



# SOUTHERN ILLINOIS UNIVERSITY CARBONDALE

## CLEAN COAL REVIEW BOARD

### Ashworth Combustor Retrofit

ClearStack Combustion Corporation

This project demonstrates the commercial viability of ClearStack Combustion Corporation's Ashworth Combustor™. This novel combustion technique uses three stages of combustion, which reduces SO<sub>2</sub>, NO<sub>x</sub>, and particulates. The host site for the first retrofit was the Illinois Department of Human Service's Lincoln Development Center in Lincoln, Illinois. Phase two of the project will be carried out with assistance from Ameren AEG, Promecon, and Sargent and Lundy. This project will determine whether or not, AEG's Hutsonville Boiler #6 can be retrofitted with the Ashworth Combustor System.

Lincoln site:

Total Project: \$3,340,613

Board Commitment: \$1,000,000

Hutsonville Site:

Total Project: \$840,160

Board Commitment: \$252,048

#### Progress Report

Hutsonville Site: Several modeling tasks are underway concerning the AEG Hutsonville site. Conceptual engineering completed so far shows that the retrofit is feasible without major interference to the plant. Hutsonville Boiler #6 (Unit #4) is a nominally 85 MWe CE tangential-fired boiler. It has an electrostatic precipitator for particulate control and a sulfur trioxide (SO<sub>3</sub>) flue gas conditioning system to reduce fly ash resistivity, but has no SO<sub>2</sub> control equipment, low NO<sub>x</sub> configuration burners, or separated overfire air (SOFA). However, coal firing is done in an air-biased fashion to reduce NO<sub>x</sub> emissions somewhat. With the current operation using a 75/25 WY/IN coal blend, at full load the SO<sub>2</sub> and NO<sub>x</sub> emissions are 1.2 lb and 0.28 lb per million Btu, respectively. The engineering assessment showed the most economic Ashworth Combustor retrofit would be to locate the first stage Ashworth gasifiers on three corners of the boiler furnace.

Based on an October 1, 2005 start date, the project could meet a 2007 spring outage for the retrofit of the technology. Process and detail design activities are projected. The gasifiers are the long lead time items and would be delivered to the site in the early spring of 2007 with demolition and construction starting after the boiler shutdown. Commercial operation would begin in mid-2007. Following startup, a testing period would begin to assess operability and air pollutant emissions.

Lincoln Site: The coal used for all test burns was from Turris Mine, a #5 Seam Illinois coal. A CEMS unit was used to determine emissions of nitrogen oxides, sulfur dioxide, and carbon monoxide. NO<sub>x</sub> emissions were as low as 0.095 lb/10<sup>6</sup> Btu using the three-stage combustion technique. Sulfur dioxide emissions were reduced to approximately 1.7 lb/10<sup>6</sup>, a 76% reduction, achieved with a limestone Ca/S ratio of 0.85. Carbon monoxide emissions were 15-30 ppmv @ 3 vol% O<sub>2</sub> dry. Mercury removal data indicated that the Ashworth Combustor removed nearly 100% of mercury, either in the first stage molten slag or in the fly ash. Leaching procedure tests conducted on first stage slag and fly ash indicated no leaching of mercury. The results indicate that the Ashworth Combustor is a very promising coal combustion technology because it reduces multi-pollutants. This staged combustion technology, in the near term, has its best application to coal-fired power plant units of 200 MWe and less; units that are uneconomical for the addition of Selective Catalytic Reduction plus Wet Scrubbers.

Last Updated February 22, 2007