

(19) The Use of Real Time Measurement and Artificial Intelligence to Improve Efficiency and Reduce Emissions at Coal-Fired Power Plants

This two-year effort will seek to develop a technique to measure coal properties in real time, and to process the data such that coal-fired electric utility operators can adjust their operation to avoid slagging and fouling.

Total project cost: \$750,000

Funding request: \$600,000

Project Lead: NYSERDA

Project Participants: Brayton Point Generating State; Energy Research Company; Lehigh University

Start Date: August 1, 2005

End Date: August 1, 2007

Presentations/Publications

A meeting was held with personnel at Constellation Energy, a coal-fired power plant in MD. ERCo and LU-ERC provided a briefing on the project goals and plans. They are interested in the system being developed.

Patents

None.

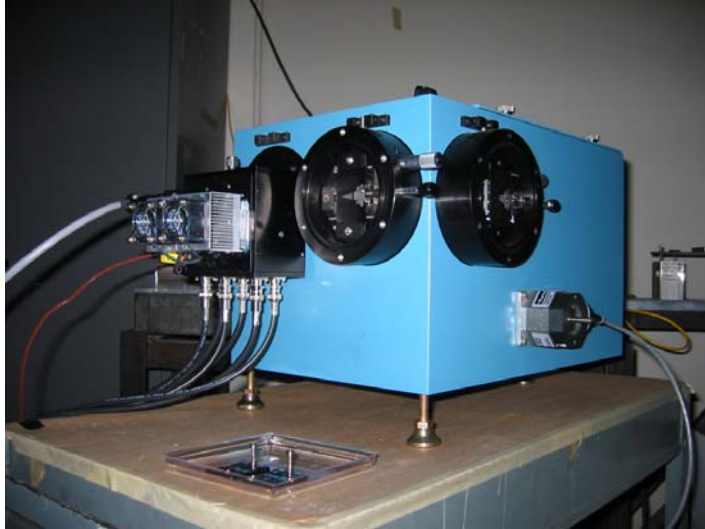
Progress in Past Quarter and Current Status

The LU-ERC finished the development of the coal inventory. This coal inventory contains coal samples from coal-fired boilers (Logan St., Harrison St., Bridgeport St., Hatfield Ferry St., St. Clair St., Brandon Shores St., Pleasants St.) and all coals that Brayton Point fires at its boilers. These coals have known slagging/fouling characteristics and cover a broad range of slagging propensities. The coals samples were sent to an analytical laboratory for ultimate, proximate, ash trace mineral and ash fusion temperature analyses. Different slagging indices were calculated for these coals based on the laboratory test results. ERCo will conduct LIBS tests on the samples.

The LU-ERC has used the NeuFrame software package to model the U.S. Geological Survey Report No. 94-205 in terms of developing neural network models that relate coal and ash properties to calculated slagging indices. The models are being refined to include only parameters are readily available from the LIBS technology and slagging indices that are based on the base-to-acid ratio and the ash fusion temperatures.

A specialized spectrometer was fabricated and is shown in the figure below. It will be used to measure Hg in the coal down to very low values.

The sample chamber, discussed in the previous progress report, is nearly completed. It will be tested next quarter.



Plans for Next Quarter

- The LU-ERC will participate in LIBS testing of the coal inventory to determine mineral concentration for all available coal samples.
- The LU-ERC will coordinate the Brayton Point Station plant measurements.
- Shakedown testing of the test chamber will be completed.