled strainer volumes	3	Why is the debris bed on a flat plate representative of a debris bed on a complex shape and filled strainer volumes?	Feb 15 2008	Sent
9	Bypass flow around bed - edge effects	4	Describe the impact of the VUEZ screen configuration and suction piping on the results. The screen may exhibit bypass flow at the edges of the debris bed. How is this prevented or considered in the results?	Feb 29 2008	
10	Debris settling in tanks	5	Address the adequacy of the turbulence levels in the tank to ensure adequate circulation around all coupons/materials and material in suspension.	Mar 14 2008	
21 20	Flow conditions and material interaction Tank mixing versus time of material interaction	6	Address any material settling inside the tank and the impact on the results.	Mar 14 2008	
8	Gas void issues and impact on results	7	Describe the impact of gas void issues under the debris bed on the results.	Mar 21 2008	
2	Technical basis of bump-up factor	8	Provide the basis for the bump up factor and illustrate with an example.	Feb 29 2008	

Table 1: ALION VUEZ CE Testing Questions (cont'd)

No.	NRC Issue/Comment	No.	ALION Problem Statement	Completion Date	Status
11 12 13 14 18	Test parameters ensure a conservative test Basis for temperature correction Basis for timing of acid addition Basis for timing of LiOH addition pH shock and impact on head loss	9	Provide the basis for the selection of the time, temperature, chemistry and materials used for the test to ensure a conservative test is performed with respect to plant conditions.	Feb 15 2008	Sent
15	Impact of elevated pH due to debris in DM water	10	What is the impact of the elevated pH due to debris dissolution in demineralized water on the results of the experiment.	Mar 21 2008	
16	Impact of sudden temperature drop in HX	11	What is the impact of a sudden temperature drop from a heat exchanger and the potential for thermal cycling?	Mar 14 2008	
17	Representativenss of plate for failed metallic coatings	12	What is the basis for representing failed metallic coatings as metallic sheets?	Feb 22 2008	Sent
19	Inclusion of fiberglass binder in experiment	13	What is the impact of neglecting the fiberglass binder in the experiment?	Mar 7 2008	
22 23	Volume change due to material additions Effect of sampling on chemical concentrations	14	What is the impact of fluid sampling on the experiment?	Mar 7 2008	
24	Repeatability of tests	15	Are the tests repeatable?	Feb 15 2008	Sent
25	Measurement uncertainties	16	How are measurement uncertainties accounted for in the development of the test parameters and application of the experimental results.	Mar 28 2008	
26	Copy of test procedure for large Elisa Loop	17	Provide a copy of the large loop test procedure.	Feb 15 2008	Sent
27	Copy of alkyd coatings chemical report	18	Provide a copy of the alkyd coatings chemical report?	Feb 15 2008	Sent
28	Quality assurance	19	Provide a summary of any quality assurance issues noted and their impact on results or corrective actions taken.	Mar 28 2008	