

# Denbury



NYSE: DNR





## Who We Are:

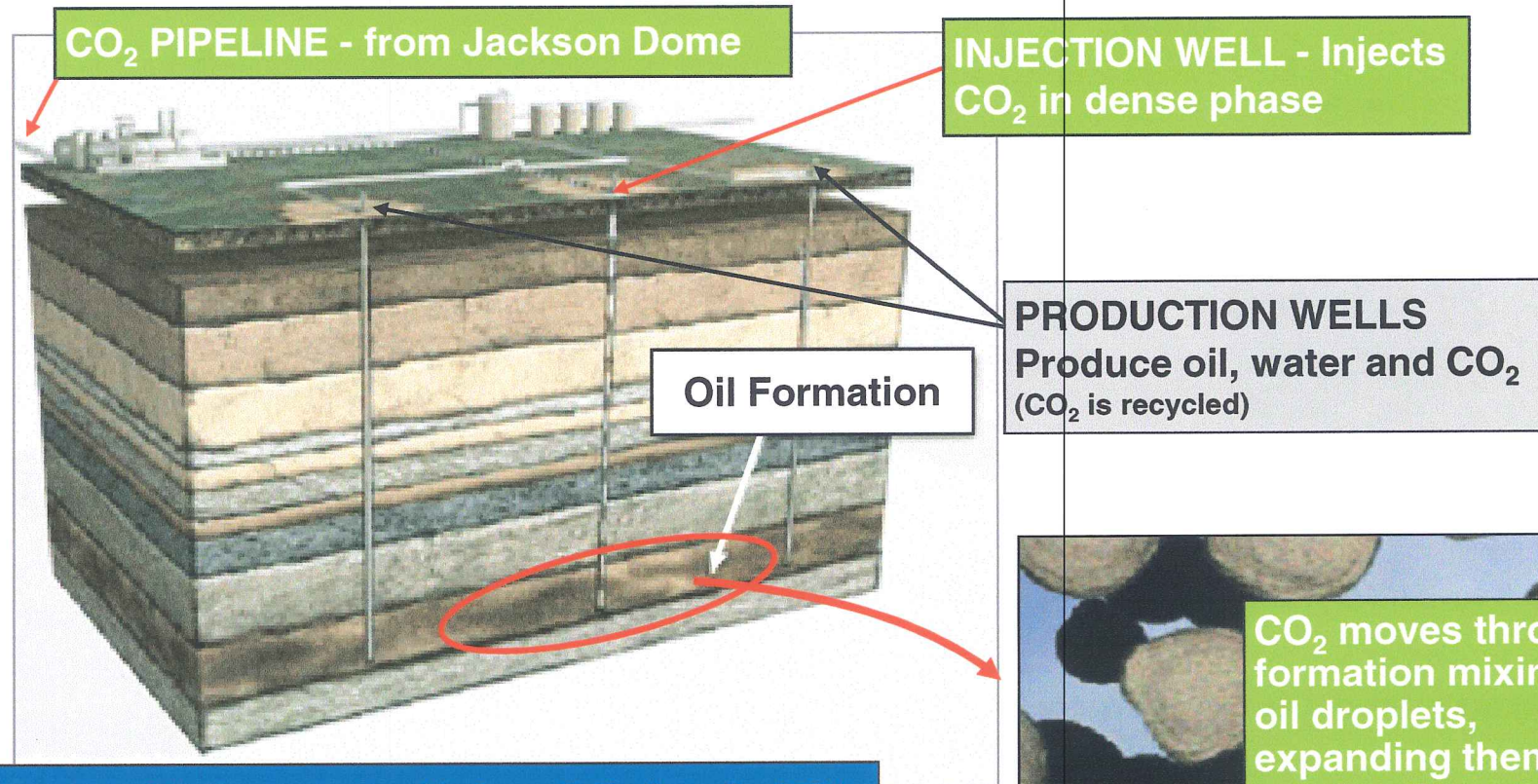
- **Denbury is the Leading CO<sub>2</sub> Enhanced Oil Recovery (CO<sub>2</sub>-EOR) Company in the Gulf Coast Region, with an Emerging Presence in the Rocky Mountains**
- **We are the Largest Equity Owner/User of CO<sub>2</sub> in the Gulf Coast Region**
- **We are one of the Largest Oil-Focused Independents**

## What We Do:

- **Denbury is Aggressively Exploiting Our Large Inventory of Gulf Coast and Rocky Mountain CO<sub>2</sub>-EOR Development Opportunities**



# CO<sub>2</sub> Operations: Oil Recovery Process



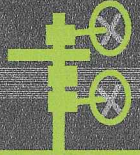
**Model for Oil Recovery Using CO<sub>2</sub> is +/- 17% of Original Oil in Place (Based on Little Creek)**

**Primary recovery = +/- 20%**

**Secondary recovery (waterfloods) = +/- 18%**

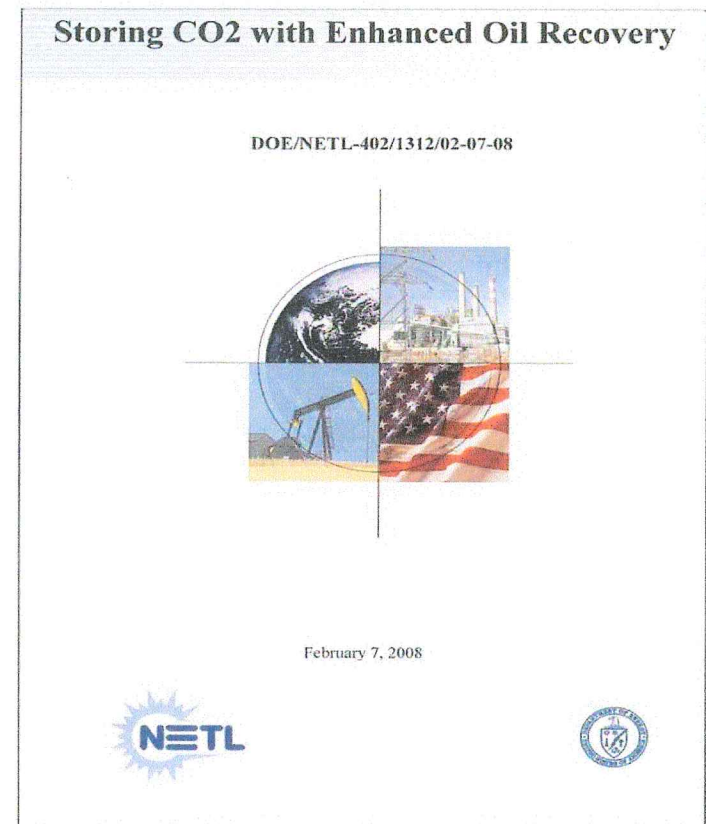
**Tertiary (CO<sub>2</sub>) = +/- 17%**





## DOE/NETL Report:

- “CO<sub>2</sub> enhanced oil recovery (CO<sub>2</sub>-EOR) offers the potential for storing significant volumes of carbon dioxide emissions while increasing domestic oil production”
- Approximately 84.8 billion barrels of oil in existing US oilfields could be recovered using state-of-the-art CO<sub>2</sub>-EOR  
(In a range of \$50-\$100/barrel, it is economically feasible to recover 39 to 48 billion barrels)
- Next generation technology offers potential for recovering more stranded oil and storing significantly more CO<sub>2</sub>
- Infrastructure for CO<sub>2</sub>-EOR can be used for large-scale carbon capture and sequestration (CCS) projects in underlying saline formations

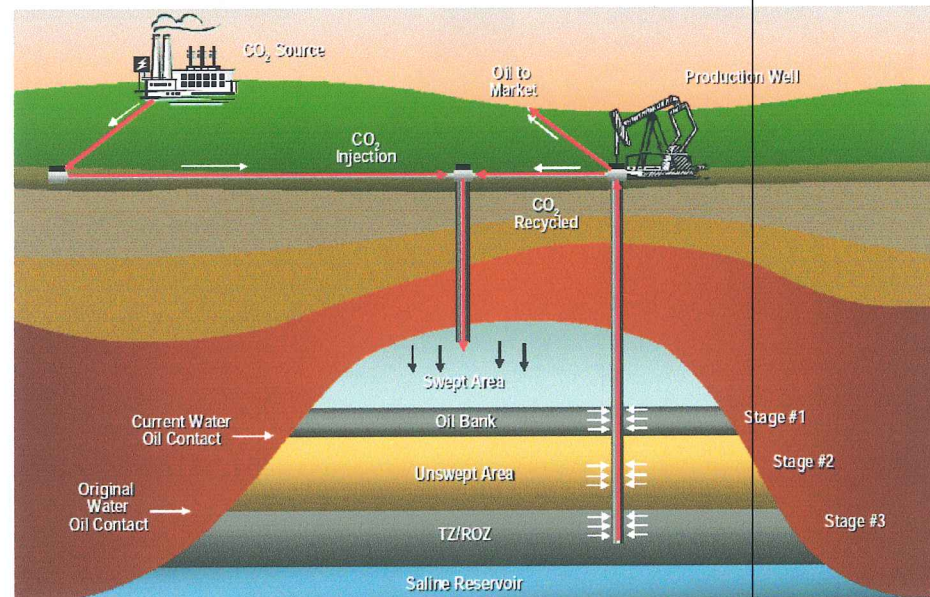




# Next Generation: CO<sub>2</sub>-EOR + CCS



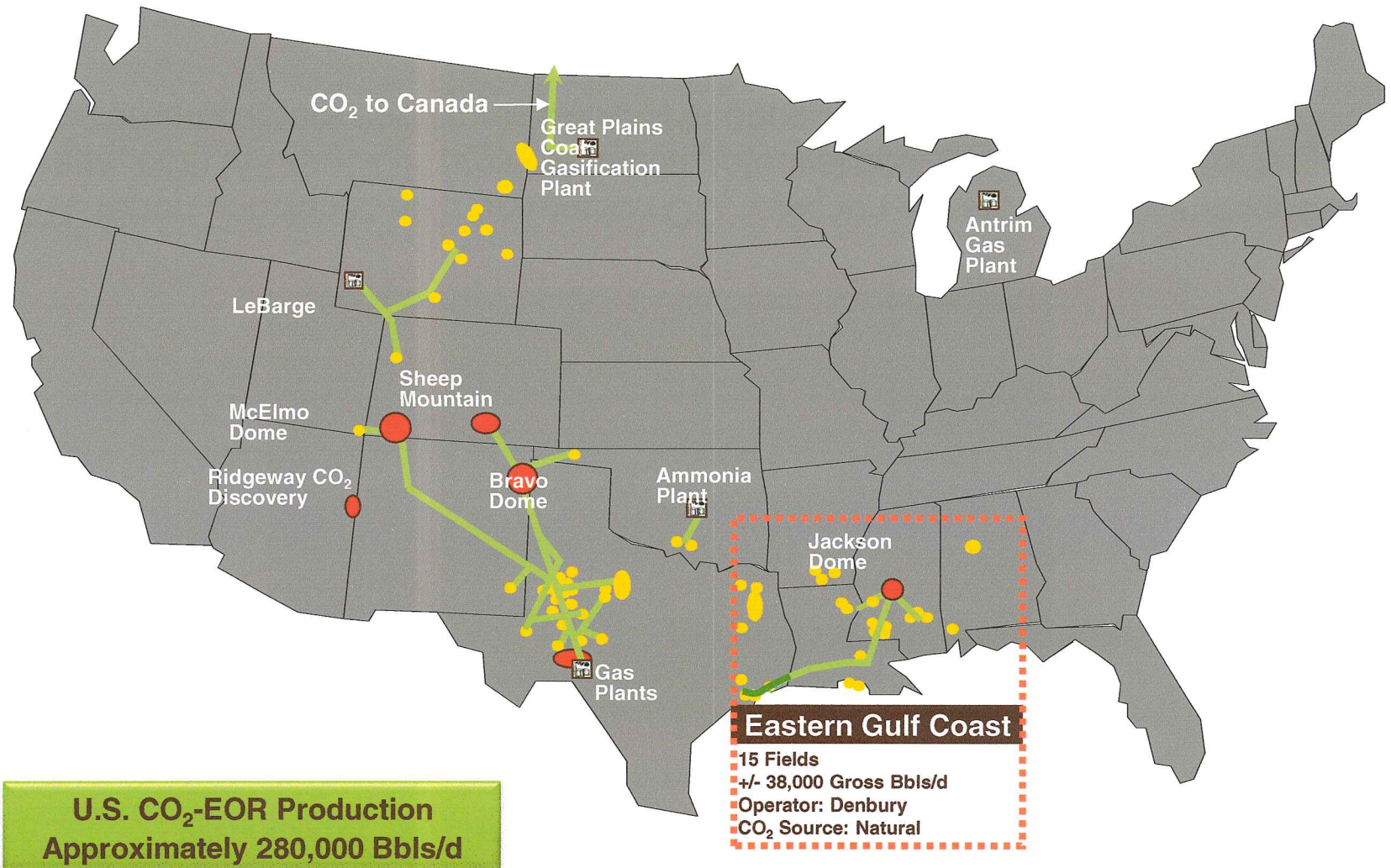
## Illustration of “Next Generation” Integration of CO<sub>2</sub> Storage and EOR



- NETL report concludes next generation CO<sub>2</sub> injection will significantly increase CO<sub>2</sub> storage, both in CO<sub>2</sub>-EOR projects and in potential post-production use for large scale carbon capture and storage (CCS) in underlying saline formations
- Based on current West Texas\* projects, CO<sub>2</sub>-EOR stores ~70% of the CO<sub>2</sub> released by the oil produced; NETL foresees next generation projects storing as much as 160% of the CO<sub>2</sub> released by the oil produced



# Current U.S. CO<sub>2</sub> Sources & Pipelines





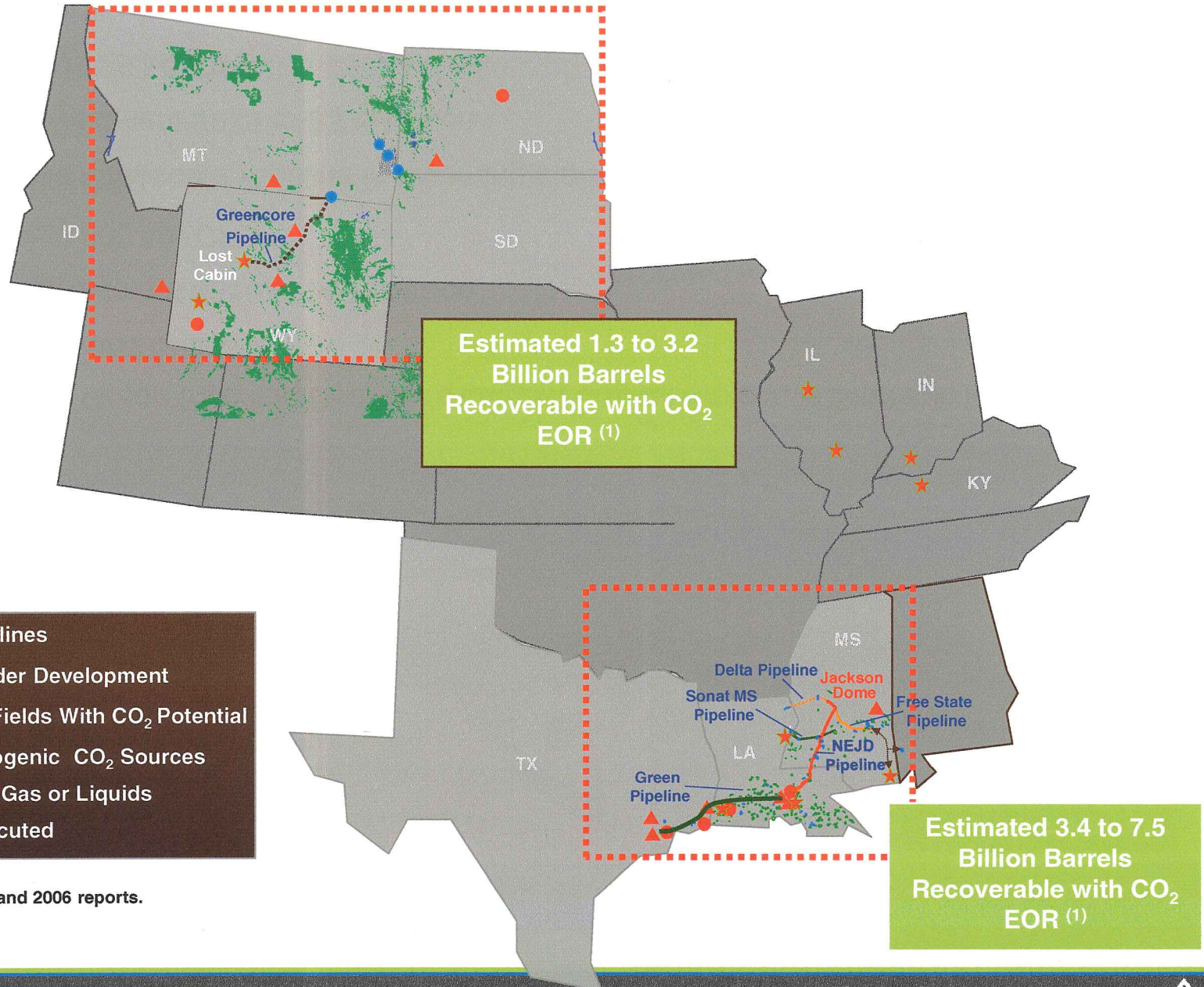
# CO<sub>2</sub> Pipelines: Transportation is Essential



- The 320 mile Green Pipeline, Denbury's Largest Capital Project, is Strategic to Our Long-term Growth Plans and Success.
  - Total Investment \$850 to \$875 Million.
  - Capacity 800 MMCFD
- The 232 mile Greencore Pipeline in Wyoming started construction in August 2011
  - Total Investment \$275 to \$325 Million
  - Capacity 725 MMCFD
- CO<sub>2</sub> Emitters Such as, Power Plants, Coal Gasification Facilities, Chemical Plants, etc. Require Nearly Continuous Run-time (24/7 Operations).



# CO<sub>2</sub>-EOR Potential in the Gulf Coast and Rockies



- Existing CO<sub>2</sub> Pipelines
- - - CO<sub>2</sub> Pipelines Under Development
- Rocky Mountain Fields With CO<sub>2</sub> Potential
- Existing Anthropogenic CO<sub>2</sub> Sources
- ▲ Proposed Coal to Gas or Liquids
- ★ CO<sub>2</sub> Contract Executed

(1) DOE 2005 and 2006 reports.

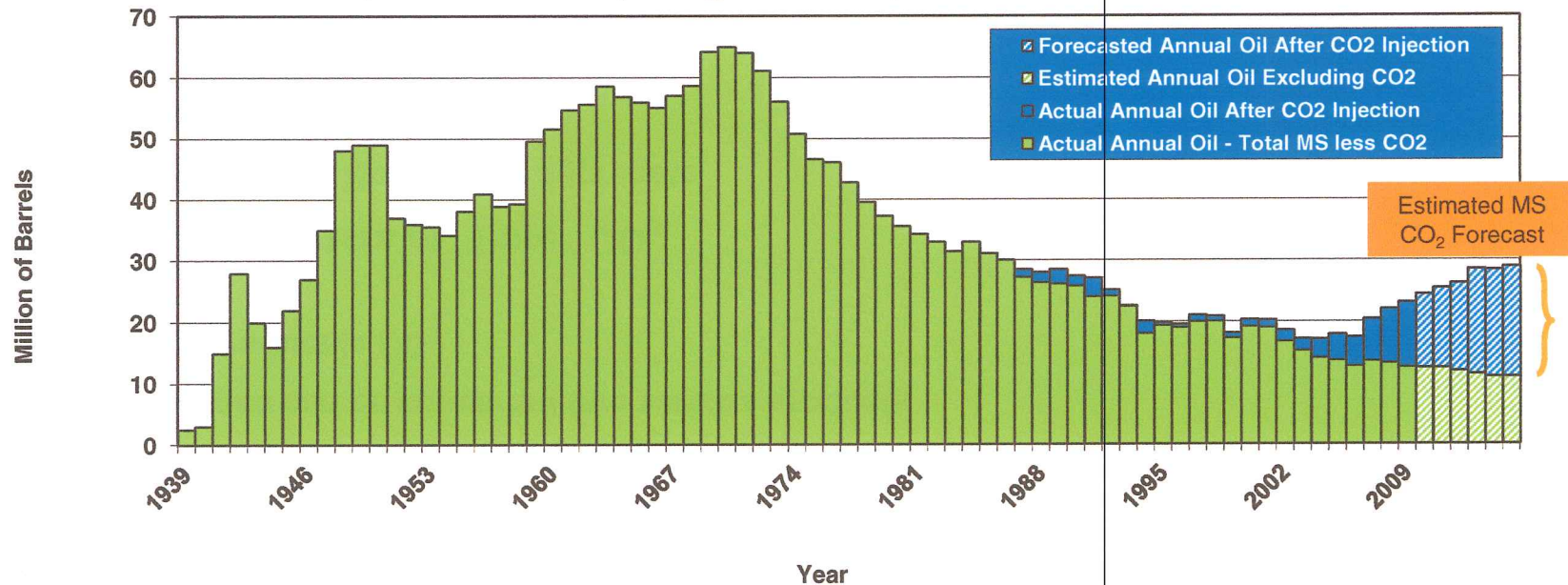


# CO<sub>2</sub> Can Impact the Future Production Decline



## Mississippi Annual Oil Production

Total Cumulative Oil: 2.48 Billions Barrels (through June 2010)



## CO<sub>2</sub> EOR Has Increased Mississippi Oil Production

- CO<sub>2</sub> EOR operations increase domestic oil production
- Creates jobs and improves the local economies in which we operate
- Provides a promising method to safely sequester industrial CO<sub>2</sub> emissions
- Helps reduce our nation's need for imported oil
- From 2006 to 2009 total oil production for Mississippi has increased approximately 25%
- From 2006 to 2009 CO<sub>2</sub> oil production for Mississippi has increased from 27% to 46% of total Mississippi oil production
- From 2006 to 2009 CO<sub>2</sub> EOR grew an average 22% annually



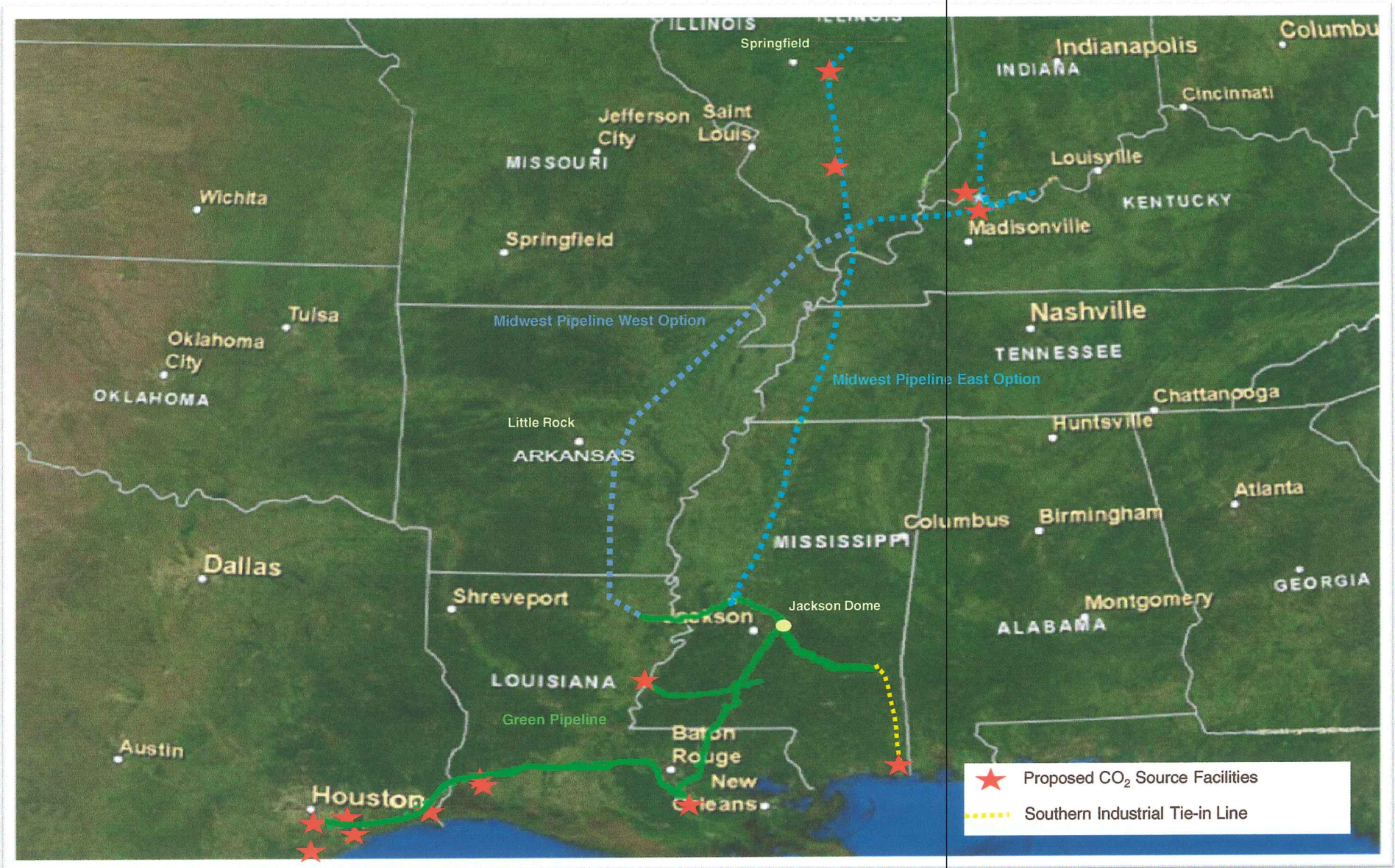
# Potential Sources of Additional CO<sub>2</sub>



- **Natural Sources - Jackson Dome (Gulf Coast)**
  - Estimated +/- 5 Tcf of additional potential reserves
  
- **Existing Rocky Mountain Sources**
  - Could be several hundred MMcf/d
  
- **Carbon Gasification Projects**
  - Convert solid carbon into Syngas
  - Syngas can be converted into various products
  - By product is CO<sub>2</sub>
  
- **Existing Emitters of “Pure” CO<sub>2</sub>**
  - Up to 150 MMcf/d in the aggregate
  - Smaller volumes per plant
  
- **Existing Emitters of “Dilute” CO<sub>2</sub>**
  - Large volumes
  - Expensive to capture based on current technologies



# Potential Midwest Pipeline







- Advancing U.S. Energy Production:
  - CO<sub>2</sub>-EOR can recover billions of barrels of identified oil from existing US oilfields, and offers immediate production without additional exploration and development lead times
  - The environmental impact of every barrel of recovered US oil from CO<sub>2</sub>-EOR could be offset by carbon capture and storage (CCS), versus no CO<sub>2</sub> reduction for imported oil
- Infrastructure for Future CCS Solutions:
  - CO<sub>2</sub> pipeline networks will enable large-scale CCS during enhanced oil recovery and in post-production utilization of underlying saline formations
  - CO<sub>2</sub> pipeline networks provide the basic infrastructure needed for development of carbon solutions for environmentally-sensitive industrial developments including existing power plants, industrial sites, innovative gasification projects that can produce transportation fuels, power, substitute natural gas, fertilizer and chemicals from plentiful U.S. natural resources





- Regulatory Framework Exists for CO<sub>2</sub>-EOR and Sequestration
  - Right to Inject CO<sub>2</sub> Exists Under our Mineral Leases
  - Injection Wells are Permitted Under Existing EPA UIC Regulations
  - CO<sub>2</sub> Pipelines are Regulated by the DOT and OPS Under Existing Regulations
  - Oil and Gas Operations are Regulated by State Regulators
  - Geologic Description of Reservoirs are Well Understood
    - We know where the CO<sub>2</sub> will be
  - The Only Regulatory Piece Missing is Post Injection Monitoring
    - Based on initial indications from regulatory workshops, the cost of post injection monitoring appears reasonable – EPA rule making now completed
    - Post injection monitoring stage for CO<sub>2</sub>-EOR is 20 to 40 years into the future





- Regulatory Framework does not Exist for CO<sub>2</sub> Sequestration in Saline Reservoirs
  - Pore Space Ownership
  - EPA Class VI CO<sub>2</sub> Injection Well Rule
  - Who will Regulate CO<sub>2</sub> Storage: Federal or States?
    - States: Environmental Quality Department (DEQs) or Oil and Gas Departments (MSOGB)
  - Geologic Description of Reservoirs are not Well Understood
    - Where will the CO<sub>2</sub> be?
  - Most States have a form of Unitization for Oil and Gas Operations
    - How do you amalgamate the necessary pore space for CCS?
      - Oil and gas model of unitization? Compulsory or voluntary?
      - Eminent Domain?



# Carbon Capture & Storage – Geologic Examples



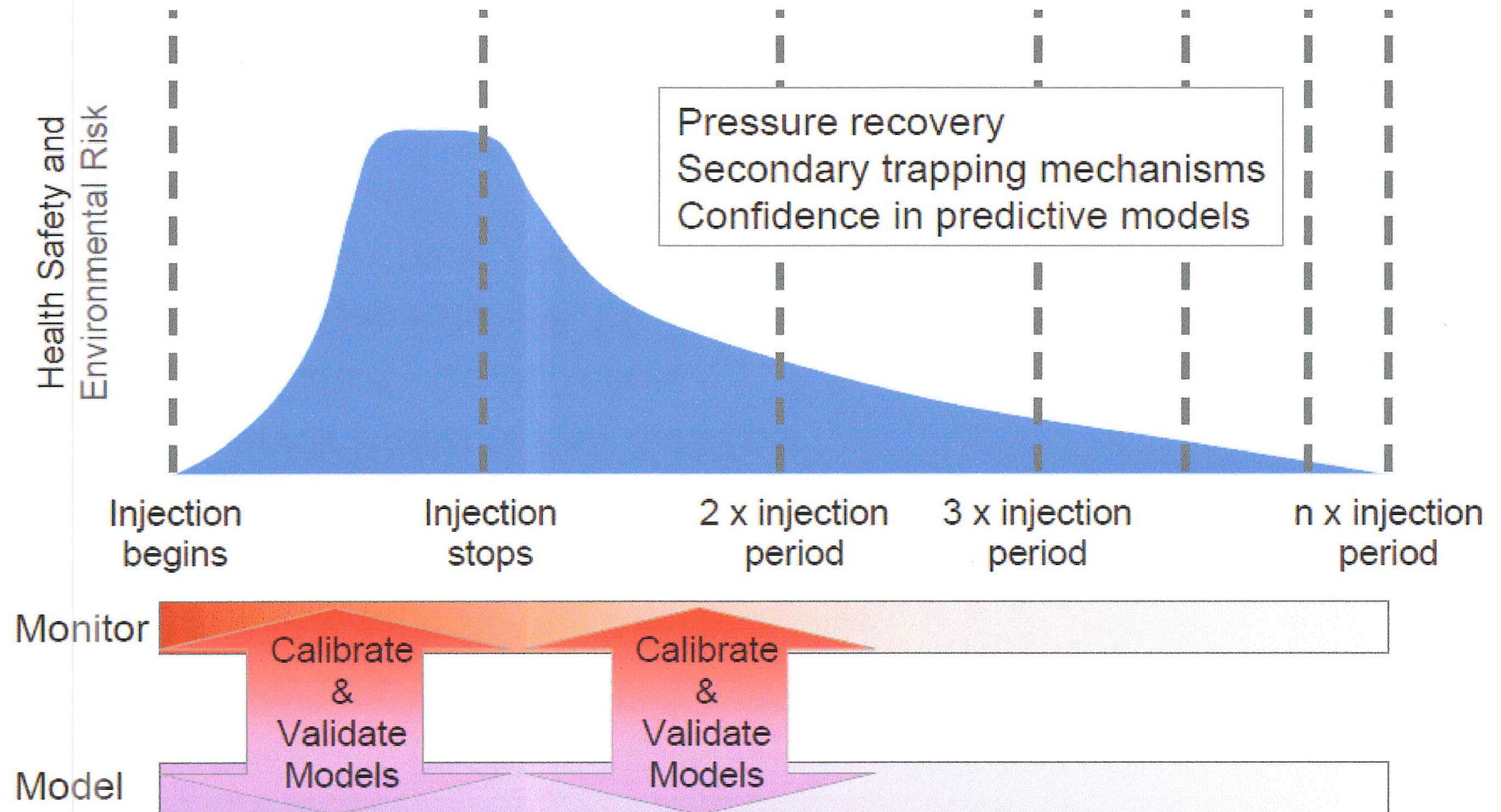
- **Base Case** - Single Project Emitting 200 MMcf/d of CO<sub>2</sub>
  - 30 Year Life
  - Total CO<sub>2</sub> Emissions – 2.2 Tcf of CO<sub>2</sub>
- **Oil Field**
  - +/- 6,500'
  - Reservoir Pressure - +/- 3,000 psi
  - Areal Extent – 20,000 acres
  - Storage Capacity - +/- 1.6 Tcf
  - 217 of 223 Tracts Ratified the Unit
- **Saline**
  - 6,500'
  - Reservoir Pressure - 3,000 psi
  - Thickness – 125'
  - Porosity – 20%
  - Percent of Pore Space Utilized – 4%
- **Pore Space Required: ±150,000 acres (±233 square miles)**



# Idealized Risk of CO<sub>2</sub> Sequestration



## Quantitative Assessment of Long-term Liability & Risk Management



Source: Stanford University Global Climate & Energy Project



# What is Needed and Can Be Done Today



- Federal/State Law and Policy should recognize that CO<sub>2</sub>-EOR is CCS
  - 40 years of safe and secure experience
  - Only CCS strategy that can be done today
- Incentives, not regulations, will encourage deployment of CCS technology
  - IRS 45Q Tax Credits (\$10/ton for EOR and \$20/ton for Saline)
  - Tie to domestic energy development (both new coal and oil)
  - Only market financial engine available to develop CO<sub>2</sub> pipeline system
  - EPA MVA rule needs to be workable (Class VI vs. Class II UIC wells)
  - States/EPA need to certify CO<sub>2</sub> volumes as being sequestered
- Pore Space Ownership issues
  - Mechanism needed to aggregate large areas of underground storage space
  - While developing, oilfield can provide early CCS for decades
- Liability issues
  - Current proposals (insurance/trust fund) not necessary for CO<sub>2</sub>-EOR
  - Low to non-existent risk in oilfield – operational vs. underground





***Bottom Line: CO<sub>2</sub>-EOR is a viable, economical and technologically feasible way to encourage CCS of anthropogenic CO<sub>2</sub> in a safe and secure manner under a known and proven regulatory system***