PROJECT facts

DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
FEDERAL ENERGY TECHNOLOGY CENTER

ADVANCED CLEAN/EFFICIENT
POWER systems

PS010.0697

SECOND GENERATION ADVANCED REBURNING FOR HIGH-EFFICIENCY NO_x CONTROL

PRIMARY PROJECT PARTNERS

Energy and Environmental Research Corporation
Irvine, CA

MAIN SITE

Energy and Environmental Research Corporation
Irvine, CA

University of Texas (UT) at Austin

TOTAL ESTIMATED COST

$2,260,000

COST SHARING

DOE	**$1,645,300**
Non-DOE	**$614,700**

Project Description

Title 1 of the 1990 Clean Air Act Amendments regulates nitrogen oxides (NO_x) in ozone non-attainment areas, making it necessary for utility companies to improve the pollution control of their coal-fired boilers. The initial Title 1 regulations allowed the use of Reasonably Available Control Technologies (RACT), which in most areas meant that NO_x levels were acceptable in the range of 0.4 to 0.5 pounds per million Btu. However, these levels are unacceptably high for ozone non-attainment areas. More stringent NO_x control will be essential to bring many of the ozone non-attainment areas into compliance, particularly in the Northeast.

In conjunction with the U.S. Department of Energy, California-based Energy and Environmental Research Corporation (EER) developed a NO_x control process called Advanced Reburning (AR) prior to this project. In the AR process, a portion of the fuel requirement is introduced downstream of the combustion zone to create a reducing zone that destroys NO_x. Overfire air is subsequently introduced to satisfy the air requirement, while an additional reducing agent is injected. The AR process has achieved NO_x reduction up to 85%.

This project will develop second-generation versions of AR that have the potential to achieve 95% NO_x reduction on all types of coal-fired boilers. This reduction will be accomplished without requiring massive hardware changes—and at about half the cost of such post-combustion technologies as Selective Catalytic Reduction (SCR), which is currently considered the maximum achievable control technology for NO_x reduction. Second Generation Advanced Reburning (SGAR) processes will incorporate several improvements over conventional AR, including the use of promoter additives to enhance reducing-agent effectiveness. SGAR experiments will be conducted at laboratory, bench, and pilot scales.

Program Goal

Tighter environmental standards—including those imposed on ozone non-attainment areas by the Clean Air Act Amendments of 1990—are requiring U.S. coal-based power plants to be much cleaner and more efficient. DOE's Advanced Power Systems program aims to accelerate the commercialization of highly efficient, affordable technologies that support the use of coal and natural gas as reliable, low-cost energy sources while meeting or exceeding established environmental regulations.

The goal of this particular project is to allow coal-fired plants to achieve NO_x emissions levels equivalent to 0.06 pounds per million Btu through SGAR processes. These processes are intended for post-RACT applications in ozone non-attainment areas that require NO_x control in excess of 80%.

Second Generation Advanced Reburning for High-Efficiency NO_x Control

CONTACT POINTS

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Project Partners

University of Texas (UT) at Austin
Austin, TX
(sodium promoter chemistry)

Nalco Fuel Tech
Naperville, IL
(commercialization assistance)

Fuller Power Corporation
Bethlehem, PA
(fine coal preparation)

Gas Research Institute
Chicago, IL
(cofunding)

Electric Power Research Institute
Palo Alto, CA
(cofunding)

Project Benefits

There is a significant need for high-efficiency, low-cost NO_x control that utilities can apply to meet the latest NO_x control requirements. (Currently available post-combustion technologies, such as Selective Catalytic Reduction, can be prohibitively expensive.) The Second Generation Advanced Reburning technologies to be developed by this project will exceed the current state of the art in NO_x control, offering the following benefits:

- Control of NO_x (about 95%) comparable with or greater than that of Selective Catalytic Reduction at lower capital, lower maintenance, and lower operational costs
- Applicability to all types of coal-fired units (wall, tangential, and cyclone)
- Limitation of air toxics, toxic solid/liquid waste, or criteria pollutants, which are substances considered hazardous under the Resource and Recovery Act as amended in 1984 (criteria pollutants may be ignitable, corrosive, or reactive)
- Compatibility with technologies for controlling other pollutants (such as SO_2, CO_2, and air toxics)
- Minimal impact on boiler efficiency and operations
- The flexibility to accommodate additional processes for even more stringent NO_x control.

Cost Profile

(Dollars in Thousands)

	Prior Investment	FY95	FY96	FY97	Future Funds
Department of Energy*	—	$183	$125	$205.7	$1,131.6
Private Sector Partners	—	—	$90	$93	$431.7

* Appropriated Funding

Key Milestones