Carbon Capture Ready: What Next?

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Acknowledgments

- DOE
- BEG: Sue Hovorka, Ian Duncan...
- GCCC Member Companies
- BEG Global Collaborators
- FutureGen Texas Team
Outline

• Power and Coal

Electricity is the “energy” of the future. Coal and uranium are the major sources of heat for power generation in the mid term.
US Energy Use

Global proved oil and gas reserves
Recoverable coal reserves
(oil shale and oil sands not included)

- Coal
- Oil
- Natural Gas

Quadrillion ($10^{15}$) Btu

US, EE & FSU, China, Middle East, Rest of World

The GCCC is providing basic data to bring science, industry, decision makers, and NGOs together to develop sound policy.
The Gulf Coast Carbon Center (GCCC)
Current Programs: ~$12 Million

- SECARB Phase II
  *Fault seal testing, migration of fluids, stacked storage*

- SWCARB Phase II
  *Long-term injection, water quality, effective practices*

- FutureGen
  *Clean Coal Foundation, Regional Data Base*

- Frio II
  *Quantification of dissolved and trapped CO₂ in brine*

- Carolinas
  *SE US storage potential, variety of areas and basins*

- BP 4 Refineries
  *Survey of LA, Michigan, Illinois, and SE Gulf Coast Basins*
GCCC Current Activities

1. Assess Options for Reducing GHG Emissions
2. Assist in development of a CO2 sequestration industry
3. Communication, education and technology transfer
Inventory of Sinks with Economic Offset (EOR)
Inventory of Large-Volume Sinks (Brine-Bearing Formations)

Source: Gulf Coast Carbon Center

~ 220 Gt!

1. Offshore GOM
2. Upper Tertiary ss
3. Middle Tertiary ss
4. Lower Tertiary ss
5. Cretaceous ss
6. Lower Potomac Fm.
7. Cape Fear Fm.
Inventory of Sources

- Global ~ 25.6 Gt of CO2 annually
- U.S. ~ 5.7 Gt of CO2 annually
- Texas ~ 700 MMt of CO2 annually

Source: Gulf Coast Carbon Center
Field Demonstration
Projects and Experiments

Frio I Pilot
Reservoir model
Knox/Yeh, BEG

Injection interval

BP, Praxair, Schlumberger
Flow Simulation
TOUGH2, Doughty, LBNL
Field Demonstration
Projects and Experiments

Frio II

$1 million funding from DOE
USGS, 3 Nat’l labs contributing
Schlumberger, Praxair

Objective:

Improve quantification of two-phase and dissolution-trapping mechanisms leading to permanent CO$_2$ storage

Source: Gulf Coast Carbon Center
Policy and Regulatory Issues

Create products that assure sound technical information is conveyed to policy makers and regulators.

Work with RRC, TCEQ
Present at EPA workshops
Technical support for FutureGen

Review existing protocols
Assurance ranking strategy
Outline

• Power and Coal
• The GCCC
• FutureGen Texas

To be successful, FutureGen must propagate many FutureGen like facilities in the near term.
FutureGen Texas
Site Selection Process

1. Get the public involved
2. Open and fair competition
3. Business, not political decision
4. Meet anticipated FutureGen criteria
5. Competition is a good thing
17 Regional Councils of Governments Expressed an Interest
9 Regional Councils of Governments Submitted a Proposal
5 Regional Councils of Governments Made the Shortlist
Two Sites Selected

Proposals Submitted on May 4, 2006
Two Sites on National Short List

A Yee Hah Moment
There is an approach that will make everyone somewhat unhappy!

Such is compromise; it often works.

• Forming a Clean Coal Industry
It Starts with CO2

- Grab it: Capture
- Change it: Compress
- Move it: Transport
- Store it: Sequester
- Prove it: MMV

...and pay for it...
The “Stick”

- Climate is changing
- Negative impacts exceed positive
- Therefore CO$_2$ is “bad”
- Popular to “do something” about it
- Emissions regulations drive cap and trade markets
- Industry and economy… deal with it

Government/Industry > 1
The “Carrot”

- Climate is changing and has been for a few billion years
- Anthropogenic CO2 is background noise
- Keep pumping out the GHGs
- Public and Environment... adapt and get over it

Government/Industry < 1
The “Cabbage”
(Hurts if it hits you, but you can still eat it...)

- Climate changing
- Anthropogenic CO2 partially responsible
- CO2 is a commodity
- Government jump start industry
- Commerce takes over
- Energy/Environment/Economy benefit

Government/Industry ~ 1
Governments

• Reward Innovation
  • Incentives
  • Clean power credits
  • Co-fund R&D
• Assume CO$_2$ “liability”
• Streamlined permitting/EIS
• Share infrastructure costs
Commerce

• Seek “fit-for-purpose” sites
• Innovate and invent
• Invest in infrastructure and talent
• Commercialize and compete
• Less talk and more action!
An Early Driver: EOR

EOR recovery in Texas outside of the Permian Basin is estimated at 4-6 bbo, using ~ 700 MT CO₂

At $60 oil, 5.7 bbo generates:
- wellhead value: $342 billion
- wellhead taxes: $30 billion
- other taxes: $22 billion
- economic activity: $498 billion

EOR finances the required infrastructure!
Down the Road: CO2

A growing market for power and CO\textsubscript{2}, including commodity and credits, could center around regions such as the Gulf Coast with excess storage capacity.

Sustains the market!
Summary

• Electricity is the “energy” of the future. Coal and uranium are the major sources of heat for power generation in the mid term.

• The GCCC is providing basic data to bring science, industry, decision makers, and NGOs together to create sound policy.

• To be successful, FutureGen must propagate many FutureGen like facilities in the near term.

• There is a compromise approach (the cabbage) to get the show on the road and avoid the stick. Let’s get after it!