

PROJECT FACTS

UNIVERSITY OF KENTUCKY CENTER FOR APPLIED ENERGY RESEARCH

PARTICIPANTS

UK CAER
UK Dept of Civil
Engineering
East Kentucky Power
Cooperative
Irving Materials Inc.

SPONSORS

Ky Dept. of Energy
Dev. and
Independence
(Formerly Governor's
Office of Energy
Policy)

PROJECT VALUE

GOEP: \$102,866
UK: \$24,629
Industry: \$25,000

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ENVIRONMENTAL & COAL TECHNOLOGIES

High Value Applications for Flue Gas Desulfurization Materials

According to the Energy Information Agency (EIA), the amount of electric power generated in the US from coal is expected to grow by 15% over the next 10 years and by 61% by 2030. Along with this tremendous increase in coal consumption by electric utilities, emissions are projected to decrease substantially. In order to achieve the emissions reductions, EIA forecasts that the use of flue gas scrubbing technologies will more than double in the next 10 years with an accompanying doubling of the annual production of scrubber by-products from the current 30 million tons. Approximately 33% of the scrubber by-products produced annually are now used, primarily in the production of gypsum wallboard. While this market has seen unprecedented growth over the past decade, the wallboard industry demand for scrubber-generated synthetic gypsum is expected to peak within the next 4-5 years.

Kentucky coal-fired utilities will mirror this national trend. We will have to add over 2 GW of new coal power to meet our needs in the next decade. Most of this power will be scrubbed and thus the amount of flue gas desulfurization (FGD) materials will likely double, increasing by 3.4 million tons in the next five years. In addition, Kentucky has recently added 300 MW of power via fluidized bed combustion (FBC), resulting in approximately 400,000 tons of spent bed material requiring disposal. The planned addition of 600 MW more FBC power will increase this material to 1 million tons by 2009. The increase in FGD gypsum and FBC ash will have a substantial impact on the utilization of coal combustion byproducts in Kentucky, largely because the quantity of FGD gypsum will exceed the demand for wallboard.

In the southern U.S. much of the additional gypsum, which is composed of calcium sulfate, can be used in agriculture. This use has less potential in Kentucky, which relies heavily on agricultural limestone to provide critical pH control and nutrient benefits. Therefore, this project seeks to conduct research towards the development of high-value cementitious materials produced using Kentucky's sulfated coal combustion by-products. Calcium sulfate based cements are rapid-hardening, relatively inexpensive alternatives to Portland cement for certain construction applications. An added benefit is that they are extremely energy efficient and low CO₂-emitting materials. New uses for synthetic gypsum and fluidized bed combustion materials also have the potential to create additional industries equivalent to that existing for wall board production.