

Regional Carbon Sequestration Partnerships



2006 Annual Review Meeting

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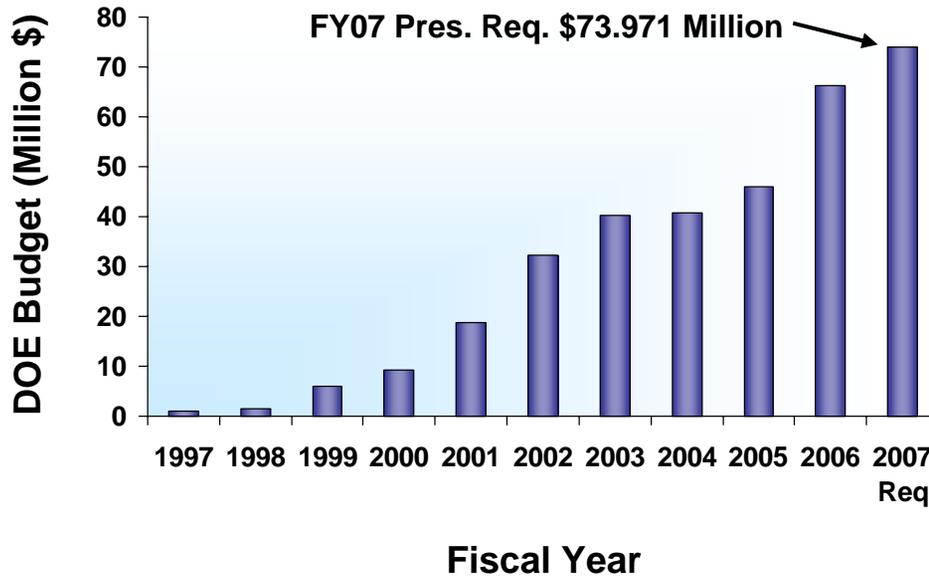
Overview of Meeting

- **Welcome!!!**
- **Oil and Gas Workshop**
- **Regional Partnerships Review Meeting**
 - Regional Partnerships Programmatic Highlights
 - Field Validation Test Highlights
- **Networking!!!**



Budget Highlights

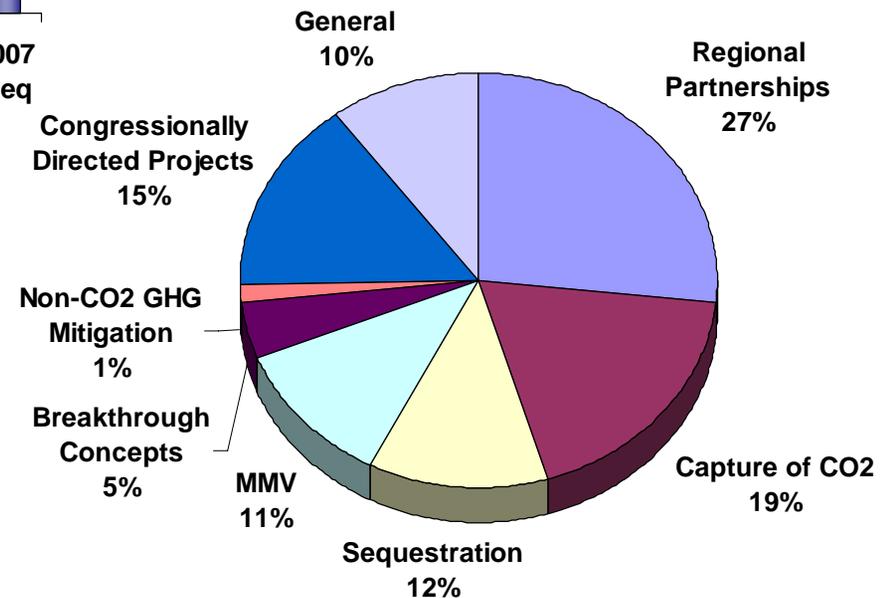
Sequestration Program - FY2006



Strong industry support
~ 39% cost share on projects

Federal Investment to Date
~ \$260 Million

FY 2006 Budget



Diverse research portfolio

~ 70 R&D Projects

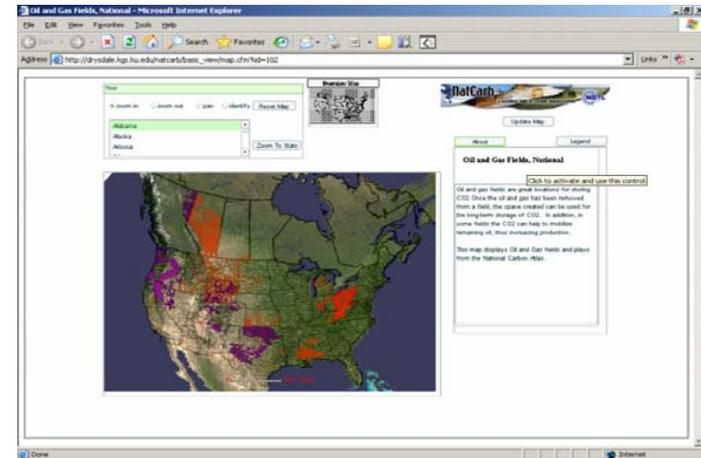


Carbon Sequestration Regional Partnerships

“Developing the Infrastructure for Wide Scale Deployment”

Phase I (Characterization)

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



Phase II (Field Validation)

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

Phase III (Deployment)

- 10 years (2007-2016)
- Several large scale injection tests

Regional Carbon Sequestration Partnerships

| | |
|---|---|
|  | <p>California Energy Commission http://www.westcarb.org/</p> |
|  | <p>New Mexico Institute of Mining and Technology http://www.southwestcarbonpartnership.org/</p> |
|  | <p>Montana State University http://www.bigskyco2.org/</p> |
|  | <p>University of North Dakota, Energy & Environmental Research Center http://www.undeerc.org/pcor/</p> |
|  | <p>University of Illinois, Illinois State Geological Survey http://www.sequestration.org/</p> |
|  | <p>Battelle Memorial Institute http://www.mrcsp.org/</p> |
|  | <p>Southern States Energy Board http://www.secarbon.org/</p> |

Characterization Phase Accomplishments

Characterized opportunities for capture and storage of carbon dioxide in North America

Developed National Carbon Sequestration Atlas and Geographic Information System (NATCARB)

Completed regulatory analysis and published recommendations for states – IOGCC Report 2005

Public outreach

- Documentary of Carbon Sequestration
- Focus groups used to gauge public opinion
- Outreach materials - websites and fact sheets

Developed regional action plans for regulatory permitting, MMV, outreach, and project implementation

Identified promising opportunities for validation phase



Worldwide CO₂ Storage Activity



Project size (total CO₂ injection)

- Commercial (greater than 1 MMtCO₂)
- Large pilot (100 ktCO₂ to 1 MMtCO₂)
- Pilot (11 ktCO₂ to 99 ktCO₂)
- Micro-pilot (10 ktCO₂ or less)

Storage formation

- Oil field
- Gas field
- Saline formation
- Coal seam

Projects that are part of the Regional Carbon Sequestration Partnership

| Partnership | Geologic Province | Total CO ₂ Injection (tons CO ₂) | Approximate Depth (ft) | Partnership | Geologic Province | Total CO ₂ Injection (tons CO ₂) | Approximate Depth (ft) |
|------------------|---------------------|---|------------------------|-------------------|------------------------|---|------------------------|
| A SRCSP | Paradox Basin | 525,000 | 5,800 | M PCOR | Williston Basin | 3,000 | >500 |
| B SRCSP | Permian Basin | 300,000 | 5,700 | N SECARB | Mississippi Salt Basin | 3,000 | 7,500 |
| C PCOR | Keg River Formation | 250,000 | 4,900 | O MGSC | Illinois Basin | 2,500 | 1,200-2,800 |
| D SRCSP | San Juan Basin | 75,000 | 3,000 | P MGSC | Illinois Basin | 2,500 | Up to 3,150 |
| E MGSC | Illinois Basin | 10,000 | 5,000-10,000 | Q MGSC | Illinois Basin | 2,500 | 2,800-3,150 |
| F MRCSP | Cincinnati Arch | 10,000 | 8,000-10,000 | R MGSC | Illinois Basin | 2,500 | 2,800-3,150 |
| G MRCSP | Michigan Basin | 10,000 | 4,000 | S SRCSP | Paradox Basin | 2,000 | 6,000 |
| H MRCSP | Appalachian Basin | 10,000 | 2,500-4,000 | T WESTCARB | Central Valley CA | 2,000 | 5,000 |
| I SECARB | Gulf Coast | 7,500 | 8,000 | U WESTCARB | Central Valley CA | 2,000 | 4,000 |
| J SECARB | Gulf Coast | 7,500 | 10,000 | V WESTCARB | Kaiparowits Basin | 2,000 | 8,000 |
| K Big Sky | Grand Ronde Basalt | 3,000 | 2,700 | W SECARB | Central Appalachian | 1,000 | 1,000 |
| L PCOR | Duperow Formation | 3,000 | 1,000 | X SECARB | Black Warrior Basin | 1,000 | 2,300-5,000 |
| | | | | Y MGSC | Illinois Basin | 750 | 1,000 |

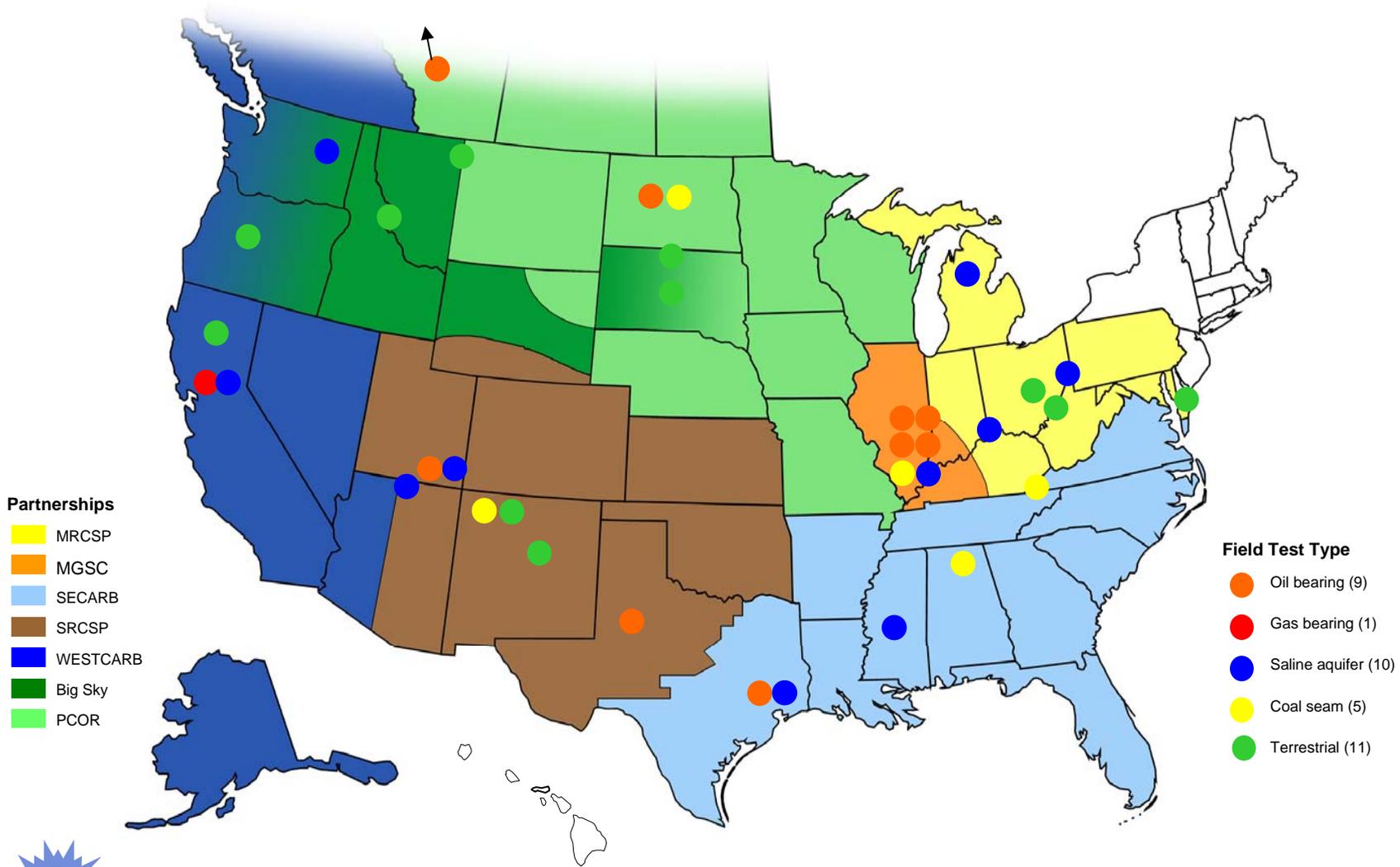
Worldwide CO₂ Storage Projects

| Project Name | Injection Start Date | Total CO ₂ Injection (tons CO ₂) | Approximate Depth (ft) | Project Name | Injection Start Date | Total CO ₂ Injection (tons CO ₂) | Approximate Depth (ft) |
|-----------------------|----------------------|---|------------------------|----------------------------|----------------------|---|------------------------|
| 1 Carson | 2011 | 40,000,000 ^a | TBD | 10 Allison Unit | 1995 | 360,000 | 3,100 |
| 2 Gorgon | 2009 | >36,000,000 ^b | 7,500 | 11 Otway Basin | 2006 | 100,000 | 6,500 |
| 3 Sleipner | 1996 | 20,000,000 | 2,600-3,300 | 12 Ketzin | 2006 | 60,000 | 2,300 |
| 4 Weyburn | 2000 | 20,000,000 | 4,800 | 13 Minami-Nagaoka | 2002 | 10,000 | 3,600 |
| 5 Miller Field | 2009 | 18,000,000 ^c | 13,000 | 14 West Pearl Queen | 2002 | 2,100 | TBD |
| 6 In Salah | 2004 | 17,000,000 | 5,900 | 15 Frio | 2004 | 1,600 | 4,900 |
| 7 K12B | 2004 | 8,000,000 | 13,000 | 16 Fenn Big Valley | 1998 | 200 | 4,300 |
| 8 Snohvit | 2006 | >7,000,000 ^d | 8,500 | 17 Yubari | 2004 | 200 | 2,950 |
| 9 Secunda | 2010 | TBD | TBD | 18 Qinshui Basin | 2003 | 150 | 1,650 |
| | | | | 19 RECOPOL | 2003 | 10 | 3,600 |

^a 4 MMt/yr * 10 yrs | ^b 10,000 t/d * 365 * 10 yrs | ^c 1.2 MMt/yr * 15 yrs | ^d 2,000 t/d * 365 * 10 yrs

Regional Carbon Sequestration Partnerships

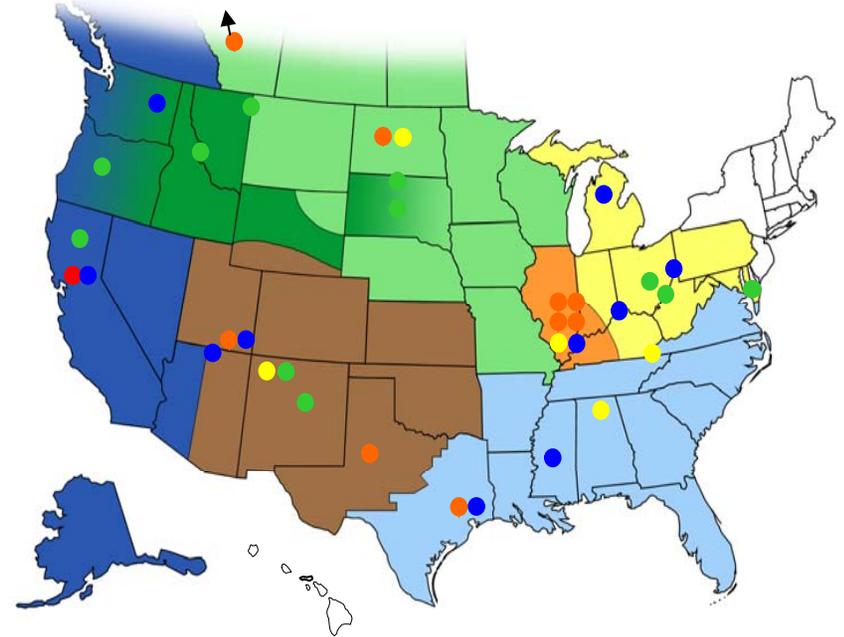
Validation Phase Field Tests



Regional Carbon Sequestration Partnerships

Deployment Phase – Scaling Up

- **FY 2007-2016 (10 years)**
- **Several Large Volume Sequestration tests in North America**
- **Injection rates up to 1,000,000 tons per year for several years**
- **Scale up is required to provide insight into several operational and technical issues in different formations**



Deployment Phase *Activities*

Years 1-3 {
Site selection and characterization
Permitting and NEPA compliance
Well completion and testing
Infrastructure development

Years 4-7 {
CO2 procurement and transportation
Injection operations
Monitoring activities

Years 8-10 {
Site closure
Post injection monitoring
Project assessment



Working Groups

- **Geologic and Infrastructure**
- **Capture and Transportation**
- **GIS and Database**
- **Public Outreach**
- **Regulatory Working Group**
 - IOGCC
- **Economics and Markets**

- **Benefits of these Groups:**
 - Developing standards
 - Sharing information
 - Developing common messages



2006-2007 Regional Partnership Highlights

- Began sequestering CO₂ and H₂S at Zama, Alberta
- Conducted geophysical surveys at several validation test sites
- Will commence drilling injection wells and/or injecting CO₂ into several oil and gas fields, saline formations, and a coal seam
- Completed national capacity estimates
- Will develop model regulations and statutes for CO₂ injection projects



2006 Carbon Sequestration Atlas

North American Capacity Assessment

- **Summarize national and regional sequestration opportunities**
- **North American Geologic Sinks**
 - Common Methodology for:
 - Saline formations
 - Coal Seams
 - Oil and Gas Fields
 - Other promising sinks
- **Summarize sources of CO₂**
- **To be issued in early 2007**



Welcome!!!

And Introductions

