



## Managing Climate Change and Securing a Future for the Midwest's Industrial Base



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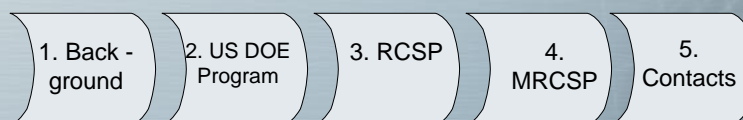
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### Please Note

- The full presentation by Mr. Ball is also available online at: [www.mrcsp.org](http://www.mrcsp.org)
- The original slides presented at the briefing did not include as much text as is included in this version. New text slides have been added to make it easier for viewers of the slides to follow the main points.
- Frequently, the new text slides have been inserted in front of the original slides to offer more detailed explanation.

## Overview

1. Background
  - Carbon dioxide (CO<sub>2</sub>) emissions and climate change
  - Carbon sequestration.
2. The U.S. Department of Energy (DOE) Carbon Sequestration Program.
3. DOE Regional Carbon Sequestration Partnership (RCSP) Program.
4. Midwest Regional Carbon Sequestration Partnership (MRCSP).
5. Contacts.



## Carbon Management: What's the Right Goal?

**The United Nations Framework  
Convention on Climate Change has as its  
ultimate objective ...**

stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.

**Article 2 (UNFCCC, 1992)**



Three Key Elements:

Stabilize concentrations not emission levels

Prevent danger at some unspecified level

Allow economic development to proceed

## Administration Carbon Management Commitments: June 11, 2001 and February 14, 2002



White House photo

### ■ Near-term commitment:

Reduce GHG intensity by 18% by 2012.

### ■ Long-term commitment:

"I reaffirm America's commitment to the United Nations Framework Convention and its central goal, to stabilize atmospheric greenhouse gas concentrations at a level that will prevent dangerous human interference with the climate."

—President George W. Bush

Deployment of best available technologies and practices across the Nation

Requires breakthroughs in the cost and performance of a portfolio of technologies  
"No Silver Bullet"

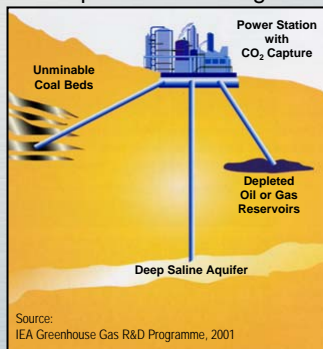
- Advanced Coal
- **Sequestration**
- Advanced Gas
- Hydrogen
- Bioenergy
- Energy Efficiency
- Nuclear
- Renewables



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## What is Carbon Sequestration?

### Carbon Capture and Geologic Storage



Capture of CO<sub>2</sub> from power plant and other stacks followed by injection and permanent storage in various geologic formations.



### Terrestrial Sequestration



Improved land management practices that enhance assimilation of carbon from the atmosphere and conversion of it to long term storage in soil and crops.

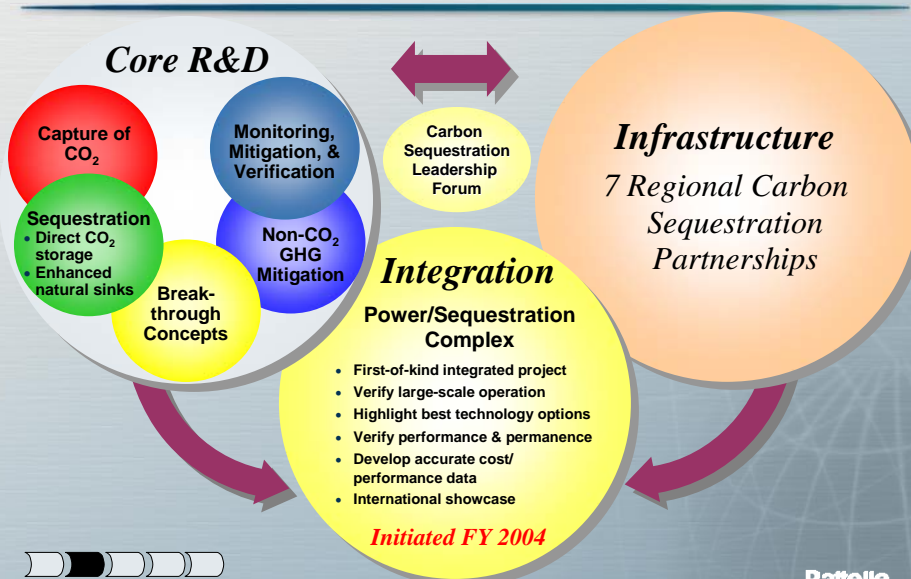
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## DOE's Carbon Sequestration Program

- As demonstrated on the following slide, the U.S. Department of Energy has a three-pronged carbon sequestration program.
- Battelle is involved in all three of these areas.
- Core Research and Development is used to study and begin to develop the science and the individual components of CCS.
- The regional carbon sequestration partnerships are helping to develop the infrastructure to support CCS as we'll discuss in a moment.
- Integration of these programs will occur through the FutureGen program, an effort to build the first complete CCS system in the US.



## NETL/DOE Carbon Sequestration Program Structure

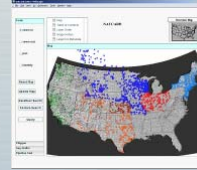




## Regional Carbon Sequestration Partnerships Program - Phased Approach

### Phase I (Characterization)

- 24 months (2003-2005)
- 7 Partnerships (40 states)



### Phase II (Field Validation Tests)

- 4 years (2005 - 2009)
- All 7 Phase I Partnerships continued
- \$100 million federal funds
- \$45 million in cost share

### Phase III (Integration)

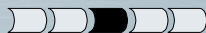
- 4 years (2009-2013)
- Pending authorization
- Significance to FutureGen

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## Geologic Field Validation Tests

### • 25 geologic sequestration assessments across the seven partnerships

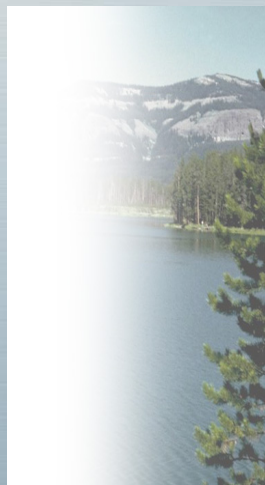
- 4 stacked saline/enhanced oil recovery formations sequestration tests
- 6 saline formation sequestration tests
- 6 coal seam sequestration tests with enhanced coal bed methane
- 8 depleted oil field sequestration tests with enhanced oil recovery
- 1 depleted gas field sequestration test with enhanced gas recovery.



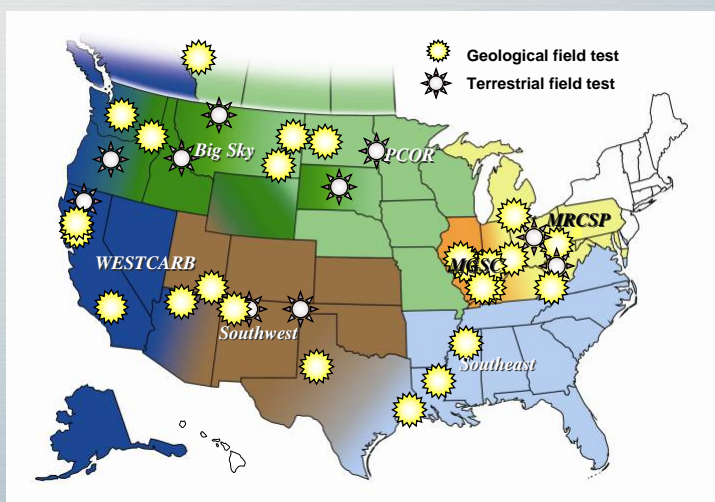
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## Terrestrial Sequestration

- 10 terrestrial indirect sequestration tests across the partnerships.
- Agriculture/Rangeland management
  - 4 Forestry
  - 1 Mineland restoration
  - 1 Wetland/Prairie Restoration.



## Phase II Field Validation Tests



## MRCSP Phase II Partners



## MRCSP Activities in Phase I

- Identified CO<sub>2</sub> sources in the MRCSP Region.
- Assessed the region's potential for storing CO<sub>2</sub>
  - Deep geologic reservoirs
  - Terrestrial ecosystems.
- Assessed the cost of capturing CO<sub>2</sub> from these sources.
- Identified critical issues for
  - Technology deployment
  - Safety
  - Economics
  - Regulations and public acceptability.
- Engaged public stakeholders to inform them about carbon sequestration and to obtain their feedback.
- Identified potential Phase II demonstration projects.



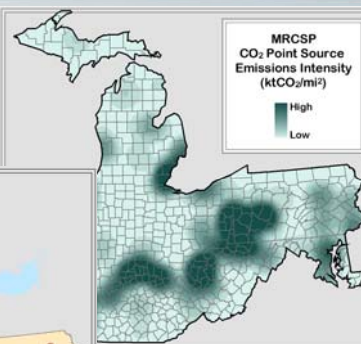
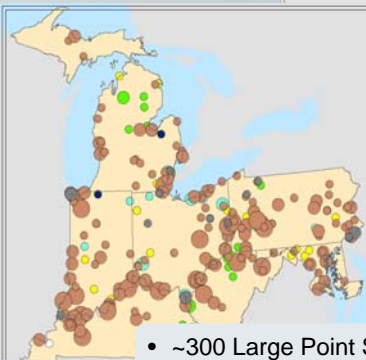
## Focus on the MRCSP Region

- The next three slides provide some overview information about the 7-state MRCSP region.
- MRCSP includes: Indiana, Kentucky, Maryland, Michigan, Ohio, Pennsylvania and West Virginia.
- The region relies quite heavily on the production and use of energy.
- It is situated on top of a geology that holds great promise for CCS and for terrestrial sequestration.



## The MRCSP Region: The Nation's Engine Room

- One in six Americans
- 1/6 of U.S. Economy
- 1/5 of U.S. Electricity Generated
  - 3/4 From Coal

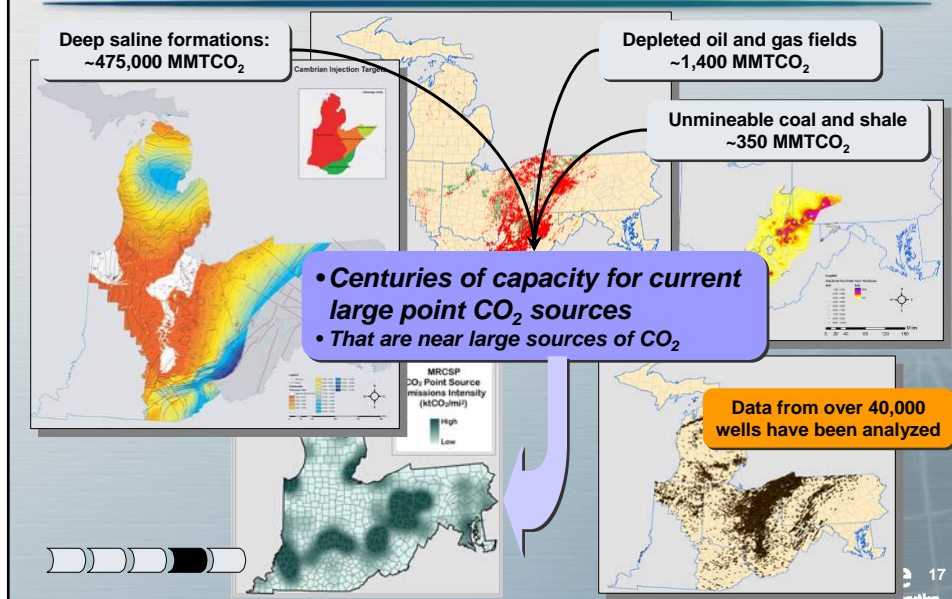


- ~300 Large Point Sources (>100,000 tonnes/year)
- ~800 Million tonnes CO<sub>2</sub>/year

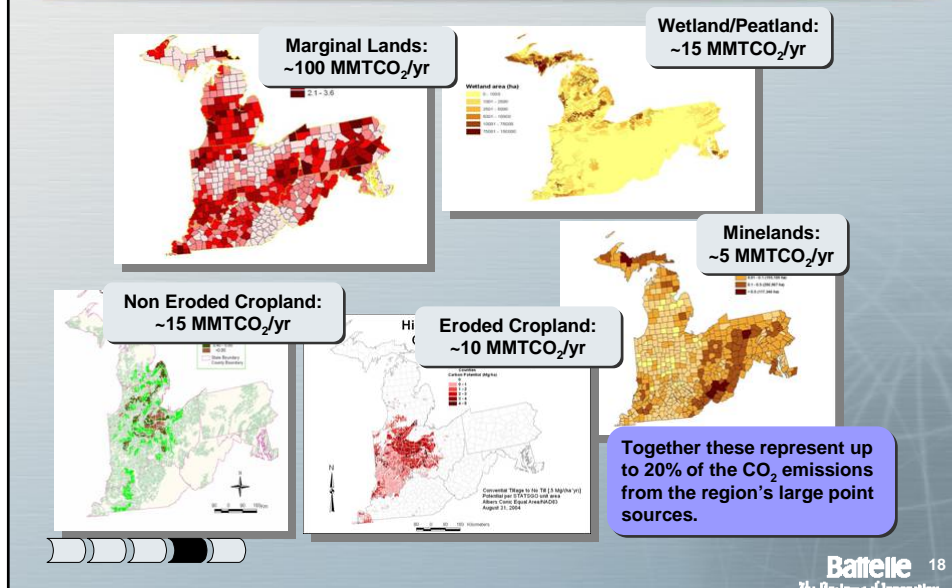




## The Geological Potential of the Region is Vast and Well Positioned Relative to Sources



## The Terrestrial Sequestration Potential in the Region is also Large



## Efforts to Build Informed Constituency

- During Phase I and throughout Phase II, the MRCSP team has made a concerted effort to share information with the public.
- MRCSP believes that gaining public support is critical to the success of the effort and that the best way to build that support is by sharing information and listening to concerns.
- In addition to numerous briefings and informational meetings, the MRCSP also developed an interactive website to provide a means for stakeholders to get in touch with the research team. The following slide shows a screen shot of the web page.



## Our Web Site ([www.mrcsp.org](http://www.mrcsp.org))

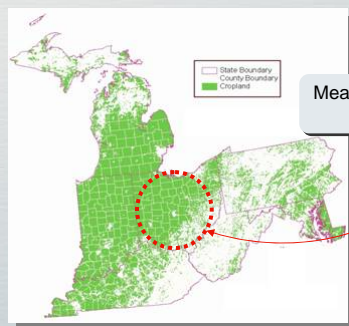
The screenshot shows the MRCSP website layout. A callout on the left points to the 'We Want to Hear from You' section, stating: 'A forum for feedback on selected topics'. A callout on the right points to the 'Introduction to Carbon Sequestration' section, stating: 'Educational information on carbon sequestration'. The website header includes the MRCSP logo and navigation links like Home, Join Our Mailing List, and Learn about Climate Change and Carbon Sequestration. The main content area features a sidebar with links to Regional Partnerships, Fact Sheets, and a Members Area. The central content area displays 'Topic 1' through 'Topic 5' for public feedback, and an 'Introduction to Carbon Sequestration' section with sub-topics like Carbon sequestration, The regional partnership program, and Additional information. A progress indicator at the bottom shows 4 out of 5 steps completed.

## MRCSP Phase II Objectives

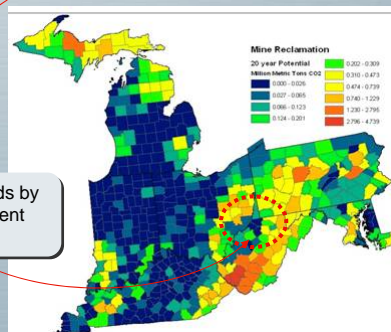
- Conduct multiple geological and terrestrial field projects.
- Use innovative methods such as “piggyback” drilling to generate additional geologic information about the region.
- Continue to engage public stakeholders to inform them about the sequestration and to obtain their feedback
  - Conduct site specific outreach activities in conjunction with field tests.
- Continue working with regulators in the region to understand and evolve the regulatory process for sequestration projects.
- Expand on the regional characterization of Phase I by filling key data gaps and adding field test results to the knowledge base.
- The following two slides give a broad overview of the planned field projects.



## MRCSP Phase II Candidate Terrestrial Field Tests



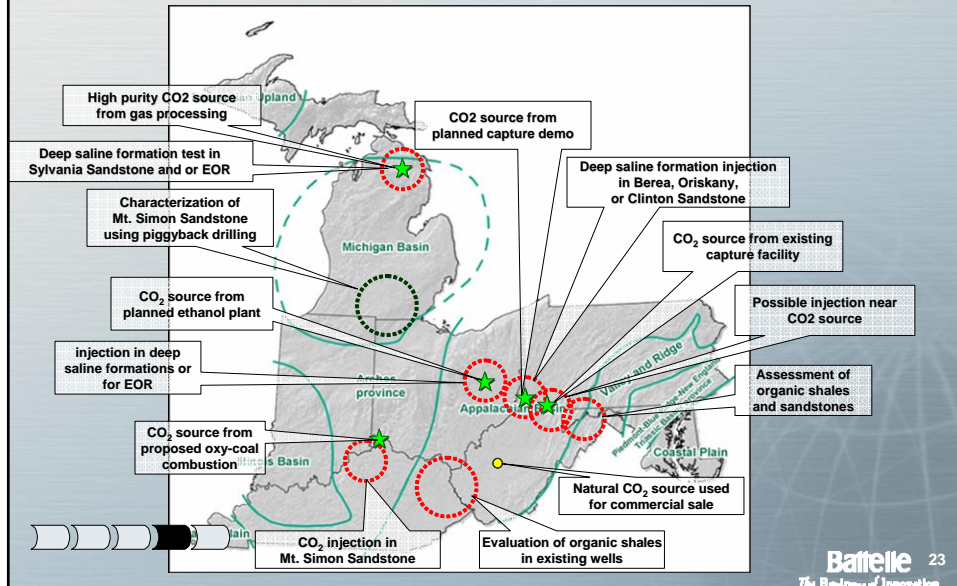
Measure sequestration on croplands under different conditions.



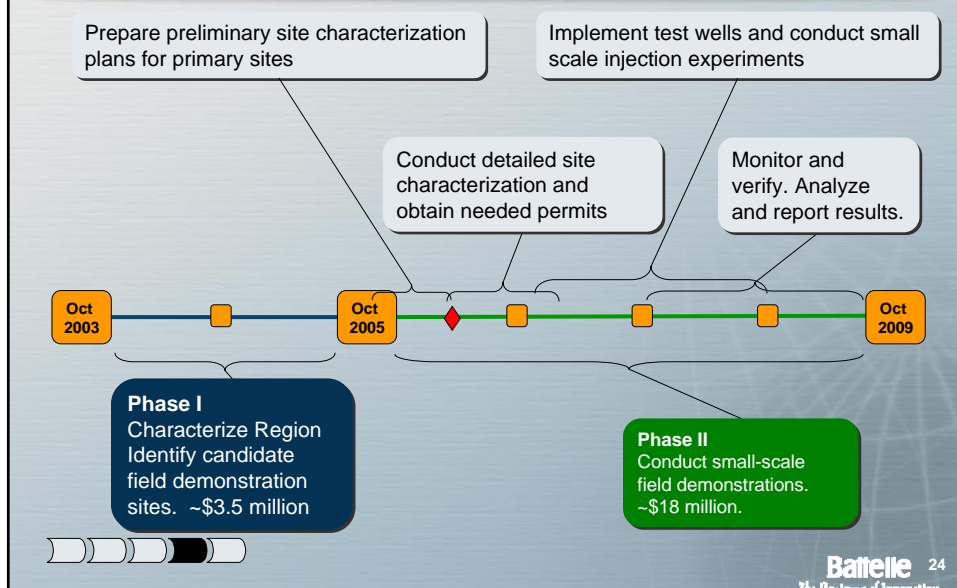
Characterize sequestration for minelands by comparing carbon uptake under different reclamation practices.



## MRCSP Phase II Candidate Geologic Field Tests



## Timeline for MRCSP Phase I and Phase II Activities





## Feedback is Welcome

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- MRCSP Website: [www.mrcsp.org](http://www.mrcsp.org)
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<http://www.netl.doe.gov/coalpower/sequestration/partnerships/index.html>

