June 27, 2006

MEMORANDUM TO: Jared S. Wermiel, Deputy Director
Division of Safety Systems

FROM: Michael L. Scott, Chief ***/RA/***
Safety Issues Resolution Branch
Division of Safety Systems

SUBJECT: STAFF OBSERVATIONS OF TESTING FOR GENERIC SAFETY ISSUE 191 DURING APRIL 28, 2006, TRIP TO THE ALION HYDRAULICS LABORATORY

On April 28, 2006, the NRC staff traveled to the Alion Hydraulics Laboratory in Warrenville, Illinois, to observe generic testing associated with the resolution of Generic Safety Issue 191 (GSI-191). The objectives of the trip were to observe in-progress large-tank qualification testing of a modular strainer array simulating the proposed top-hat replacement suction strainer design for San Onofre Nuclear Generating Station (SONGS) and to familiarize NRC staff with Alion's testing capabilities. The trip was coordinated with a separate staff visit to Fauske & Associates (ADAMS Accession ML061720472) to observe work sponsored by industry to identify a replacement buffering agent for use in pressurized water reactor containment pools. The staff was informed before the trip that the SONGS testing had been delayed. However the staff continued with plans to visit the Alion Hydraulics Laboratory to observe preparations for the SONGS test and also to observe other test activities underway at the facility. The participating NRC staff members were Ralph Architzel of NRR/DSS/SSIB, Paul Klein and Matt Yoder of NRR/DCI/CSGB, and Paulette Torres of RES/DET. The staff interacted with licensee personnel from SONGS along with vendor personnel from Enercon Services, and Alion Science and Technology.

A member of the NRC staff had previously visited the Alion laboratory on February 24, 2006, to observe plant-specific testing for another licensee and provided a summary of staff observations (ADAMS Accession ML060750467). The information that follows summarizes the visit on April 28, 2006.

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Facility Tour

The Alion laboratory has several hydraulic test apparatuses, including (1) a large tank for performing integral head loss testing of modular strainer arrays or strainer prototypes, (2) a small-scale vertical head loss test loop, (3) a small-scale multi-function test loop that has temperature control capability and is intended to be used for chemical effects testing, and (4) a small-scale transport flume. The test facilities are somewhat flexible in function.

Figure 1 Strainer in Flume

The staff observed an informal flow test of a single strainer module in the small transport flume (Figure 1). The test allowed the staff to qualitatively observe the tendency for increased suction to occur at the base of the top-hat strainer module (which was nearest to the suction line) relative to its top (i.e., farthest from the suction line). By placing a hand near the strainer surface the staff felt a pronounced variation in the suction force along the lengthwise axis of the top-hat strainer module, which appeared to explain staff observations that the top-hat strainers tend to load non-uniformly in the axial direction (i.e., with increased debris accumulation at the base of the strainer module). The test also included coatings debris in the form of epoxy chips which had been purchased commercially. The staff observed that the coatings tested tended to sink past the strainer unless they directly settled on a nearly horizontal surface.

The vertical test loop that is intended to be used for chemical effects testing has a 16-gallon capacity, is compatible with a representative sump environment, and is capable of operating at up to a maximum temperature of 160°F (Figure 2). The laboratory had equipment for generating precipitates per the methodology outlined in WCAP 16530-NP, and loop testing was planned to evaluate the head loss effects of each precipitate. Alion personnel described their overall approach to plant-specific chemical effects evaluations. Debris bed type and thickness in the vertical head loss loop will be scaled for consistency with the full-scale testing. Head loss measured in the vertical test loop using plant-specific debris and plant specific environments (e.g., pH, temperature) will be used to develop a "bump-up" factor to be applied to existing large-scale array test results. Testing will be performed to compare head loss in representative containment pool environments with non-representative environments (e.g., deionized water).

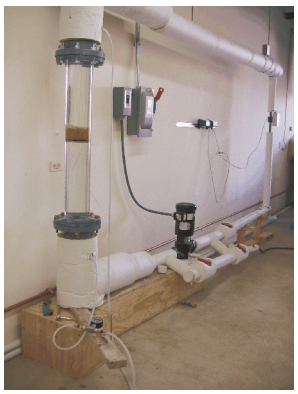

Figure 2 Chemical Effects Loop

The original primary purpose of the staff's trip was to observe setup testing of an array of full-size double top-hat strainer modules in the large test tank for the SONGS plants. This testing was not able to be started before the staff visit; however the staff observed the array to be tested, discussed preparations for the test with both licensee and vendor (Alion/Transco) staff, and discussed recent test results for other plants' strainer arrays in the large tank test facility. The modular array

Figure 3 Inner Filter Removed after Testing

will be housed in a chamber constructed of sheets of plexiglass. The purpose of the plexiglass chamber was to simulate the presence of a sump pit and/or other nearby strainer modules. The staff also observed disassembly of several inner filters that were installed inside the top-hat strainers during recent debris head loss testing. The filters appeared effective in capturing fibrous debris that had passed through the strainer perforated plates. Additionally Alion staff discussed filter bypass testing and observed results which identified significantly less bypass of debris when the inner filters where installed in the top-hat strainers. The debris that was able to bypass the inner filters was generally smaller than the debris that bypassed the strainer without the inner filter installed. Although the top-hat strainers had been completely engulfed in fibrous debris, debris captured by the inner filters was neither uniform nor a continuous bed in the worst case (Figure 3). As mentioned previously, the staff also observed set-up testing for a horizontal top-hat which included epoxy coatings chips and fiberglass, discussed debris preparation and test methods, vendor plans to conduct chemical effects tests, and became familiarized with the testing arrangements at the Alion Hydraulics Laboratory.

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