

Kentucky Consortium for Carbon Storage

Western Kentucky Deep Storage Focus Group

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Warren Anderson

Rick Bowersox

Jim Cobb

Steve Greb

Jim Drahovzal

Cortland Eble

Dave Harris

John Hickman

Mike Lynch

Brandon Nuttall

Marty Parris

Mike Solis

Kathy Takacs

Dave Williams



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 CO₂ enhanced gas recovery and CO₂ 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??

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
CO₂ 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 CO₂ is a concern in all CO₂ projects (like FutureGen)
 - This project will involve small volumes of CO₂
 - 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 CO₂
- 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 side-wall 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 CO₂
- Public education and outreach
- Reporting and technology transfer

Deep Wells

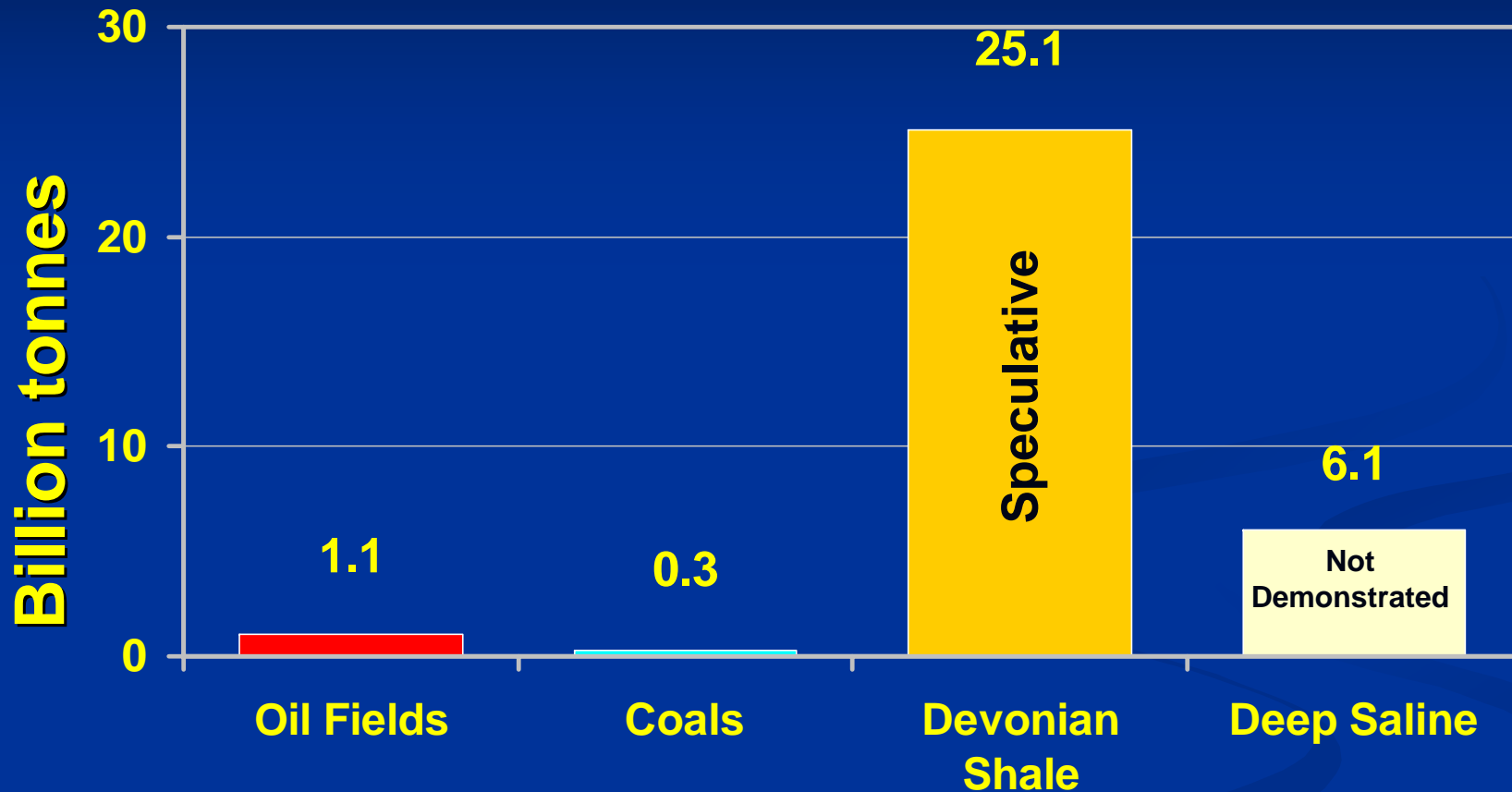
- Site characterization by KGS and consortium members
 - Subsurface mapping
 - Purchase existing seismic data; acquire new seismic
 - Evaluation of well logs, cores, and well samples
 - Characterize seals
 - Design monitoring plan (subsurface and surface)
 - Permit wells according to regulations for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

DOE Phase I CO₂ Storage Estimates



While CO₂ 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

State Funds	Industry Match	DOE & other states	Total
\$ 1.35M	\$1.35M	\$0.5M	\$3.2M

Budget for 7,500 foot injection well in Decatur, Illinois is \$4.1M

