



CCS Project Updates

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U.S. DEPARTMENT OF
ENERGY

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Southern Company Services, Inc. CCPI-2

Kemper County Advanced IGCC with CO₂ Capture

- Kemper County, MS
- 582 MWe (net) with duct firing; 2 TRIG™ gasifiers, 2 Siemens combustion turbines
1 Toshiba steam turbine
- Fuel: Mississippi lignite
- 67+% CO₂ capture (Selexol® process);
3,000,000 tons CO₂/year
- EOR: Denbury Onshore LLC, Treetop
Midstream Services LLC
- Total estimated project cost: ~\$ 6.8B
- Project Financing:
 - Capped Rate Recovery: \$2.88 Billion
 - DOE Cost Share: \$407
 - Southern Co. Finances Remainder



Key Dates

- Project Awarded: Jan. 30, 2006
- Project moved to MS: Dec. 5, 2008
- NEPA Record of Decision: Aug. 19, 2010
- Initiate excavation work: Sept. 27, 2010

Status

- Plant construction >99% complete
- Peak construction labor 6,121
- Lignite mine in commercial operation: June 2013
- Combined cycle commercial operation on natural gas: August 2014
- First Syngas production initiated: July 14, 2016
- Commercial Operations Expected: 2016



Petra Nova – NRG W.A. Parish CCPI-3

Advanced Post Combustion CO₂ Capture

- Thompsons, TX (near Houston)
- 240 MWe slipstream at NRG Energy's W.A. Parish power plant (originally 60 MWe)
- Fuel: PRB sub-bituminous coal
- 90% CO₂ capture (KM CDR Process[®])
1,400,000 tonnes CO₂/year
- EOR: Hilcorp West Ranch oil field
- Total Project Cost: ~\$1 billion
 - NRG Equity - \$300 million
 - JX Nippon Equity – \$300 million
 - Project Financing - \$250 million
 - DOE Cost Share: \$190 million



Key Dates

- Project Awarded: May 2010
- Air Permit: December 2012
- NEPA Record of Decision: May 2013
- Financial Close: July 2014
- Commercial Operation: January 2017

Status

- Construction of all major equipment complete: quencher, absorber, regenerator, HRSG, cooling tower
- Final construction activities on-going: heat tracing, lighting, and final grading and paving
- Commissioning activities on-going
- Pipeline mechanically complete, hydro-test completed
- Overall EPC effort: 99.7% complete (8/31/16)
- Construction: 98.7% complete (8/31/16)



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Air Products & Chemicals, Inc. ICCS Area 1

Steam Methane Reforming with CO₂ Capture

- Port Arthur, TX (Hydrogen plant at Valero Refinery)
- 90%+ CO₂ capture (Vacuum Swing Adsorption) from 2 steam-methane reformers (SMRs) yielding ~925,000 tonnes CO₂/year
- ~30 MWe cogeneration unit to supply makeup steam to SMRs and operate VSA and compression equipment
- CO₂ to Denbury “Green” pipeline for EOR in Texas at West Hastings oil field
- Total Project: \$431 MM;
- DOE Share: \$284 MM (66%)



Key Dates

- Phase 2 Awarded: June 15, 2010
- FEED completed: Nov. 2010
- Permit By Rule (PBR) and Standard Air Permits issued: May 2011
- NEPA FONSI: July 2011
- Construction started: Aug. 2011
- Operation started: Dec. 2012

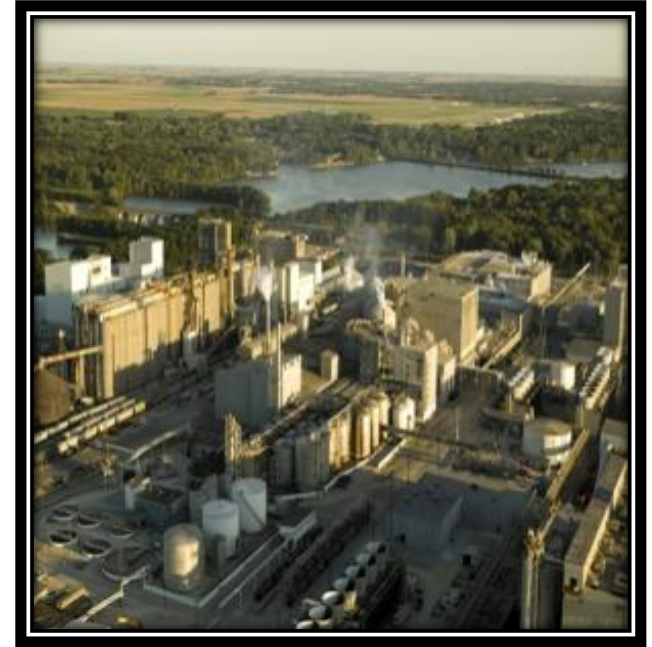
Status

- PA-1 initiated operation: March 3, 2013
- PA-2 initiated operation: Dec. 16, 2012
- Full capacity achieved: April 2013
- Has operated >100% of design when needed
- 1 MM tonnes CO₂ delivered as of 4/24/14
- 2 MM tonnes CO₂ delivered as of 5/15/15
- Over 3 MM tonnes of CO₂ delivered as of July 2016



Archer Daniels Midland Company ICCS Area 1 *CO₂ Capture from Biofuel Plant*

- Decatur, IL
- CO₂ (>99% purity) is a by-product from production of fuel-grade ethanol via anaerobic fermentation
- Up to 90% CO₂ capture, dehydration (via tri-ethylene glycol) & compression
- ~900,000 tonnes CO₂ /year
- Sequestration in Mt. Simon Sandstone saline formation.
- Total Project Cost: \$208 MM.
- DOE Cost Share: \$141 MM (68%)



Key Dates

- Phase 2 Awarded: June 15, 2010
- FEED Completed: April 2011
- NEPA FONSI: April 2011
- Construction started: May 2011
- UIC Class VI Injection Well Permit: Sept. 2014; UIC Class VI Operating Permit: Early 2016
- Sequestration start: 1Q-2017

Status

- Construction ~99% complete Apr. 2016
- Two monitoring wells drilled: Nov. 2012
- Commissioning compression and dehydration system completed: Sept. 2015
- Injection well completed: Sept. 2015
- Awaiting final EPA authorization to start CO₂ injections using Class VI UIC permit.