Focus Group Meetings

- Initial consortium meeting on Dec. 7, 2007
- Over 100 in attendance
- Expressed desire to organize overall project by geographic area and project type
- 3 focus groups meeting this week:
  - Wednesday: Western Kentucky deep CO₂ storage
  - Thursday: Eastern Kentucky deep CO₂ storage
  - Friday: Enhanced oil and gas recovery
Outline

- HB 1 funding and directives
- Kentucky Consortium for Carbon Storage
- Vision and expected results
- Project organization and structure
- Preliminary budget development
- Discussion and questions
Why Are We Here?

- Kentucky HB 1 was passed in a 2007 special session and signed into law August 30.
- Provides financial incentives for coal gasification plants
- Provides $5 million for carbon sequestration research in Kentucky
- “The Kentucky Geological Survey is encouraged to use these funds to match available federal and private funds to the extent possible.”
2007 HB 1 Directives

- Drilling of deep wells in the eastern and western coal fields to estimate sequestration potential
- Quantify the potential for:
  - Enhanced oil and gas recovery
  - Enhanced coalbed methane recovery
- Test the Devonian shale for CO$_2$ enhanced gas recovery and CO$_2$ sequestration potential
Vision

- $5 million is not sufficient to accomplish everything in HB 1
- A joint industry–government consortium is the only way to achieve these objectives
- The **Kentucky Consortium for Carbon Storage** (KYCCS) has been formed by KGS
Consortium Model

- Industry involvement is necessary for the success of this project
  - Cost sharing
  - Guidance and direction of research
  - Provide expertise not available at KGS
  - Justification of the Commonwealth’s investment in carbon management research
## Today’s Goals

### Morning
- Identify likely members of Western Kentucky project
- Create a Project Advisory Committee and define its responsibilities
- Discuss and agree on funding structure, funding levels, deadline for participation, other concerns

### Afternoon
- Present our initial technical approach
- Discuss preliminary budget??

**Morning**

- Identify likely members of Western Kentucky project
- Create a Project Advisory Committee and define its responsibilities
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**Afternoon**

- Present our initial technical approach
- Discuss preliminary budget??
HB 1 Research Organization:

3 Subprojects

- **Western Kentucky Deep Sequestration**
  - Rick Bowersox and Dave Williams

- **Eastern Kentucky Deep Sequestration**
  - Steve Greb and Warren Anderson

- **CO₂ EGR/EOR**
  - Devonian shale CO₂ EGR, Brandon Nuttall
  - CO₂ EOR, Marty Parris
  - Enhanced coalbed methane production, Cortland Eble

- **Public Education and Outreach**
  - Mike Lynch
Subproject Integration

- Subprojects will run concurrently
- Communication between teams important
- Efforts will be made to coordinate work schedules and contracts to extent possible for cost savings
  - Seismic acquisition, drilling
Western Ky. Project Goal

Identification, characterization, and testing of CO$_2$ storage in saline reservoirs in Western Kentucky

Will be accomplished by drilling of a deep well to test multiple potential target zones
**Impact of Results**

- Kentucky geology is not homogeneous

- Research sites will be as representative as possible, however:
  - A successful project will not prove sequestration is possible everywhere, and an unsuccessful project will not condemn the entire state

- We cannot guarantee success – there is risk involved
Project Structure

- Industry cost-share to be administered separately by subproject
- University of Kentucky Research Foundation (UKRF) is a not-for-profit 501(c)(3) corporation
- This existing legal structure should suffice for tax benefits to contributors
- Maximum tax benefits may be realized through a gift mechanism, but this would preclude direct benefit or involvement in project decisions
Project Advisory Committees (PACs)

- Separate advisory committees proposed for 3 subprojects
- Equal representation from major participating companies, the Commonwealth, and KGS
- Advisory committee responsibilities:
  - Major project decision points
  - Major expenditures
  - Main contact point for communications
  - Technical support, guidance, and oversight
PAC

- HB 1 mandates that KGS lead the technical effort with input and collaboration from partners.
- KGS to evaluate sites and develop objectives based on technical merit.
- KGS will present major project decisions to PAC for agreement on significant expenditures.
Liability of Sponsors

- **Sponsor liability for university research:**
  - UK cannot indemnify sponsors, but we know of no case where a sponsor has been held liable for research activity.
  - UK legal counsel is currently looking into this.

- **Liability related to injected CO\(_2\) is a concern in all CO\(_2\) projects (like FutureGen):**
  - This project will involve small volumes of CO\(_2\).
  - Will follow lead established by DOE demonstration projects.
  - Liability insurance could be explored.
Confidentiality

- Data and results of project to be published
  - No confidentiality
- Confidential data provided by consortium members to aid in regional or site evaluation will be held confidential within the consortium
Probable Participants

Western Kentucky Deep Storage

- Commonwealth of Kentucky
  - Portion of $5,000,000 total funding to be determined
- Illinois Office of Coal Development
  - $250,000 commitment
- ConocoPhillips
  - Data, in-kind services, financial support
- Kentucky Syngas, LLC
  - Financial support, in-kind services
- E.ON U.S.
  - 1/8 share of $5 million matching funds: $625,000 over 4 years
Probable Participants

Western Kentucky Deep Storage

- Henderson County Riverport Authority
  - Drilling sites (surface and mineral ownership) in Henderson County on Ohio River
  - Rail access, office space and support, field office

- Schlumberger Carbon Services
  - Consulting services, discounted logging and well services, Petrel and ECLIPSE software donation

- Sunshine Oil & Gas, LLC
  - Drilling site, funding for well
Pending Participants

Western Kentucky Deep Storage

- Big Rivers Electric Corp.
- Kentucky Resources
  - Drilling site in Muhlenberg County
- GEO Oil and Gas, LLC
  - Drilling site(s)
Federal Cost Share

- Several options to obtain federal matching dollars in other subprojects
- No federal dollars identified to date for Western Kentucky project
- Midwest DOE partnership a remote possibility, but Illinois already has committed $250k
Project Schedule

- Western Kentucky project to require approximately 2 years for completion
- Site and target selection: spring 2008
- Seismic acquisition/interpretation: summer 2008
- Well design/permitting: fall 2008
- Drilling: winter 2008/2009
- Testing/injection to follow
Discussion Points

- Project Advisory Committees
- Liability concerns
- Project schedule
  - Organization and participation deadline
  - Technical milestones
- Identification of additional participants
- Budget
  - Financial contributions: equal shares or variable?
Deep Saline Reservoir Projects

- Tests in eastern and western Kentucky
- Depths $>2,500$ ft; likely 5,000 to 9,000 ft range
- Injection tests with either water or CO$_2$
- Locations to be chosen to provide most data on multiple target zones
- No sites have been considered yet
- Agreement with mineral owner to buy back the well if hydrocarbons are encountered possible
Technical Work: Deep Wells

- Obtain whole core and sidewall cores in reservoir and seal intervals
- Run and interpret extensive suite of well logs
- Collect brine samples from target zones for geochemistry
- Analyze core samples for porosity, permeability, mineralogy, mechanical strength, and other physical properties
- Conduct injection tests using fluid, air or CO$_2$
- Public education and outreach
- Reporting and technology transfer
Deep Wells

- Site characterization by KGS and consortium members
  - Subsurface mapping
  - Purchase existing seismic data; acquire new seismic
  - Evaluation of well logs, cores, and well samples
  - Characterize seals
  - Design monitoring plan (subsurface and surface)
  - Permit wells according to regulations for oil & gas wells or EPA-regulated injection wells.

- Well design and engineering
  - Outside consultants and consortium members
Well Design and Engineering

- KGS lacks in-house petroleum engineering expertise
- Outside consultants will be used for design of EOR projects, wells, injection tests, and operations oversight
- Will seek in-kind contributions from service companies
While CO$_2$ EOR potential is significant, deep saline or Devonian shale storage will be needed to handle expected volumes.
What’s Next?

- Participation decisions requested by Jan. 15
  - Consortium will remain open after that date
- We expect the level of industry funding will vary
- In-kind participation is welcomed
- A company’s participation and funding level cannot be held confidential
- Project results to released immediately
Proposed Program Budget
Western Kentucky Subproject

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<th>State Funds</th>
<th>Industry Match</th>
<th>DOE &amp; other states</th>
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<td>$1.35M</td>
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Budget for 7,500 foot injection well in Decatur, Illinois is $4.1M