PROJECT **facts**

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

Power Plant Improvement Initiative (PPII)

01/2009

GREENIDGE MULTI-POLLUTANT CONTROL PROJECT

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PARTNER

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ADDITIONAL TEAM MEMBERS

AES Greenidge, LLC

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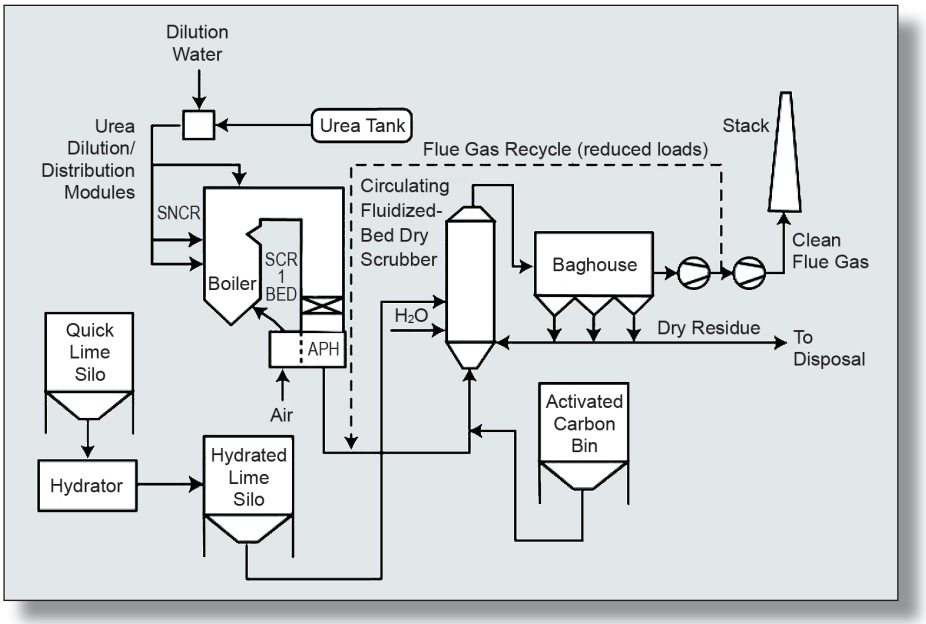
Project Description

This project demonstrated a selective non-catalytic reduction (SNCR)/in-duct selective catalytic reduction (SCR) hybrid in combination with low-NO_X burners (LNBs) and a circulating fluidized bed dry scrubber (CFBDS) system using recycled baghouse ash and activated carbon injection to cost-effectively reduce emissions of NO_X, SO_2, mercury, acidic gases, and particulate matter to levels equal to or lower than those required by regulation at an existing 107-MW plant that fires 2 to 4 percent sulfur eastern bituminous coal. The project also evaluated the effect of biomass co-firing on the multi-pollutant control system. To complement existing LNBs, an SNCR is strategically located upstream of a single-bed in-duct SCR. Urea injection required for the SNCR also generates the ammonia required for the SCR. Having the SCR downstream of the SNCR allows the SNCR to operate at lower temperatures than normal (usually avoided to protect against ammonia slip), which enhances its performance. The CFBDS system uses a reactor vessel to facilitate contact of flue gas with separately injected dry hydrated lime, activated carbon, and water. The activated carbon absorbs mercury, and the lime reacts with the SO_2, sulfur trioxide (SO_3), hydrochloric acid (HCl), and hydrofluoric acid (HF) gases to form benign solids, all of which are captured in the baghouse. Lime and activated



Schematic of the SNCR/SCR hybrid and CFBDS demonstration project

LOCATION

AES Greenidge Unit No. 4
Dresden, NY

COST

Total Project Value
$32,742,976

DOE/Non-DOE Share
$14,341,423 / $18,401,553

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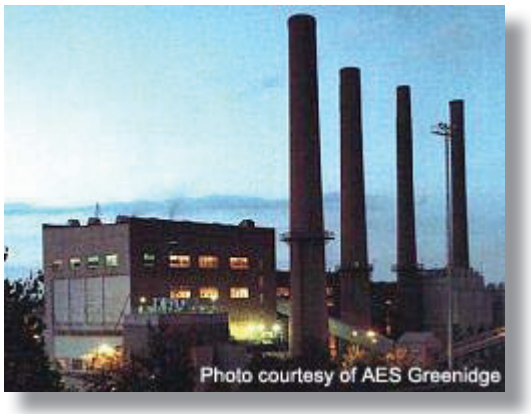
carbon sorbents captured in the baghouse are recycled to the CFBDS to enhance utilization. Performance testing of the SNCR/SCR hybrid and CFBDS included an assessment of the impact of biomass co-firing with the coal at heat inputs up to 10 percent.

Actual measured results were a NO_X emission rate of 0.10 lb/mmBtu, SO_2 removal of 96 percent, Hg removal of 94-98 percent, SO_3 removal in the range of 95 to 97 percent, and HCl removal of 97 percent. All of these results met or exceeded the emission reduction goals of this project. HF concentrations were typically at or below the detection limit, precluding the determination of removal efficiency. The project was completed on October 18, 2008.

Benefits

The power industry is seeking lower cost and more compatible multi-pollutant control alternatives to SCR and wet scrubbers for the more than 400 domestic coal-fired generating units with capacities ranging from 50–300 MW. Economics of scale that make SCR and wet scrubbers viable for large plants do not apply to these relatively small units, and small units typically are space constrained, making it difficult, if not impossible, to install conventional SCR and wet scrubbers. Greenidge Unit No. 4 is representative of the small coal-fired electricity generating units that together represent almost one-quarter of the U.S. coal-fired generating capacity. The NO_X control technology demonstrated at Greenidge required about 65 percent of the capital costs and 75 percent of the levelized annual costs of a conventional SCR unit. Performance tests of this unique combination of technologies demonstrated that the mercury removal goals were met with or without activated carbon injection. Eliminating the need for activated carbon injection substantially reduces mercury control costs. Also, the CFBDS required about half the capital cost of a conventional wet scrubber. The acid gas control afforded by the CFBDS is important because this removes the precursors to acid aerosols, which can form $PM_{2.5}$ once emitted. Acid gases must be reported to the Environmental Protection Agency (EPA) as part of the Toxic Release Inventory. Moreover, biomass co-firing may improve overall emissions performance through reduced fuel-bound nitrogen and sulfur levels, increased volatile content, and general combustion characteristics.



The photo shows a view of the Greenidge power plant facing northeast. Turbine generator Unit 4, a 107-MW output reheat unit, is at left.