PROJECT facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
FEDERAL ENERGY TECHNOLOGY CENTER

ADVANCED CLEAN/EFFICIENT
POWER systems

PS007.0697

NEW SOFTWARE SHOWS HOW TO CUT POWER-GENERATING COSTS IN FOSSIL-FIRED PLANTS

PRIMARY PROJECT PARTNERS

Praxis Engineers, Inc.
Milpitas, CA

MAIN SITE

TransAlta Utilities
Alberta, Canada

Dairyland Power Cooperative
LaCrosse, WI

TOTAL ESTIMATED COST

$891,193

COST SHARING

DOE	**$506,193**
Non-DOE	**$385,000**

Project Description

The economic environment for U.S. power production has become more competitive in recent years, spurred by the deregulation of the U.S. utility industry. Increasingly stringent environmental standards and the emergence of new markets for power-generation by-products have also made significant changes in the economic environment. As a result, power producers now need to balance environmental compliance standards and power-generation demand with the competing costs or income possibilities from fuel purchases, sales or purchases of emissions credits, sales or disposal of by-products, and efficiency of operation of various plant subsystems.

Decisions in each of these areas affect performance and costs in all of the others. Therefore, in order to genuinely reduce overall costs, the entire power plant system needs to be optimized as a single unit.

With support from the U.S. Department of Energy, Praxis Engineers has developed the Supervisory Optimization and Control System (SOCS), an on-line software package designed to perform just such a system-wide optimization. SOCS differs from all other available plant performance products in that it minimizes the costs of electric generation by a simultaneous consideration of all areas of the power plant, e.g., coal handling and coal blending, boiler operations, NO_x control, steam distribution, and flue gas desulfurization. In so doing, SOCS is able to provide much greater efficiency and competitive advantage to its users than existing technologies can, while simultaneously improving emissions compliance. SOCS makes innovative use of advanced computational techniques such as neural networks and genetic algorithms, which provide the necessary combination of speed, adaptability, and accuracy to find the least-cost plant settings under all conditions.

Program Goal

Fossil fuels provide the overwhelming majority of U.S electricity, with coal alone supplying over half. Much of this fuel is domestically produced, which is why developing more economical and environmentally sound technologies for fossil-fired power generation will enhance energy self-sufficiency and industrial competitiveness for the U.S.

The goal of this project is to demonstrate the benefits of the SOCS approach in on-line operation at two coal-fired power stations with different designs. The demonstration will cover a useful subset of the highly varied environmental and operation conditions of coal-fired power stations.

New Software Shows How to Cut Power-Generating Costs in Fossil-Fired Plants

CONTACT POINTS

Suzanne C. Shea
Praxis Engineers, Inc.
Milpitas, CA
(408) 945-4282
(408) 263-2821 fax
70402.3150@compuserve.com

William P. Barnett
U.S. Department of Energy
Federal Energy Technology Center
Pittsburgh, PA
(412) 892-6139
(412) 892-5917 fax
barnett@fetc.doe.gov

Project Benefits

The new Supervisory Optimization and Control System (SOCS) from Praxis Engineers provides the power-station operator with a mix of control setpoints that will meet NO_x, SO_x, opacity, and CO_2 emissions targets, produce the desired amount of power, and do so at the least cost. It will balance out the competing costs and income from fuel use, emissions credits, sale or disposal of bottom ash, flyash, gypsum, and other by-products, and tradeoffs between efficiency and equipment life.

The use of SOCS will:

- Reduce the overall cost of electricity generation while achieving emissions compliance.
- Increase the competitiveness and flexibility of operations.
- Allow power generators to balance emissions credits, generation costs, and by-product sales.
- Increase the efficiency of power generation.
- Reduce plant derates.
- Increase the use of low-cost U.S. fuels.
- Increase the sales of by-products.
- Improve environmental compliance.

The benefits of using SOCS might be as high as a 3% savings when expressed as equivalent fuel cost. For example, a 500-megawatt power plant using a 12,500-Btu-per-pound coal with a heat rate of 10,000 Btu per kilowatt-hour could save up to 50,000 tons of coal per year. Assuming a delivered price of $40 per ton, annual savings of $2 million would accrue—and emissions targets would still be met or exceeded.

Cost Profile

(Dollars in Thousands)

	Prior Investment	FY95	FY96	FY97	Future Funds
Department of Energy*	$171	—	$325	$10	—
Private Sector Partners	—	—	$263	$122	—

* Appropriated Funding

Key Milestones

FY96	FY97
Data Collection	Installation

Project initiated 10/95

Phase I final report 9/97