Coal – A New Era . . . with CCS

Southern States Energy Board
Virginia Coal and Energy Alliance

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The Institute strives to:
- Build policy support for CCS
- Increase commercial opportunities for CCS
- Improve public understanding and acceptance of CCS

The Institute Membership Includes:
- Industry
- NGOs
- Governments
Members in the Americas

Industry
- Archer Daniels Midland
- Cloud Peak Energy
- ExxonMobil
- Jupiter Oxygen
- NetPower
- Occidental Petroleum
- Peabody
- Shell
- Southern Company

Government
- United States Department of Energy
- Province of Alberta
- Province of Saskatchewan
- Government of Mexico (SENER)

NGOs
- Clean Air Task Force
- ClearPath Foundation
- Great Plains Institute

Research Organizations
- Battelle
- Electric Power Research Institute
- Canadian Clean Power Coalition
- Petroleum Technology Research Centre

Industry Associations
- Brazil Coal Association
- CCS Alliance
- Southern States Energy Board
- United States Energy Association
## CCS Projects, Present and Future

<table>
<thead>
<tr>
<th>Region</th>
<th>Early planning</th>
<th>Advanced planning</th>
<th>Construction</th>
<th>Operation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>12</td>
<td>18</td>
</tr>
<tr>
<td>China</td>
<td>5</td>
<td>2</td>
<td>1</td>
<td>-</td>
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<tr>
<td>Europe</td>
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<td>2</td>
<td>-</td>
<td>2</td>
<td>6</td>
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<tr>
<td>Gulf Cooperation Council</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Rest of World*</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>11</strong></td>
<td><strong>7</strong></td>
<td><strong>5</strong></td>
<td><strong>17</strong></td>
<td><strong>40</strong></td>
</tr>
</tbody>
</table>

*Includes facilities in Australia, Brazil and South Korea.

North America dominates – 15 (of 22) facilities in operation or construction, China has most facilities in planning, facility pipeline needs replenishment.
China’s Plan for Power and the Environment

• Abundant coal, but not natural gas
• Plans to leap from coal directly to renewables
• Transition will be coal with CCS
75% of Worldwide Energy from Fossil in 2040

Primary energy demand by fuel source:
(million tonnes of oil equivalent)

Source: IEA World Energy Outlook, 2015 (New policies scenario)
IPCC: 138% Higher Cost to Stay Below 2C without CCS

*Percentage increase in total discounted mitigation costs (2015-2100) relative to default technology assumptions – median estimate

Institute Congressional Attitudes Project

Test Awareness and Attitudes Towards:
- Carbon Capture
- Climate Policy
- Future of Energy

Methodology:
- Audience: Congressional Staff and Influencers
- Two Congressional Staff Focus Groups
- 100 30-Question Interviews divided D/R, Regionally
Despite significant increases in energy efficiency and renewables, the world currently derives more than three-fourths of its total energy demand from fossil fuels. Even with aggressive political, financial, and scientific support for clean energy, fossil fuels will continue to be a major source of power.

A strong majority expect fossil fuels will continue to be with us in the future.
What is Power Generation’s Future?

Q: Do you believe the future of electric power lies with renewables (wind and solar), a broader array of clean energy options (including nuclear, fossil fuels with CCS, along with renewables), or fossil fuels with no government support for clean energy?

A strong majority expects “all of the above.”
The “Business Case” vs. the Paris Agreement

Whether or not one supports U.S. adherence to the Paris Agreement, the world is moving toward a lower-carbon economy. Therefore, the U.S. should still actively pursue lower-carbon technologies, or risk falling behind the rest of the world.

Q:

69

81

19

9

3

Strongly Agree | Somewhat Agree | Somewhat Disagree/Strongly Disagree | Undecided

Strong support exists for pursuing the low-carbon economy, for business and competitiveness reasons.
Facts:

• "Climate Action" is Here to Stay
  The Worldwide Low-Carbon Economy

• So are Fossil Fuels
  Every Reputable Source Says So

• CCS is Essential to the Future of Both
Messages:

• Energy Economics
  Instead of “Coal vs. the World,” focus on energy content, cost

• Energy Security
  U.S. competitiveness depends on energy diversity

• Technology
  R&D sets free all forms of energy

• Carbon as a Commodity, not a Pollutant
  Capture it, sell it, use it, store it
Better Messaging

JOIN THE UNDERGROUND
THE ANSWER TO CLIMATE CHANGE IS RIGHT BENEATH OUR FEET

GLOBAL CCS INSTITUTE