Demonstration of a Coal-Based Transport Gasifier

CCPI-2

Advanced Power Systems

IGCC	■	CFB	□
Hybrid	□	Adv Comb	□

Participant
Southern Company Services, Inc.

Additional Team Members
Mississippi Power Company — host utility

Kellogg Brown and Root, LLC (KBR) — technology supplier

Location
Liberty, Kemper County, MS

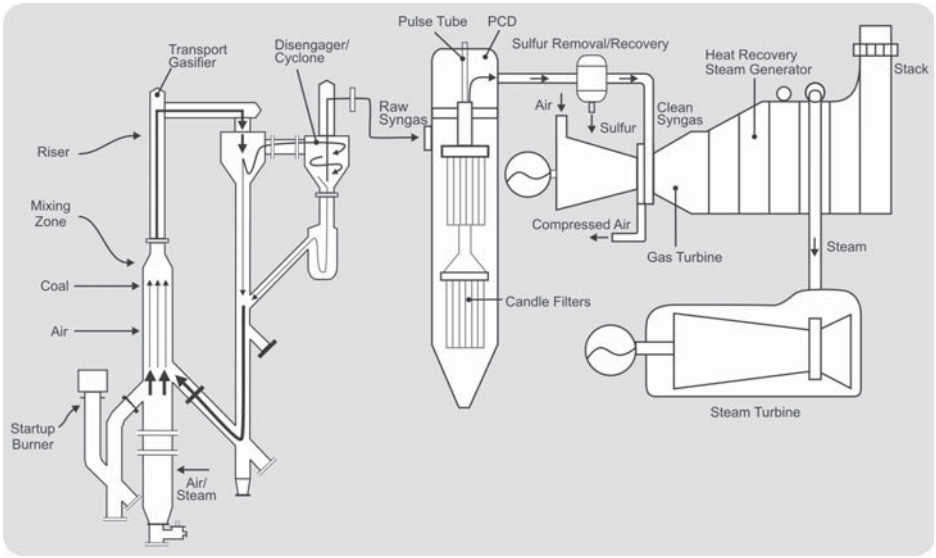
Technology
KBR air-blown transport gasifier fueled by low-rank coal in an integrated gasification combined-cycle (IGCC) application

Capacity
2x1 system utilizing two F class combustion turbines and one steam turbine

Coal
Mississippi lignite

Project Funding

Total	$1,625,082,040	100%
DOE Share	293,750,000	18.1
Participant	1,331,332,040	81.9



Objectives
To assess the operational, environmental, and economic performance of the air-blown transport gasifier-based integrated gasification combined-cycle (IGCC) system with two transport gasifiers, two F class combustion turbines, and one steam turbine.

Technology/Project Description
The project will demonstrate an IGCC unit applying transport gasification in an air blown mode. The project will utilize two transport gasifier trains each with its own coal feed and ash handling systems. The combined cycle will include two gas turbines each with its own heat recovery steam generator, both feeding a single steam turbine. The transport gasifier consists of two sections: a short, larger-diameter mixing zone and a longer, smaller-diameter riser. Air is introduced at the bottom of the mixing zone to raise heat by burning the carbon in recirculated char. Coal and sorbent are fed to the top of the mixing zone to separate the coal from the oxidant and avoid burning volatile material produced when the coal is heated. All of the solids and gases are carried from the mixing zone into the riser where devolatilization and carbon-steam gasification reactions occur to produce synthesis gas (syngas). The majority of the unreacted char leaving the riser is captured by a disengager and cyclone assembly and recycled back to the mixing zone through a standpipe and a nonmechanical "J-valve." The syngas and fine char that are not captured in the cyclone are cooled in a heat exchanger before entering a metallic candle-filter particulate collection device (PCD), which removes any remaining particulate matter from the gas. Beyond the candle-filter PCD, emission controls include a sulfur removal system, selective catalytic reduction (SCR), and a mercury removal system.

Project Duration 142 Months	Period of Operation 54 Months	Status/Schedule *Estimated date

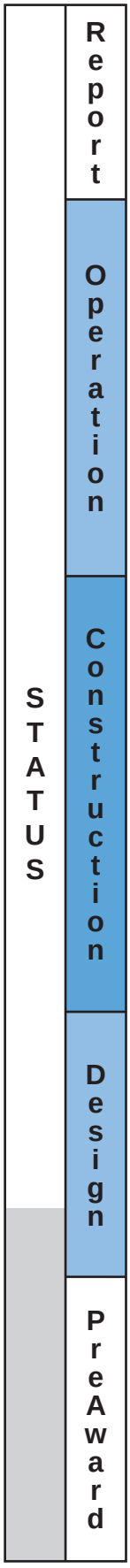
Benefits

The transport gasifier is based on a simple, robust, and efficient technology similar in design to a fluidized catalytic cracking (FCC) unit that has been proven over 50 years in the petroleum refining industry. The transport gasifier operates at considerably higher circulation rates, velocities, and riser densities than does a conventional circulating fluidized-bed, resulting in higher throughput, better mixing, and higher mass and heat transfer rates. The recycling of solids increases the effective residence time and increases carbon conversion. Moreover, the transport gasifier represents a major efficiency gain relative to slagging gasifiers for applications using high ash, high melting point coals. It does not depend on slagging (melting) the ash to remove minerals from the process. Slagging requires a large amount of energy, which cannot be recovered. This process technology makes possible the cost effective production of syngas from low-rank, high moisture, and high ash coals, whereas most other gasification technologies cannot. Such coals make up half the proven reserves in both the United States and the world. The transport gasifier can also be operated on oxygen, which affords the option to produce chemicals.

Status/Accomplishments

The cooperative agreement was awarded on January 30, 2006 for a single train (285 MW net) demonstration to be built in Orlando, Florida. As initial construction was under way, the activities at Orlando were canceled over concerns for carbon capture and sequestration (CCS). CCS was not viewed as economical for the Orlando site due to the distance from suitable sequestration storage locations. In May 2008, DOE granted approval to relocate the demonstration to Kemper County,Mississippi for a dual train configuration. The DOE funding was unchanged.

Mississippi Power Company submitted a Need Determination with the Mississippi Public Services Commission (MPSC) on June 10, 2008.



Final Report Issued	*5/18**
Draft Report Issued	*2/18**
Operation Completed	*11/17**
Operation	*6/13**
Construction	*1/10**
NEPA Completed (EIS)	*11/09**
Award	*1/06*
Selection	*10/04*

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