TOXECON II™ AND HIGH-TEMPERATURE REAGENTS OR SORBENTS FOR LOW-COST MERCURY REMOVAL

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This two-site project is part of an overall program funded by the Department of Energy's National Energy Technology Laboratory (NETL) and industry partners to obtain the necessary information to assess the feasibility and costs of controlling mercury from coal-fired utility plants. Host sites included in this program are Entergy's Independence Station, and MidAmerican's Louisa Station. TOXECON II™ evaluations through the DOE program were completed at Independence Station in 2007. High temperature sorbents were tested at Louisa Station in 2006. A summary of results from TOXECON II™ testing at Independence will be presented during this NETL meeting.

TOXECON II™ testing has been underway at Entergy's Independence Steam Electric Station (ISES), Unit 2 since 2005 on 1/16 to 1/8 of the 842MW unit. Independence fires Powder River Basin (PRB) coal and is configured with a cold-side ESP for particulate control (SCA 542 ft^2/kacfm). The primary contractor for TOXECON II™ testing at Independence is ADA-ES, Inc. Funding for testing has been provided by DOE NETL through DOE contract DE-FC26-05NT42307, Entergy, EPRI, and ADA-ES. Supplemental funding beyond the DOE program has been provided by EPRI. This presentation will summarize results from testing at ISES Unit 2 through the end of the field testing phase of the DOE program.

TOXECON II™ is a retrofit mercury control technology that requires minimal capital investment because it requires only minor retrofits to the ESP for the sorbent injection system instead of installing a separate secondary particulate control device. The primary benefit of the TOXECON II™ process is that approximately 90% of the fly ash is collected in the upstream ESP fields prior to sorbent injection. Sorbent is injected between the middle fields, generally after the first two fields, allowing the majority of the ash to be segregated from the treated sorbent/ash mixture. Therefore, the main advantage of TOXECON II is it permits plants, like Independence, to maintain sales of most of their fly ash.

Significant effort has been expended during the TOXECON II™ program at Independence to optimize sorbent distribution, including redesign of the sorbent injection grid and delivery system. Lance improvements resulted from extensive modeling efforts by ADA-ES (physical), Nels Consulting Services Inc. (physical), and Reaction Engineering International (CFD). Three lance designs were evaluated during the program at ISES. The initial, multi-nozzle per lance design was used to evaluate four powdered activated carbon (PAC) sorbents during parametric testing: NORIT DARCO® Hg, DARCO® Hg-LH,

DARCO® E-10, and DARCO® E-11. Results from these initial tests indicated that mercury removal was limited to less than 80% at injection concentrations up to 10 lb/MMacf. The four materials showed little difference in their mercury removal performance.

In 2006, significant modeling efforts were undertaken. In February and March 2007, tests with lances redesigned to improve the sorbent distribution yielded 89% mercury removal at high and low loads using DARCO® Hg-LH. In May 2007, a third lance design was evaluated. The mercury removal varied with boiler load from 78% (high boiler load) to 92% (low boiler load). During these latter tests, both DARCO® Hg-LH and Calgon FLUEPAC™-MC PLUS were evaluated and no difference in performance was noted.

The mercury removal achieved with the new lance designs was within the range expected based upon results achieved with injection upstream of the ESP. Operational issues, such as sorbent settling and plugging the conveying system, were encountered with the later lance designs. It is expected that these issues would be overcome if the conveying system were redesigned for the operating requirements of the upgraded lances. It is possible that improved mercury removal performance could also be achieved if the conveying system were modified to overcome operational issues.

Testing to date indicates extremely promising results. However, testing has also shown that system design is critical to achieving the expected results. This presentation will review results from the program at Entergy's Independence Steam Electric Station, including mercury removal performance and the impacts of sorbent injection on ESP performance and particulate emissions.