August 28, 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 STRAINER INSTALLATION DURING MAY 12, 2006, TRIP TO INDIAN POINT 2

On May 12, 2006, the NRC staff traveled to the Entergy Indian Point Energy Center to view the in-progress installation of new sump strainers at Indian Point 2 (IPP2). The participating NRC staff were Leon Whitney, John Lehning and Roberto Torres. The staff plans to audit the licensee's corrective actions to address Generic Letter (GL) 2004-02 "Potential Impact of Debris Blockage on Emergency Recirculation During Design Basis Accidents at Pressurized Water Reactors" at IPP2, and this observation visit supports the planned Fall 2006 audit at IPP2.

The strainers viewed were provided to Entergy by Enercon Services/Transco. A report in ADAMS (ML060750467) documents John Lehning's observations of previous Indian Point strainer testing. While in containment, John Lehning and Roberto Torres walked down all levels of containment to view conditions and equipment as discussed below.

The main licensing organization contact for this visit was Donna Tyner (supporting Kevin Kingsley, who was on swingshift during the team's visit). There were brief interactions with T. R. Jones and George Dahl, also of the Entergy licensing organization. There were no meetings held with the licensee other than necessary for preparation for containment entry. Davi Shih, Entergy Project Manager for the strainer installation, and two contractor personnel from Enercon Services, Inc., accompanied the staff during the containment entry.

CONTACT: Leon Whitney, NRR/DSS/SSIB
301-415-3081
John Lehning, NRR/DSS/SSIB
301-415-1015

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OFFICE	SSIB	BC:SSIB
NAME	LWhitney	MScott
DATE	08/ 23 /06	08/ 28 /06

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Indian Point Unit 2 Sump Configuration

IPP2 is equipped with two sumps[redacted]apor containment (VC) sump. The IR[redacted]R pumps inside containment, which provide the p[redacted]on phase of an accident. The VC sump provides[redacted]y by supplying suction to two 100%-capacity res[redacted]ontainment. The VC sump is not placed into s[redacted]

Double Top-Hat Strainer Module[redacted]

The IPP2 replacement strainer d[redacted]osed to other plants' single top-hat designs tha[redacted]he diagram below provides the basic concep[redacted]onnection to the suction plenum is not pictured).

(a) Front View (b) Side View

Figure 1: Double Top-Hat Strainer Module (not to scale)

On the front view, the shaded annular areas represent solid metal plate surface, and the white annular areas represent the interstitial volumes of the strainer. On the side view, the darker rectangular areas represent perforated plate surface, and the lighter rectangular areas represent internal interstitial volumes. Perforated strainer area exists on the outer cylindrical surface of the top hat module, as well as on the three inner cylindrical surfaces. Each double top-hat strainer module can accommodate two downstream filters, one inside each annular internal volume (i.e., inside the volumes represented by the dark shaded areas in the above diagram). Vendor personnel indicated that the IPP2 strainer perforations will be 3/32 inch in diameter.

Status of Sump Modifications

The staff observed the progress of modifications to install replacement strainers for both the IR sump and the VC sump. The planned replacement strainers for IPP2 will have surface areas of 3,200 ft^2 for the IR sump and 1,200 ft^2 for the VC sump.

At the time of the staff's observation, a structural matrix for strainer modules was being installed in the IR sump. An area on the containment floor (external to the IR sump) where additional strainer modules would be located had been marked with tape to show the extent of the replacement strainer modules. Similar work was noted with respect to the smaller VC sump.

The staff also noted that the double top-hat strainer modules had been brought into containment and were staged at various levels of containment. The vendor stated that downstream filters had been installed in the strainer modules.

The licensee stated that no concerns had been identified with respect to protecting the sump strainers from jet impingement and missiles.

Containment Flow Channeling Modifications

The staff observed the containment modifications performed by the licensee to (1) increase the tendency for debris to settle in calm areas of the containment pool and (2) interdict large pieces of debris traveling toward the sumps.

Two holes of approximately 20 inches square had been cut into the crane wall to direct flow of water on the containment floor to the reactor cavity/in-core tunnel area, where velocities and turbulence levels are relatively low. As a result, some types of debris that are diverted into the reactor cavity/in-core tunnel area may have reasonable opportunity to settle prior to reaching the sump strainers. On the floor of the containment, the staff viewed the reactor cavity/in-core tunnel area. This area appeared to be approximately 20 ft below the containment floor level. At a depth approximately halfway to the bottom of the reactor cavity/in-core tunnel, the staff observed another level of grating. Vendor personnel noted that the presence of this grating would result in an increase in the uniformity of the flow pattern through the reactor cavity/in-core tunnel area.

To ensure that large and some small pieces of debris cannot bypass the reactor cavity/in-core tunnel settling pathway, the licensee is in the process of installing debris interceptors with 1/2-inch holes at key locations along the containment floor to prevent pieces of debris of larger dimensions from transporting directly to the sump strainers. However, flowing water (as well as small fines and fine particulate debris) would be permitted to pass through the debris interceptors directly to the sump strainers.

The licensee stated that computational fluid dynamics (CFD) had been used to validate the licensee's understanding of the predicted flow pattern induced by the flow channeling modifications.

Miscellaneous Observations

Although the containment entry focused upon the objectives described above, the staff briefly observed the material condition of various equipment and components in the containment, including the internal recirculation pumps, trisodium phosphate (TSP) buffer baskets, various primary system components (e.g., coolant pumps, steam generators, and the pressurizer) and their thermal insulation arrangements, the refueling cavity drainage path, containment coatings, and general containment cleanliness with respect to latent debris (allowing for the fact that IP2 was in a refueling outage). The staff noted that all insulation observed in the IPP2 containment (including Cal-Sil) appeared to be metal jacketed.