

FY-02-XLV-114
**“Mercury Control Technologies for Electric Utilities
Burning Lignite Coals”**

CONTRACTOR: Energy & Environmental Research Center

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PARTICIPANTS

<u>Sponsor</u>	<u>Cost Share</u>
Basin Electric Power Cooperative	\$ 25,000
Minnkota Power Cooperative	\$ 25,000
OtterTail Power Company	\$ 25,000
Environment Canada, Canada	\$100,000
SaskPower, Saskatchewan, Canada	\$100,000
Luscar Ltd	\$ 25,000
EPRI (Minnesota Power, Excel, GRE tailored collaboration)	\$ 50,000
DOE	\$333,000
NDIC	<u>\$150,000</u>
Total	\$ 833,000

Project Schedule - 13 Months

Contract Date – 4/30/02
Start Date - 5/30/2002
Completion Date 6/30/03

Project Deliverables:

Project Mgmt Plan – May 16, 2002 ✓
Status Report – Aug 15,2002 ✓
Status Report – Nov 15,2002 ✓
Strategic Report – Nov 26, 2002 ✓
Status Report – Feb 15,2003 ✓
Status Report – May 15,2003 ✓
Final Report – Jun 30,2003 ✓

OBJECTIVE / STATEMENT OF WORK

The EERC has formed a consortia-based project that will focus on developing cost-effective elemental mercury control technologies for utilities burning lignite coals. The EERC has proposed the first of a two-phase program. Phase 1 of the program will develop an improved understanding of mercury-sorbent interactions under flue gas conditions that are found in lignite fired power plants. As these interactions are better understood, a group of sorbents will be selected and tested to determine relative elemental mercury capture efficiencies. The test program will consist of laboratory scale screening followed by pilot scale tests of the

most promising sorbents/additives. If pilot scale test results show promise, a Phase 2 field demonstration program would be proposed at an operating lignite-fired power plant.

STATUS

First Quarter Task 1 bench-scale tests to screen a number of potential mercury capture sorbents have been completed. This activity focused primarily on identifying and selecting high-sodium lignites to produce activated carbon and testing the sorbents in a fixed-bed reactor for their ability to capture Hg^0 . Results of fixed-bed testing showed some initial breakthrough followed by increased mercury capture up to about 3 hours. After 3 hours, the released mercury was primarily in an oxidized form (>90%). These results suggest that steam-activated carbons produced from any of the received lignites could produce comparable effective mercury capture sorbents. The most promising sorbents have been selected for pilot-scale testing. Selection criteria included reactivity (as compared to baseline FGD), capacity, physical properties (particle size, surface area, functionality), and cost. Pilot-scale testing is underway.

July 1, 2002 – September 30, 2002 Quarterly Report

Pilot plant testing was performed to quantify the mercury control performance of various sorbents and emission control configurations. Norit FGD and Luscar char-derived sorbents were evaluated for mercury removal from combustion flue gas from lignite coals from the Poplar River Station and from the Freedom mine. Four emission control configurations were tested: ESP, pulse-jet FF, Advanced Hybrid FF and an ESP-FF. Both the Norid and Luscar char sorbents observed effected mercury capture. The ESP configuration required much higher levels of char injection. Relatively high char injection levels were required for the FF unit due to the high cleaning pulse rate.

November 6, 2003 Final Report

Results of tests indicate the following:

- Incomplete combustion of Poplar River and Freedom lignite produced unburned carbon that promoted mercury oxidation.
- High temperature activation Luscar and Darco produced more reactive char than lower temperature activation.
- Control systems utilizing fabric filters were more effective at reducing mercury than an ESP. Effectiveness ranking is: Toxecon & Advanced Hybrid > FF > ESP.