

FY03-XLVIII-117

“Mercury and Air Toxic Impacts of Coal Combustion Byproduct Disposal and Utilization”

CONTRACTOR: Energy & Environmental Research Center

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PARTICIPANTS

<u>Sponsor</u>	<u>Cost Share</u>
Great River Energy	\$37,500
Utility Solid Waste Activities Group	\$75,000
Center for Air Toxic Metals	\$75,000
Energy & Environmental Research Center	\$25,000
Cinergy Corp	\$75,000
EPRI	\$75,000
DOE-NETL	\$1,200,000
NDIC	<u>\$37,500</u>
Total Cost	\$1,600,000

Project Schedule - 36 Months

Contract Date –5/22/03
Start Date –5/22/03
Completion Date –5/30/06
Extension – 9/30/06

Project Deliverables

Contract Award ✓
1st Annual 2004 5/30/04 (✓)
Task 3 & DOE funds 11/15/04 (✓)
2nd Annual Report 5/30/05 (✓)
Task 5 & DOE funds 12/31/05 (✓)
Final Report – 9/30/06 (✓)

OBJECTIVE / STATEMENT OF WORK

The goal of the proposed project is to evaluate potential impacts of mercury and other air toxic elements on the management of coal combustion byproducts (CCBs). Supporting objectives are to: 1) Determine the potential release of selected air toxic elements such as mercury from CCBs under specific environmental conditions; 2) Increase the existing database on mercury and other air toxic elements with respect to potential release into the environment; 3) Develop appropriate laboratory and field experimental protocols; and 4) Develop comparative laboratory and field data. The study will facilitate the comparison of data from existing and evolving emission control systems and the anticipated results will support continued environmentally responsible management of CCBs and development of guidelines for appropriate utilization and disposal requirements. The study will also facilitate the maintenance of current CCB markets and minimize potential barriers to further utilization of CCBs.

STATUS

Year 1 Annual Report (May, 2003 – May 2004)

Project activities focused on: Assembling literature to facilitate sample and methods selection; Identifying and obtaining appropriate CCBs for laboratory evaluations; Continuing the development of methods to evaluate mercury and air toxic releases from CCBs; Determining the release of mercury under different conditions for the three mechanisms.

Year 2 Annual Report (May 2004 – May 2005)

By-product field samples include fly ash, FGD material, bottom ash and coal mill rejects. The samples are representative of bituminous, subbituminous and lignite coals. Leaching and other tests are on-going, with a preliminary conclusion that total mercury and leachable mercury have no correlation.

Final Report

A multiyear study was conducted to evaluate the impact of mercury and other air toxic elements (ATEs) on the management of coal combustion by-products (CCBs). The ATEs evaluated in this project were arsenic, cadmium, chromium, lead, nickel, and selenium. The study included laboratory tasks to develop measurement techniques for mercury and ATE releases, sample characterization, and release experiments. A field task was also performed to measure mercury releases at a field site.

Samples of fly ash and flue gas desulfurization (FGD) materials were collected from full-scale coal-fired power plants operating both without and with mercury control technologies in place. In some cases, samples from pilot- and bench-scale emission control tests were included in the laboratory studies. Several sets of “paired” baseline and test fly ash and FGD materials collected during full-scale mercury emission control tests were also included in laboratory evaluations. Samples from mercury emission control tests all contained activated carbon (AC) and some also incorporated a sorbent-enhancing agent.

Laboratory experiments focused on measuring releases of mercury under conditions designed to simulate CCB exposure to water, ambient-temperature air, elevated temperatures, and microbes in both wet and dry conditions. Results of laboratory evaluations indicated that:

- Mercury and sometimes selenium are collected with AC used for mercury emission control and, therefore, present at higher concentrations than samples collected without mercury emission controls present.
- Mercury is stable on CCBs collected from systems both without and with mercury emission controls present under most conditions tested, with the exception of vapor-phase releases of mercury exposed to elevated temperatures.
- The presence of carbon either from added AC or from unburned coal can result in mercury being sorbed onto the CCB when exposed to ambient-temperature air.

The environmental performance of the mercury captured on AC used as a sorbent for mercury emission control technologies indicated that current CCB management options will continue to be sufficiently protective of the environment, with the potential exception of

exposure to elevated temperatures. The environmental performance of the other ATEs investigated indicated that current management options will be appropriate to the CCBs produced using AC in mercury emission controls.