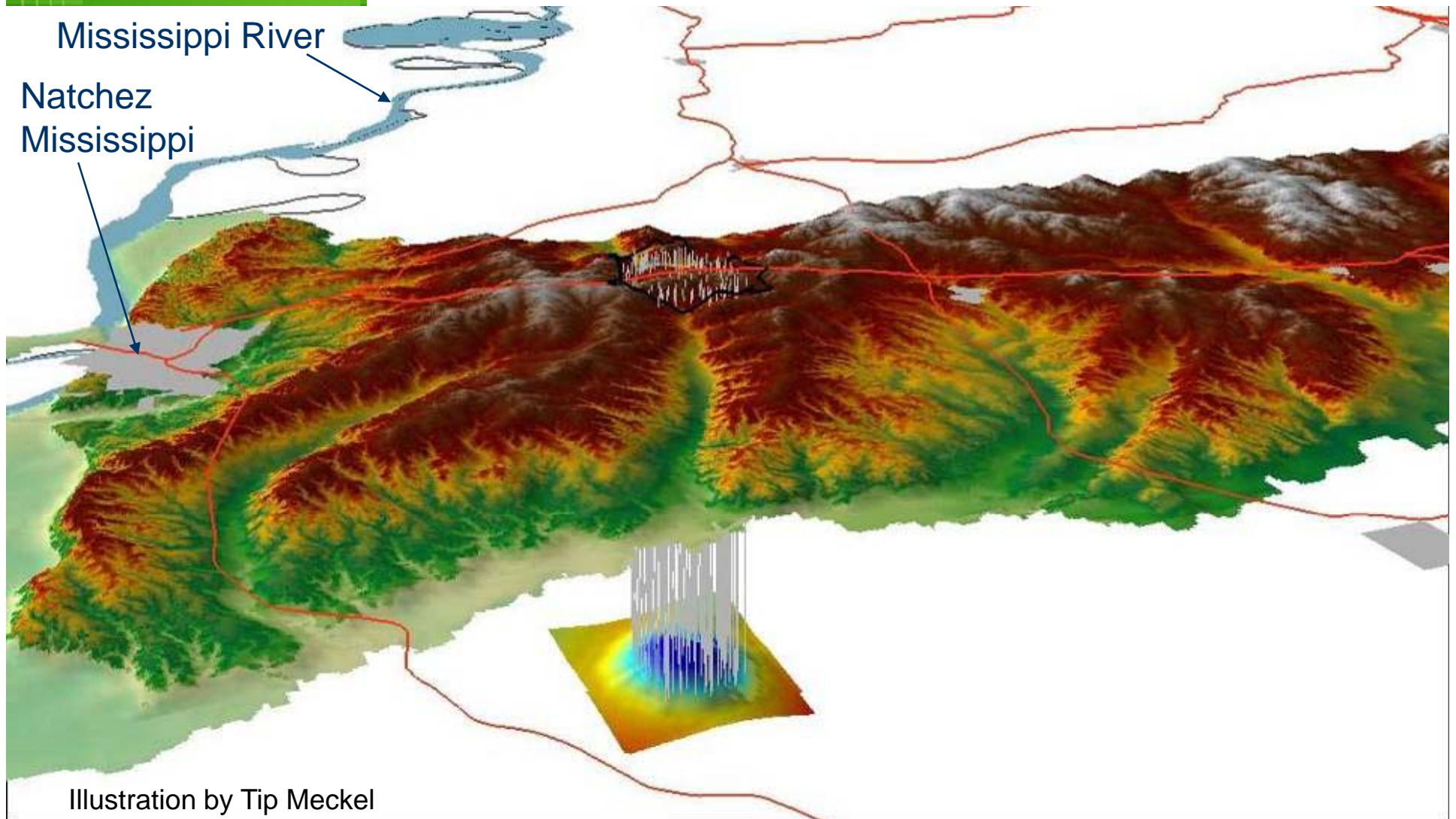


Update on Results of SECARB Test of Monitoring Large Volume Injection at Cranfield

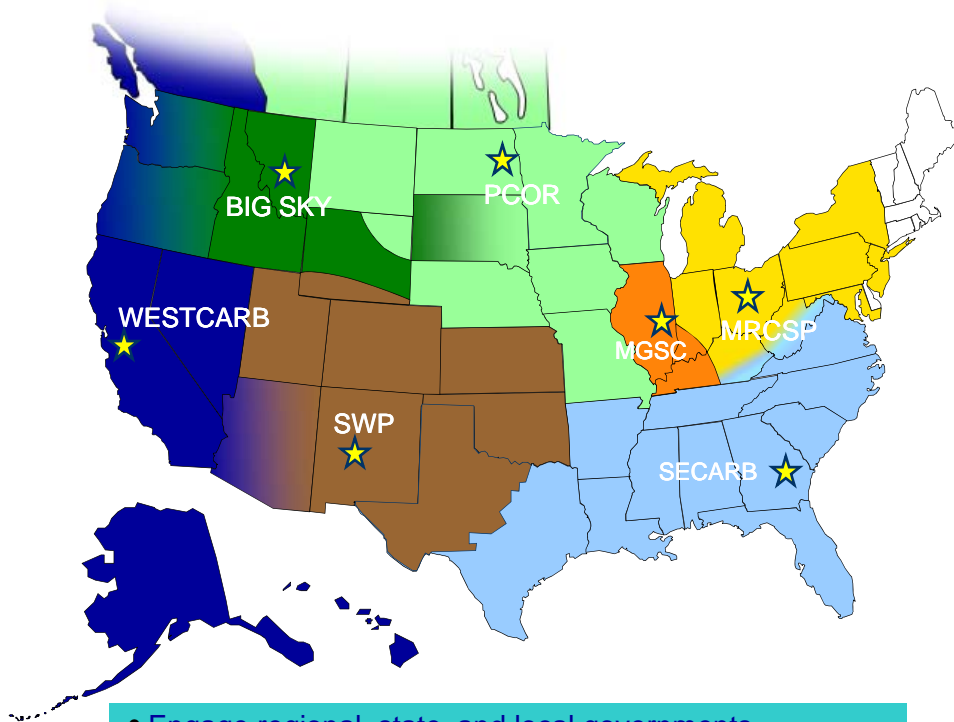


Regional Carbon Sequestration Partnerships

Developing the Infrastructure for Wide Scale Deployment

Seven Regional Partnerships

400+ distinct organizations, 43 states, 4 Canadian Provinces



- Engage regional, state, and local governments
- Determine regional sequestration benefits
- Baseline region for sources and sinks
- Establish monitoring and verification protocols
- Address regulatory, environmental, and outreach issues
- Validate sequestration technology and infrastructure

Characterization Phase (2003-2005)

Search of potential storage locations and CO₂ sources

Found potential for 100's of years of storage

Validation Phase (2005-2010)

20 injection tests in saline formations, depleted oil, unmineable coal seams, and basalt

Development Phase (2008-2017+)

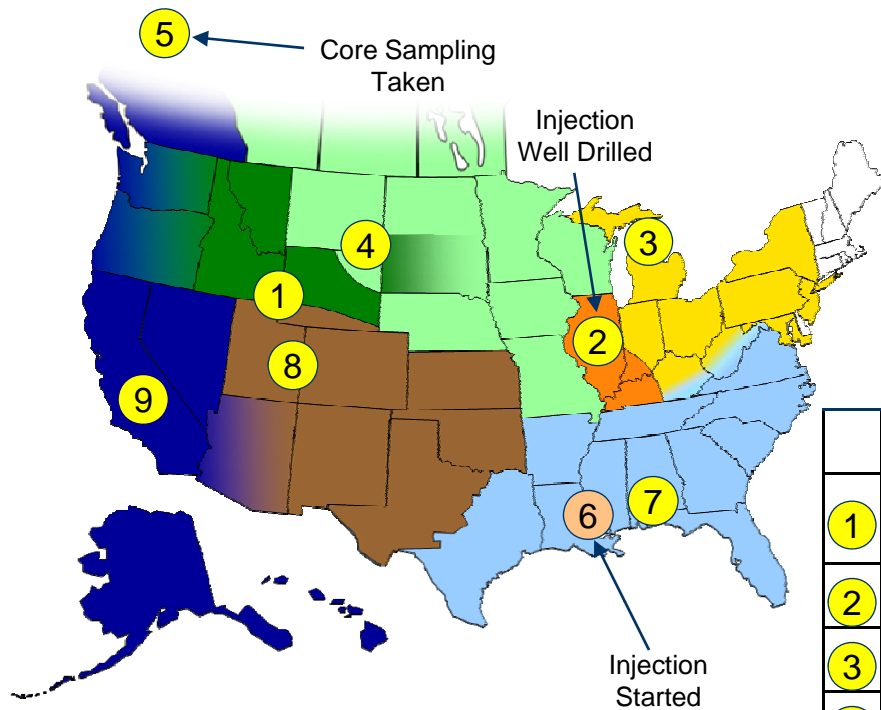
9 large scale injections (over 1 million tons each)

Commercial scale understanding

Regulatory, liability, ownership issues

RCSP Phase III: Development Phase

Large-Scale Geologic Tests



○ Injection Ongoing

● Injection Scheduled 2011/2015

Note: Some locations presented on map may differ from final injection location

- ✓ Nine large-volume tests
- ✓ Injections scheduled 2011/2015

	Partnership	Geologic Province	Type
①	Big Sky	Triassic Nugget Sandstone / Moxa Arch	Saline
②	MGSC	Deep Mt. Simon Sandstone	Saline
③	MRCSP	St. Peter Sandstone	Saline
④	PCOR	Bell Creek Field	Oil Bearing
⑤		Devonian Age Carbonate Rock	Saline
⑥	SECARB	Lower Tuscaloosa Formation	Saline
⑦		Paluxy Formation	
⑧	SWP	Regional Jurassic & Older Formations	Saline
⑨	WESTCARB	Central Valley	Saline

Cranfield “Early” Field Test Collaboration



Denbury Onshore LLC



Sandia Technologies, LLC

LBNL
LLBL
USGS
ORNL
NETL

Schlumberger

Carbon Services

QEA

BP

U Mississippi

Miss State

UTPGE

UT DoG

University Tennessee

Princeton

Stanford

University Edinburgh

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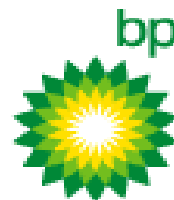
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Gulf Coast Carbon Center Industrial Associates

KINDER MORGAN



Luminant



ExxonMobil



Schlumberger



Southeast Regional CS Partnership

Large-Scale Project Site – Saline “Early Test”

Target Formation

- Massive Sandstone Lower Tuscaloosa

CO₂ Source

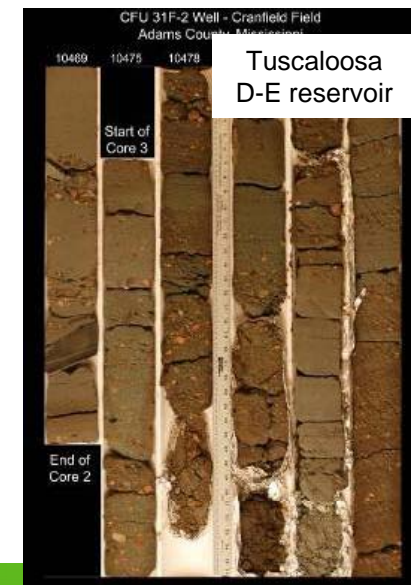
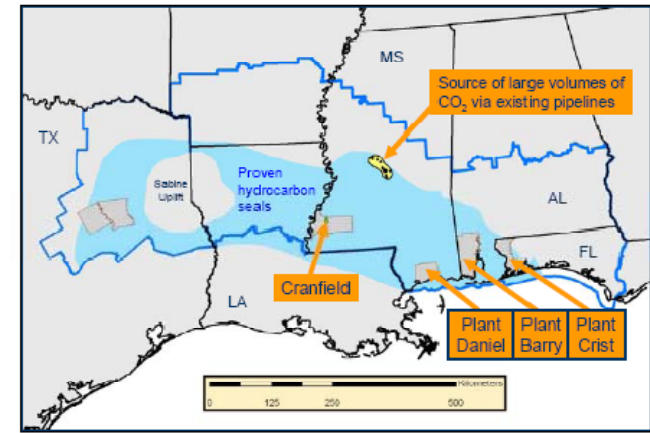
- Jackson Dome (natural source) delivered via Denbury Resources' Sonat CO₂ pipeline

CO₂ Injection Amount (Current)

- > 2.0 million metric tons (combined P2 and P3)

Current Status

- Injection began on 04/01/2009
- Monitoring wells(F2 and F3) are between 220-370 feet from injection well
- Electrical Resistivity Tomography (ERT) receivers were installed in the two monitoring wells



Southeast Regional CS Partnership

Phase III Monitoring Techniques

Deep Subsurface - Two Observation Wells

- In-Zone (Reservoir)
 - Cross-well tomography
 - ERT (Electric Resistance Tomography)
 - Joint inversion (saturation, sweep efficiency)
 - Fluid sampling (U-tube)
 - Thermal response
 - Whole cores / core analyses
 - RST (Reservoir Saturation Tool – Schlumberger)
 - BHP (Bottom Hole Pressure)
 - BHT (Bottom Hole Temperature)
 - Pressure monitoring
 - Chemical Tracers
 - Stable Isotopes
- Above Zone (Monitoring Sand above confining unit)
 - Pressure (to detect possible leaks)

Southeast Regional CS Partnership

Phase III Monitoring Techniques

Surface and Shallow Subsurface

- Soil gas monitoring
 - Anomalous Methane (from old wells?)
 - Anomalous CO₂ (from deep injection?)
- Water wells (chemistry)
- Ground water flow modeling

Overview – Cranfield

- 1 million tonne/year rate achieved Dec 20, 2009
- 2 Million tonnes monitored since July 2008
- Rate to be maintained >15 months
- Monitored with standard and novel approaches
 - History match pressure response
 - Fluid flow measured/monitored – multiple tools / complex flow field
 - First US use of Electrical Resistance Tomography (ERT) for sequestration (deepest to-date worldwide)
 - Quantification of CO₂ dissolution
- Export to commercial EOR/sequestration projects



Thank You

