Update on the Kemper TRIG™ IGCC Project
Southern Company Facts and Figures

- **Regulated Utilities**
  - Alabama Power
  - Georgia Power
  - Gulf Power
  - Mississippi Power
  - Southern Nuclear

- **Competitive Power**
  - Southern Power
  - Southern Generation

- **Other**
  - Southern LINC Wireless
  - Southern Telecom

- **46,000 MW capacity; 303 generating units**
- **2012 sources of electric generation**
  - 32% coal
  - 47% gas
  - 16% nuclear
  - 5% renewables
Power Systems Development Facility (PSDF)

Government Support

Operations & Management

Industry Sponsors

U.S. Department of Energy National Carbon Capture Center at the Power Systems Development Facility

Managed by Southern Company Services, Inc.
TRIG™ uses a different approach compared to entrained flow or fluid bed gasifiers.

- GE
- E-gas
- Shell
- Siemens
- MHI
- TRIG™

Entrained Flow (Once Through)

Oxygen Blown

Burner-type, Slagging

Fluid Bed

Air or O₂-Blown

No Burner Non-Slagging

(Not to Scale)
PSDF Gasification Systems Development

Flexible Fuel Feeding

Ash Removal

Sensors and Controls

Particulate Removal
Kemper County TRIG™ 3-D Perspective
**Kemper County TRIG™ IGCC Overview**

- **2x1 Integrated Gasification Combined Cycle (IGCC)**
  - 2 Transport Gasifiers
  - 2 Siemens SGT6 - 5000F CTs
  - 1 Toshiba Steam Turbine
  - 582 MW peak and 524 MW on syngas
  - Heat Rate: 12,150 Btu/kWh
  - 28.1% HHV Efficiency w/ CO₂ control and >40% moisture coal
  - UOP's Selexol Process for H₂S and CO₂ removal
  - Haldor Topsøe's Wet Sulfuric Acid for H₂SO₄ production.
  - 65% CO₂ capture (~800 lb/MWh emission rate)
  - Mine Mouth Lignite

- **Owner & Operator:** Mississippi Power

- **By-Products (TPY)**
  - ~3,000,000 - Carbon dioxide used for EOR
  - ~135,000 - Sulfuric acid
  - ~20,000 - Ammonia

---

**Kemper Lignite Composition**

<table>
<thead>
<tr>
<th></th>
<th>Average</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heat Content</td>
<td>5,290</td>
<td>4,765</td>
<td>5,870</td>
</tr>
<tr>
<td>Moisture</td>
<td>45.5</td>
<td>42</td>
<td>50</td>
</tr>
<tr>
<td>Ash</td>
<td>12.0</td>
<td>8.6</td>
<td>17</td>
</tr>
<tr>
<td>Sulfur</td>
<td>1.0</td>
<td>0.35</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Kemper County IGCC Infrastructure

~70 miles transmission.
  ✓ Station energized
~60 miles CO₂ pipeline (for EOR).
  ✓ 100% Complete
~5 miles natural gas pipeline.
  ✓ 100% Complete
~31,000 acre mine site.
  ✓ Placed in Service in June 2013.
~30 miles treated effluent line
  ✓ 100% Complete
Construction Progress -- Fall, 2011
Construction Progress -- Fall, 2012
TRIG™ with Carbon Capture

Gasifier Island

- Coal milling & drying
- High pressure coal feeding
- Transport gasifier
  - Transport air compressor
  - Coal milling & drying

High temperature syngas cooling
  - High pressure coal feeding

Particulate collection
  - Fine G-ash
  - Sour water

WATER GAS SHIFT REACTION
  - Sour water treatment
  - Sour water

Low temperature Syngas cooling
  - Sour water treatment

CO₂ AND SULFUR REMOVAL
  - MERCURY REMOVAL
  - SWEET SYNGAS

CO₂ compression and drying

CO₂

Gasifier Island

COAL MILLING & DRYING
HIGH PRESSURE COAL FEEDING
TRANSPORT GASIFIER
PROCESS AIR COMPRESSOR
COARSE G-ASH
AIR
COAL MILLING & DRYING
HP, SUPERHEATED STEAM
CONDENSATE
CONDENSER
HEAT RECOVERY STEAM GENERATOR
GAS TURBINE
STEAM TURBINE
POWER
TO STACK

Combined Cycle

SOUTHERN COMPANY
Syngas Clean-up – H₂S absorber tower installation
A sense of scale -- $H_2S$ Absorbers
Syngas Clean-Up Equipment
## Key Startup Milestones Completed

<table>
<thead>
<tr>
<th>Key Milestones</th>
<th>Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>✓ Admin/Control Building - DCS Control System Functional</td>
<td>21-Sep-12</td>
</tr>
<tr>
<td>✓ Start Filling Treated Effluent Reservoir</td>
<td>15-Oct-12</td>
</tr>
<tr>
<td>✓ Station Service Energized</td>
<td>8-Nov-12</td>
</tr>
<tr>
<td>✓ Water Treatment Plant Commissioning Completion</td>
<td>30-Mar-13</td>
</tr>
<tr>
<td>✓ Cooling Tower Completion</td>
<td>10-Apr-13</td>
</tr>
<tr>
<td>✓ Fire Auxiliary Boiler</td>
<td>5-Aug-13</td>
</tr>
<tr>
<td>✓ First Fire Combustion Turbine – A</td>
<td>28-Aug-13</td>
</tr>
<tr>
<td>✓ First Fire Combustion Turbine – B</td>
<td>4-Sep-13</td>
</tr>
<tr>
<td>✓ Steam Turbine – Sync To Grid</td>
<td>5-Oct-13</td>
</tr>
<tr>
<td>• First Gasifier Heatup</td>
<td></td>
</tr>
<tr>
<td>• Reliable Syngas To Combustion Turbine A</td>
<td></td>
</tr>
<tr>
<td>• Reliable Syngas To Combustion Turbine B</td>
<td></td>
</tr>
</tbody>
</table>
Extensive control logic verification prior to plant operation.

Integration issues are being evaluated and addressed through use of a process simulator in advance of integrated plant operation.
Summary

Construction focusing on piping, instruments and electrical. EPC was 74% complete through August, 2013. Commissioning / startup progressing as systems are completed by construction. Startup was 46% complete through August, 2013.

Integration issues are being addressed with a simulator in advance of integrated plant operation.
Thank you!