



Southern Company

Clean Coal Strategy
Carlton Blue





Why Clean Coal Technology

- Southern Company's has a significant amount of coal generating facilities
- Abundant Supply of Coal – 200 years
- Cheap 1/6 the cost of Oil/Natural Gas
- 1/2 Energy Production in US
- Significant Investment in Clean Coal Research



Problem with Coal

- Green House Gas
- Acid Rain
- Health Problems
- Clean Air Act – EPA
- Environmental Just



Clean Coal Options

- Carbon Capture and Sequestration (CCS)
- Coal Gasification (IGCC) – Pre-Combustion CCS
- Decommissioning – Smaller and Less Efficient Plants
- Low Carbon Alternatives
 - Nature Gas ($1/2 \text{ CO}_2$)
 - Nuclear



Map of CCS Project





CCS Project in US

USA							
Project Name	Leader	Feedstock	Size MW	Capture Process	CO2 Fate	Start-up	Location
TCEP	Summit Power	Coal	400	Pre	EOR	2014	Texas
Trailblazer	Tenaska	Coal	600	Post	EOR	2014	Texas
Kemper County	Southern	Coal	582	Pre	EOR	2014	Mississippi
HECA	SCS	Petcoke	390	Pre	EOR	2014	California
FutureGen	FutureGen Alliance	Coal	200	Oxy	Saline	2015	Illinois
WA Parish	NRG Energy	Coal	60	Post	EOR	2017	Texas
Sweeny Gasification	ConocoPhillips	Coal	680	Pre	Saline/ EOR	TBD	Texas
AEP Mountaineer	AEP	Coal	235	Post	Saline	On Hold	West Virginia
Taylorville	Tenaska	Coal	602	Pre	Saline	On Hold	Illinois
Antelope Valley	Basin Electric	Coal	120	Post	EOR	On Hold	North Dakota



Carbon Capture and Sequestration (CCS)

- Alabama Power's Plant Barr, a pulverized coal-fired power plant near Mobile, Alabama.





Pilot Program

- In 2011, Alabama Power and Southern Company, along with the U.S. Department of Energy (DOE), Mitsubishi Heavy Industries Ltd. (MHI), the Electric Power Research Institute and several other partners, plan to operate a demonstration facility that will capture and store between 100,000 and 150,000 tonnes of carbon dioxide (CO₂) per year from the plant's coal-fired electricity production.



Pilot Program

- The CCS plant will capture emissions from one of seven generating units at the plant, which has a total capacity of 2525 MW. As part of the pilot CO₂ injection project at Citronelle oilfield, the captured CO₂ from a 160MW flue gas stream at Plant Barry will be transported 16km by pipeline and an estimated 150,000 tonnes of CO₂ per year stored permanently in deep saline formations. The CO₂ storage plan is thus part of DOE's Southeast Regional Carbon Sequestration Partnership (SECARB). The Southern States Energy Board is leading the SECARB effort



Coal Gasification (IGCC) -Kemper County Project

- Mississippi Power / Southern Company is building a 582-megawatt Integrated Gasification Combined Cycle (IGCC) Power Plant which is \$ 2.3 Billion (\$ 270 million DOE grant and \$133 million tax credit
- The Plant can capture and sequester 50 % of its carbon dioxide emission.



Coal Gasification (IGCC) -Kemper County Project

- Plant uses TRIG – Transport Integration Gasification which was developed at Power System Development Facilities in Wilsonville, Alabama in partnership with Southern Company, DOE and KBR – 13 years in development
- Technology works with low-rank coal (less efficient but half the worldwide coal reserves)



Environmental and Commercial Benefits

- Capability to achieve extremely low SO_x, NO_x and particulate emissions from burning coal-derived gases.
- Sulfur in coal, for example, is converted to hydrogen sulfide and can be captured by processes presently used in the chemical industry.
- In some methods, the sulfur can be extracted in either a liquid or solid form that can be sold commercially. Other advanced emission control processes are being developed that could reduce NO_x from hydrogen fired turbines to as low as 2 parts per million.

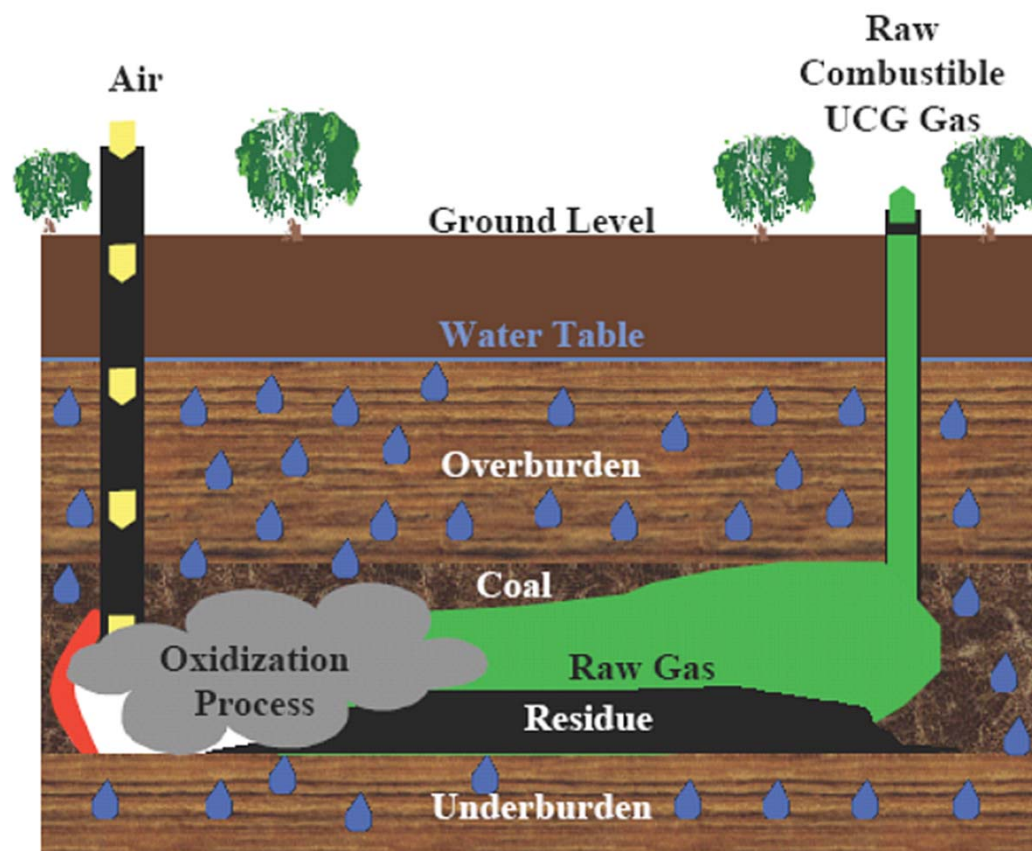


Environmental Benefits

- In an Integrated Gasification Combined-Cycle (IGCC) plant, the syngas produced is virtually free of fuel-bound nitrogen.
- NO_x from the gas turbine is limited to thermal NO_x. Diluting the syngas allows for NO_x emissions as low as 15 parts per million.
- Selective Catalytic Reduction (SCR) can be used to reach levels comparable to firing with natural gas if required to meet more stringent emission levels.



UCG PRODUCTION PROCESS



A dark, moody photograph of a sunset or sunrise. The sky is a deep red and orange, with a bright yellow sun partially visible on the horizon. Silhouettes of power lines and towers are visible against the sky. The word "Questions?" is written in white text in the center of the image.

Questions?