PROJECT facts

U.S. Department of Energy
Office of Fossil Energy
National Energy Technology Laboratory

Clean Coal Power Initiative (CCPI)

12/2006

Integration of Advanced Emissions Controls to Produce Next-Generation Circulating Fluid Bed Coal Generating Unit (Withdrawn Prior to Award)

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PARTICIPANT

Colorado Springs Utilities
Colorado Springs, CO

ADDITIONAL TEAM MEMBERS

Foster Wheeler Power Group, Inc.
Clinton, NJ

Project Description

Ray D. Nixon Power Plant

Colorado Springs Utilities (Springs Utilities) and Foster Wheeler are planning a joint demonstration of an advanced coal-fired electric power plant using advanced, low-cost emission control systems to produce exceedingly low emissions. Multi-layered emission controls will be integrated into a circulating fluidized bed (CFB) combustion unit to produce what experts predict will be the cleanest coal-fired unit in the world. The technology is expected to be cost-competitive and reliable. Springs Utilities and Foster Wheeler plan to demonstrate this new technology at commercial scale in the 150 megawatt generating unit at the Ray D. Nixon Power Plant, located south of Colorado Springs. To control nitrogen oxides (NO_X), the system uses advanced staged-combustion that can achieve very low furnace NO_X levels, coupled with an advanced selective non-catalytic reduction system that can reduce stack NO_X to levels currently achievable only with higher-cost selective catalytic reduction. To control sulfur oxides (SO_X), the design features a three-stage approach to achieve high sulfur capture (96-98 percent) with low limestone consumption (less than half of conventional CFB systems). In addition to the advanced SO_X and NO_X control technology, the advanced low-emission combustion system includes a low-cost integrated trace metal control system that can remove up to 90 percent of mercury, lead and other metals, and virtually all acid gases in the flue gas.

The combustion system is integrated with an advanced solids separator system instead of traditional cyclones. The solid separators are integrated into the traditional furnace structure, resulting in both improved reliability and lower system cost. This design allows a reduced combustor size, elimination of the traditional hot expansion joints, and improved operational performance and reduced maintenance costs. Demonstration of all of these integrated design features in a single unit and on a commercial scale, is the goal of this project. Emission performance is of key importance, but low system cost and reliability are also essential for commercial success. The figure on the following page depicts the project concept.

LOCATION

Ray D. Nixon Power Plant
Fountain, El Paso County, CO

ESTIMATED PROJECT DURATION

72 months

COST

Total Estimated Cost
$301,504,000

DOE/Non-DOE Share
$30,000,000 / $271,504,000

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Benefits

This project offers the opportunity to demonstrate a low-cost advanced emission control system for CFBs burning a variety of coals and other fuels. The system is predicted to achieve low levels of NO_x (0.04 lb/million Btu with Powder River Basin Coal), very-high sulfur control (96-98 percent), and trace metal emission control of up to 90 percent of the mercury contained in the fuel. This demonstration project will burn a variety of fuels, including Powder River Basin subbituminous, Illinois and Pittsburgh eastern bituminous, waste coal and biomass/woodwaste. If the installed technology operates successfully, this unit would become the cleanest coal-fired electric power plant in the country. The plant includes a dry cooling tower to minimize water use (an increasingly important consideration in power plant design). Colorado Springs is the fastest growing city in the region and will benefit by lower power costs from using clean coal technology. Potential fuels include 20-30 million tons of coal washings from the steel industry in Pueblo, CO—an unsolved environmental problem—and deadwood removed from forests for wildfire management.

Project Status

December 9, 2003, Colorado Springs Utilities notified the U.S. Department of Energy (DOE) that a recently completed Electric Integrated Resource Plan does not support a need for the 150 MW of power in the 2008 timeframe. CSU subsequently withdrew from the Cooperative Agreement negotiations.