

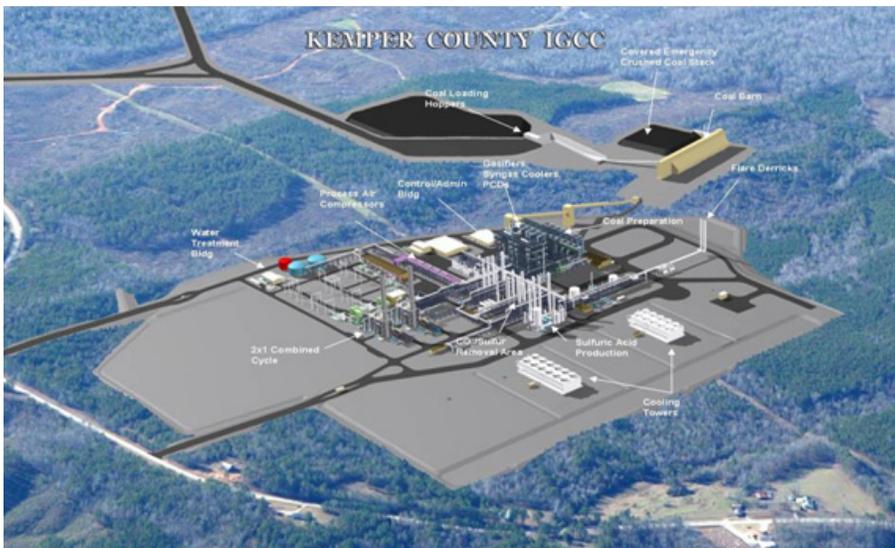


# Demonstration of a Coal-Based Transport Gasifier

## Background

Coal is an abundant and indigenous energy resource and supplies almost 50 percent of the United States' electric power. Demand for electricity, vital to the nation's economy and global competitiveness, is projected to increase by more than 30 percent by 2030. The continued use of coal is essential for providing an energy supply that supports sustainable economic growth. Unfortunately, nearly half of the nation's electric power generating infrastructure is more than 30 years old and is in need of substantial refurbishment or replacement. Additional capacity must also be put in service to keep pace with the nation's ever-growing demand for electricity. It is in the public interest for the nation's energy infrastructure to be upgraded with the latest and most advanced viable technologies to achieve greater efficiencies, environmental performance, and cost-competitiveness.

The Department of Energy (DOE) Office of Fossil Energy, through the National Energy Technology Laboratory, is charged with the implementation of the DOE's Clean Coal Power Initiative (CCPI). The intent behind the CCPI is to leverage public and private investment to secure low-cost energy production and protection of the environment. The specific missions of the CCPI are as follows: (i) to develop promising, advanced



Plant Ratcliffe TRIG™ Facility

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## PARTICIPANT

Southern Company Services Inc.  
Birmingham, AL

## PARTNERS

Mississippi Power Company  
Kellogg, Brown and Root (KBR)

## PROJECT DURATION

**Start Date**  
1/30/2006

**End Date**  
5/1/2018

## COST

**Total Project Value**  
\$2.67 Billion\*

**DOE/Non-DOE Share**  
\$270 Million / \$2.4 Billion

\*Note: The cost above represents the total project cost including costs not covered by CCPI.

## NATIONAL ENERGY TECHNOLOGY LABORATORY

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clean coal power generation technologies; (ii) to accelerate these new coal power generation systems into the market by conducting full-scale technology demonstrations; and (iii) to generate substantial economic and environmental benefits to ensure a secure energy future as these technologies are commercialized by the industry.

## Project Description

DOE awarded Southern Company Services a cooperative agreement under the CCPI Round 2 Program to provide direct financial support for the development and deployment of the Transport Integrated Gasification (TRIG™) technology that is being utilized by the Project. The Project will be the first commercial scale integrated gasification combined cycle (IGCC) plant in the United States to use TRIG™ air blown technology in the gasification process. Plant Ratcliffe will be built in Kemper County, Mississippi, adjacent to viable lignite reserves. The lignite reserves will be developed and mined by North American Coal Corporation and will be used as the primary feedstock for the IGCC plant. The IGCC plant will utilize state-of-the-art emissions controls, including carbon dioxide (CO<sub>2</sub>) capture, and will be owned and operated by Mississippi Power Company.

The Project will utilize two transport gasifier trains, each with its own coal feed and ash handling systems. Coal is first heated in a specialized process vessel with air and steam to extract synthesis gas (syngas) from the coal. The gas is then cleaned and used to fire a gas turbine to generate electricity. The hot exhaust gas leaving the turbine is then used to heat water to produce steam which is then sent to a steam turbine to generate additional electricity. Using the two different power generation cycles is a very efficient way of increasing the amount of electricity that can be generated from a ton of coal in an environmentally friendly manner.

## Goals/Objectives

The primary objective of this project is to demonstrate the operation of a commercial-scale, air-blown Transport Gasifier technology and integrate it with a combined-cycle island. Other objectives of the project include:

- To operate an advanced syngas cleanup system that includes sulfur removal and recovery; high temperature, high-pressure (HTHP) particulate filtration; ammonia recovery; and mercury removal.
- To demonstrate high availability, high thermal efficiency, low cost, and low emissions of the IGCC in commercial operating mode.
- To operate an integrated CO<sub>2</sub> capture and compression system with the intent to capture and geologically sequester 65% of the CO<sub>2</sub> via enhanced oil recovery.

## Benefits

The TRIG™ technology offers a simpler and more robust method for generating power from coal than other alternatives. It is unique among coal gasification technologies in that it is cost-effective when handling low rank coals and when using coals with high moisture or high ash content. These coals make up half the proven reserves in both the United States and the world. Moreover, the transport gasifier is capable of both air- and oxygen-blown operation. This inherent flexibility will allow future applications of this technology to be readily adapted to other applications beyond power generation, such as the production of chemicals used in industrial operations

Moreover, the inclusion of CO<sub>2</sub> control as part of the project is critical to the future deployment of coal-based power generation not only in the United States but also around the world. Installation of facilities of this nature is an important part of the strategy to become energy independent.

