FY-03-XLIX(49) – 122
"Thermal Pre-Combustion Mercury Removal Process for Low Rank Coal-Fired Power Plants"

CONTRACTOR: Montana-Dakota Utilities
PRINCIPAL INVESTIGATOR: Duane Steen

Sponsor	Cost Share
Montana-Dakota Utilities (In-kind)	$28,790
Alliant Energy	$159,919
Alliant Energy (In-kind)	$150,000
DOE	$478,850
NDIC	$139,403

Total Cost	$956,962

Project Schedule – 18 Months

Contract Date – 8/7/03

Start Date – 8/7/03

Completion Date – ~~12/31/04~~

Extended – 9/30/05

Project Deliverables

Contract Execution ✓

Reports 2003: 12/31/03 ✓

Reports 2004: 6/30/04✓ ; 8/31/04; ✓

10/30/04✓ ; 11/30/04✓ ; 12/1/04✓

Final Report: ~~12/31/04~~

Extended: 9/30/05✓

OBJECTIVE / STATEMENT OF WORK

The goal of the proposed project executed by the Wyoming Research Institute (WRI) is to evaluate the potential of scaling up a pre-combustion, thermal-based technology for the removal of mercury from low rank coals, both subbituminous and lignite. The specific objectives of this effort are intended to obtain data required to determine if this technology can successfully be deployed in PRB and lignite-fired power plants, and to provide the engineering data required to scale the process to the demonstration unit size (100 tons/hr).

STATUS

Test coal from the Westmorland mine has been collected for preliminary laboratory tests to define test parameters for larger PDU efforts. The PDU design is on-going. A pilot coal drying unit has been acquired from the former Colstrip Western SynCoal Demonstration facility. Efforts are also addressing integration of the coal drying process into power plant operations.

Pre-combustion bench-scale data was scalable and directionally consistent with pilot plant results, with up to 93% mercury removal. Combustion tests indicate that NOx levels were also reduced, with some evidence of sulfur and other trace metals. Additional tests will

consolidate the qualitative inferences and quantify possible technology advantages of thermal pretreatment of the lignite coal.

Final Report

Removal efficiencies of approximately 50-57% for lignite and 55-87% for subbituminous coal were demonstrated. The thermally treated coal results in increased oxidation of elemental mercury that in turn favors additional removal at the back end of the boiler island. Hence, the total mercury removal in the boiler plant will exceed the levels reported here. The increased cost of electricity is lower than that achieved with activated carbon injection for similar levels of mercury removal. The WRI thermal treatment process has the potential of being a cost-competitive stand-alone mercury control technology and when combined with small amounts of activated carbon (without affecting ash quality) can achieve over 90% total mercury removal. In addition, the process removes moisture from the coal resulting in increased boiler performance.