

# PROJECT facts

Environmental and  
Water Resources

11/2006

U.S. DEPARTMENT OF ENERGY  
OFFICE OF FOSSIL ENERGY  
NATIONAL ENERGY TECHNOLOGY LABORATORY



## REDUCTION OF WATER USE IN WET FGD SYSTEMS

### Background

Coal-fired power plants require large volumes of water for efficient operation, primarily for cooling purposes. Public concern over water use is increasing, particularly in water stressed areas of the country. Analyses conducted by the U.S. Department of Energy's National Energy Technology Laboratory predict significant increases in power plant freshwater consumption over the coming years, encouraging the development of technologies to reduce this water loss. Power plant freshwater consumption refers to the quantity of water withdrawn from a water body that is not returned to the source but is lost to evaporation, while water withdrawal refers to the total quantity of water removed from a water source.

### CONTACTS

#### Thomas J. Feeley III

Technology Manager  
Environmental & Water Resources  
National Energy Technology  
Laboratory  
626 Cochran Mill Road  
P.O. Box 10940  
Pittsburgh, PA 15236-0940  
412-386-6134  
thomas.feeley@netl.doe.gov

#### Sara M. Pletcher

Project Manager  
National Energy Technology  
Laboratory  
3610 Collins Ferry Road  
P.O. Box 880  
Morgantown, WV 26507-0880  
304-285-4236  
sara.pletcher@netl.doe.gov

Plant Crist Unit 5  
Hot-Side ESP

Mercury  
Research  
Center

Plant Crist  
Unit 6



*Pilot-scale tests of the regenerative heat exchange technology will be conducted at Gulf Power Company's Plant Crist in Pensacola, Florida.*



## CONTACTS (cont.)

**David Rencher**  
Principal Investigator  
URS Corporation  
9400 Amberglen Blvd.  
Austin, TX 78729  
512-419-5472  
David\_Rencher@urscorp.com

## PARTNERS

URS Group  
Electric Power Research Institute  
Southern Company  
Tennessee Valley Authority  
Mitsubishi Heavy Industries, Ltd.

In power plants equipped with recirculating cooling water systems and wet flue gas desulfurization (FGD) systems, 90 percent of the evaporative water loss occurs in the cooling towers and 10 percent in the wet FGD system. Although water use in wet FGD systems represents a smaller percentage of evaporative water loss compared to cooling tower loss, technologies to reduce the wet FGD consumption are important because of the large number of wet FGD systems to be installed, at new and existing plants, in coming years due to recent regulations promulgated by the Environmental Protection Agency. As a result of these regulations, aimed at controlling precursors of ozone, fine particulates, and mercury, an estimated 82 gigawatts (GW) of FGD capacity will be installed in the United States by the year 2020.

## Primary Project Goal

The primary goal of this project is to demonstrate the use of regenerative heat exchange to reduce flue gas temperatures and thereby minimize evaporative water consumption in wet FGD systems on coal-fired boilers. Pilot-scale tests will be performed at a southeastern U.S. coal-fired power plant.

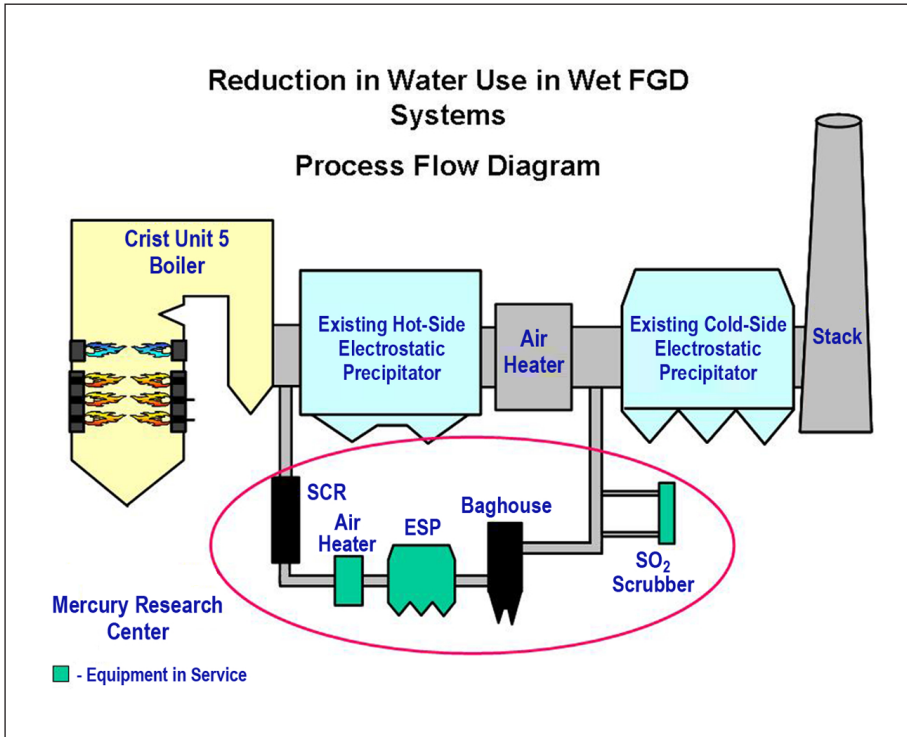
## Objectives

This project, conducted by a team lead by URS Group, is working toward a main objective of reducing freshwater consumption by wet FGD systems by 50 percent or more. Additional objectives include:

- Demonstrate that cooling flue gas upstream of the electrostatic precipitator (ESP) and reheating flue gas downstream of the FGD system will result in the following benefits to air pollution control (APC) systems:
  - Improved ESP performance due to reduced gas volume and improved ash resistivity characteristics
  - Control of SO<sub>3</sub> emissions through condensation on the fly ash
  - Avoided need to install wet stacks or to provide flue gas reheat
- Examine the potential of increased mercury removal across the ESP and FGD systems due to the cooler flue gas temperature.

## Accomplishments

This project is still in its initial stages and does not yet have any significant accomplishments.



*The process at Plant Crist includes air pollution control devices that may be more effective at lower flue gas temperatures.*

## PERIOD OF PERFORMANCE

07/01/2006 to 09/30/2008

## COST

**Total Project Value**  
\$858,396

**DOE/Non-DOE Share**  
\$573,116 / \$285,280

**ADDRESS**

**National Energy  
Technology Laboratory**

1450 Queen Avenue SW  
Albany, OR 97321-2198  
541-967-5892

2175 University Avenue South  
Suite 201  
Fairbanks, AK 99709  
907-452-2559

3610 Collins Ferry Road  
P.O. Box 880  
Morgantown, WV 26507-0880  
304-285-4764

626 Cochrans Mill Road  
P.O. Box 10940  
Pittsburgh, PA 15236-0940  
412-386-4687

One West Third Street, Suite 1400  
Tulsa, OK 74103-3519  
918-699-2000

**CUSTOMER SERVICE**

**1-800-553-7681**

**WEBSITE**

**[www.netl.doe.gov](http://www.netl.doe.gov)**

**Benefits**

By cooling the flue gas entering the FGD system, regenerative heat exchange is expected to reduce the amount of water evaporated by 50 percent or more. Additionally, when flue gas is cooled upstream of an ESP, significant co-benefits may be provided, including enhanced SO<sub>3</sub> emissions control via condensation on fly ash, improved ESP particulate control, mercury removal in the ESP, and avoided costs associated with flue gas reheat or wet stacks.

**Planned Activities**

The project will conduct pilot-scale tests of regenerative heat exchange to determine the achievable reduction in FGD water consumption at a variety of flue gas temperatures. Technical and economic analyses will be conducted to assess performance improvement of the APC systems and the resulting reduction in capital and operating costs. Testing will be conducted on a low-sulfur Eastern bituminous coal, and SO<sub>3</sub> will be spiked into the flue gas to simulate operation with higher SO<sub>3</sub> concentrations resulting from firing a higher sulfur coal or operating with a selective catalytic reduction unit. Pilot-scale testing will be performed at Gulf Power Company's Plant Crist in Pensacola, Florida.