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"Combustion Optimization System" -- Cleaner Coal Burning at Lower Costs

DOE Joins with Sunflower Electric to Outfit Kansas Coal Plant with Lower Cost System to Cut Air Emissions

Finney County, Kansas - A unique combination of high-tech combustion modifications and sophisticated control systems will be tested on a Kansas coal-fired power plant as part of the federal government's efforts to show how new technology can reduce air emissions and save costs for ratepayers.

The U.S. Department of Energy and Sunflower Electric Power Corporation have signed an agreement to use the utility's Holcomb Station power plant in Finney County, KS, to field test an "integrated combustion optimization system" – an array of state-of-the-art sensors, controls, and clean-burning combustion modifications, all linked by sophisticated "neural network" software.



Sunflower Electric's Holcomb Station will be outfitted with a combination of innovative hardware and software to further reduce air emissions.

The pollution reducing potential of the integrated system is expected to rival other devices now being installed on other coal-burning power plants, but overall costs are likely to be only half as much, a significant benefit for ratepayers.

The \$5.88 million project is part of the Energy Department's Power Plant Improvement Initiative, a program that provided federal matching funds for projects that would demonstrate innovative ways to reduce air emissions or boost the operating efficiencies of the nation's coal-fired power plants. The Energy Department, through its National Energy Technology Laboratory, is providing \$2.8 million for the 26-month project. Sunflower is contributing the additional \$3.08 million.

Coal-fired power plants, such as the 360-megawatt Holcomb Station, are the workhorses of the U.S. electric power industry, currently supplying more than half of the nation's electric power. Many of these plants are facing more stringent environmental standards, especially for air emissions such as nitrogen oxides (NO_x).

The specific technology components to be added to the plant include a separated overfire air (SOFA) system, furnace sensors, coal flow measuring and control devices, and neural network controls. If successful, the "Integrated Combustion Optimization System" will reduce emissions to 0.15 to 0.22 pounds of NO_x per million Btus and simultaneously increase power output by 7 megawatts – all at less than half the cost of state-of-the-art NO_x control technology.

Under the terms of the Energy Department's agreement with Sunflower, revenue from sales of the additional power output will be used to repay the federal government's share of the project.

Individually, the components to be installed on Unit 1 of the Holcomb Station are all commercially available. What has not been accomplished is a demonstration of the enhanced pollution and cost reduction potential when they are linked together, particularly for western Powder River Basin coals.

The Holcomb Unit 1 is already equipped with "first-generation" low-NO_x burners,

which reduce NOX pollutants by 40 to 45 percent at relatively low cost. With the application of SOFA, most of the necessary incremental NOX pollutant reductions come from combustion staging due to the overfire air. While applicable to all coal types, the low sulfur and high reactivity of Powder River Basin coals lend themselves to the SOFA-based staging and inexpensive burner modifications that are at the core of the pollution reduction project goal.

Adding a mechanism to measure and control coal flow and fineness, along with furnace sensors to define spatial distributions and neural network controls will further minimize the level of emissions at the plant and optimize combustion efficiency.

Today, only selective catalytic reduction (SCR) technology is capable of consistently achieving the most stringent emission limits set by federal and state standards – 0.15 pounds of NOX per million Btus. Rather than reducing NOX in the combustion zone, SCR uses chemical catalysts to scrub NOX pollutants from a power plant's flue gas before it is expelled from the plant. Consequently, SCR adds a complex and expensive chemical plant to the power station.

The Integrated Combustion Optimization System, if it proves successful, could provide a lower cost alternative to SCR controls, ultimately reducing the overall consumer cost of electricity. It could also help reduce the duration of the plant outages necessary for installing the system and improve overall electric system reliability.

Sunflower has selected GE Energy and Environmental Research Corp., a unit of GE Power Systems, to assist with the project and provide the core technologies being demonstrated.

The Sunflower agreement is the fourth of six projects signed under the DOE Office of Fossil Energy's Power Plant Improvement Initiative. Authorized by Congress as the precursor to President Bush's Clean Coal Power Initiative, the program is intended to demonstrate technologies that boost the efficiencies of currently-operating power plants – generating more megawatts from the same amount of fuel – or that allow currently-operating power plants to comply with environmental standards at lower costs. The Sunflower project will accomplish both objectives.

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