

PROJECT FACTS

UNIVERSITY OF KENTUCKY CENTER FOR APPLIED ENERGY RESEARCH

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POWER GENERATION & UTILITY FUELS

Carbon Management Research Group

(An industrial, governmental and academic consortium advancing carbon capture and management technologies)

Overview

Teaming with Kentucky's major power companies, the University of Kentucky's Center for Applied Energy Research has formed an industrial-governmental-academic consortium called the "Carbon Management Research Group" (CMRG). The CMRG will carry out a \$24M ten-year program of research to develop and demonstrate cost-effective and practical technologies for reducing and managing CO₂ in existing coal-fired electric power plants. The intention is to position electric utilities to respond to a carbon-constrained economy prior to the imposition of environmental rules. Its purpose is to maintain and strengthen coal's competitive advantage as a least-cost fuel for electricity production, while improving environmental quality.

Larger-scale CO₂ capture research is costly, often making it too high-risk for a single utility or governmental agency to undertake. This research alliance spreads both costs and risks. It also provides an opportunity to solve electric power generation problems in an affordable way.

Technical Focus of the CMRG

Three research projects on CO₂ capture and separation will be carried out: **Project I** is a fundamental study under real coal-derived flue gas conditions. The study will focus on scrubber configuration, formulation of new solvents, technologies to enhance CO₂ capture and reduce the energy penalty, process optimization, metal corrosion, solvent holdup characteristics, water balance/management, solvent management, as well as the environmental impact from solvent evaporation and degradation under coal-derived flue gas.

Project II is necessary for subsequent engineering scale-up. A 0.5~1MWth portable slip-stream pilot plant will be constructed to demonstrate post-combustion CO₂ capture technologies at coal-fired power plants. The test sites will be selected based on boiler configurations and coal types. The project will focus on the system operability (particulate matter impact), solvent management as related to coal types, gaseous and dissolved constituents, long-term verification, and material corrosion. At each site, a three-month parametrical study will be conducted to verify the results and findings obtained from the CAER's 0.1 MWth pilot-plant. Two solvents will be used for this investigation. A 30% MEA will be used as a baseline, followed by the best commercial solvent or a new solvent developed at the CAER.

Project III, chemical looping combustion is a more appropriate project for the next generation of power plants and as such is a potential long-term solution. However, chemical looping combustion technology could ultimately prove to be the most cost-effective means for CO₂ control for coal-based power generation. This study will focus on scaling up work previously performed at the CAER involving oxygen carriers in a pilot gasification/combustion reactor.