

# CO<sub>2</sub> Injection and Operations: The Texas Perspective

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# CO<sub>2</sub> Injection and Operations: The Texas Perspective Overview

- 1) CI&O is Big Business in Texas
- 2) Texas' CI&O Regulatory Experience covers 30+ years
- 3) Anthropogenic CO<sub>2</sub> Sequestration is Very Consistent with CO<sub>2</sub> EOR Experience

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# CO<sub>2</sub> I&O is Big Business in Texas (1)

- CO<sub>2</sub> EOR Produces 162,000 bopd in the Permian Basin Region of Texas\*
- 17% of All Crude Oil Produced in Texas Comes From CO<sub>2</sub> EOR
- Represents the Growth Area for Oil Production in the State of Texas
- Over 400 billion cubic feet (23,000,000 tons) per year of CO<sub>2</sub> is bought and sold, transported and injected in Texas for CO<sub>2</sub> EOR
- Over 400 billion cubic feet per year of recycled CO<sub>2</sub> is processed, transported and re-injected in Texas

\* Oil & Gas Journal EOR Edition - April 12, 2004

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# CO<sub>2</sub> I&O is Big Business in Texas (2)

- There are over 2200 miles of high pressure (1500-2200 psi) pipelines feeding CO<sub>2</sub> EOR projects in the Permian Basin; these pipelines have a current market value of 2.2 billion dollars\*
- There are eight major CO<sub>2</sub> processing plants in the Permian Basin drying, separating, and recompressing CO<sub>2</sub> for EOR Operations

\* Valued (Undepreciated) at \$20,000/inch-mile

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# CO<sub>2</sub> I&O is Big Business in Texas (3)

- We estimate that more than 4.8 trillion cubic ft (270 million tons) of CO<sub>2</sub> now lies within the CO<sub>2</sub> EOR reservoirs of Texas via EOR injection
- CO<sub>2</sub> EOR will produce its billionth barrel of Oil in the Permian Basin in 2006

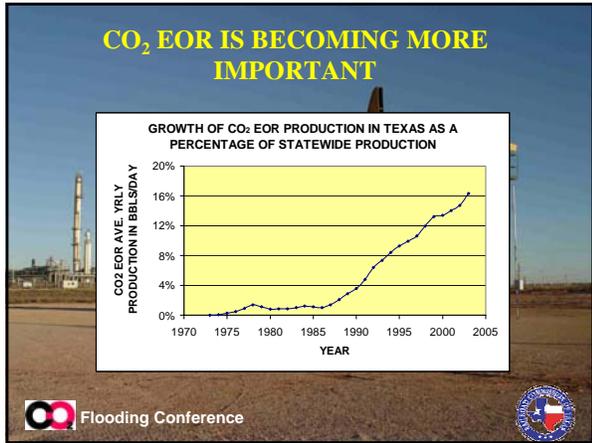
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# CO<sub>2</sub> EOR SHOWING UNREMARKABLE BUT STEADY GROWTH

GROWTH OF WW & PERMIAN BASIN CO<sub>2</sub> EOR PRODUCTION 1984 - 2002

YEAR	Permian Basin (kbopd)	Worldwide (kbopd)
1984	0	10
1986	0	15
1988	0	20
1990	0	25
1992	10	30
1994	20	40
1996	30	50
1998	40	60
2000	50	70
2002	60	80
2004	70	90

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- ## TEXAS' CI&O REGULATORY EXPERIENCE COVERS 30+ YEARS
- The Texas Railroad Commission of Texas (TRRC) Oversees all CO<sub>2</sub> Injection and Operations within Confines of Producing Areas
  - TRRC acts as Primary Contact for Industry and "Umbrella" Regulatory Agency via Texas Administrative Code: Title 16-Economic Regulation, Part 1: Railroad Commission of Texas, Chapter 3: Oil & Gas Division
    - U.S. DOT Oversees CO<sub>2</sub> Transportation in Producing Areas
    - Occupational Safety & Health Administration Oversees Oilfield Safety
    - Texas Commission on Environmental Quality (TCEQ) Oversees Groundwater Protection
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- ## CO<sub>2</sub> PERMITTING REQUIRMENTS – (1)
- CO<sub>2</sub> Must be Permitted as Injection Stream
  - Sour CO<sub>2</sub> or recycled CO<sub>2</sub> containing H<sub>2</sub>S must be permitted separately
  - Flue Gas, or inert combustion gas, must be permitted as injection fluid
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- ## CO<sub>2</sub> PERMITTING REQUIRMENTS – (2)
- CO<sub>2</sub>, containing over 100 ppm H<sub>2</sub>S must comply with RRC Rule 36 relating to Sour Gas Operations
  - Sour CO<sub>2</sub> or recycled CO<sub>2</sub>, containing H<sub>2</sub>S authority may require a public hearing
  - RRC District Offices Get Involved Early in the Flood Operations Design
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- ## Other CO<sub>2</sub> Facts
- 9279 Wells Permitted for CO<sub>2</sub> Injection in Texas
  - 9176 of These in RRC Dist 8/8A (Permian Basin)
  - Average Injection Pressure:
    - District 8: 2135 PSI
    - District 8A: 2982 PSI
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- ## CO<sub>2</sub> EOR INJECTION AND OPERATIONS AS IT RELATES TO CO<sub>2</sub> SEQUESTRATION
- THERE IS AN INDUSTRY AND REGULATORY AUTHORITIES THAT INVOLVES HUGE VOLUMES OF CO<sub>2</sub> I&O
  - COST & HS&E TESTED TECHNOLOGY DEVELOPED FOR
    - CO<sub>2</sub> SEPARATION/PROCESSING
    - CO<sub>2</sub> TRANSPORTATION
    - CO<sub>2</sub> INJECTION
    - CO<sub>2</sub> RESERVOIR SURVEILLANCE
- CONCLUSION: LESSONS LEARNED FROM CO<sub>2</sub> EOR INDUSTRY AND REGULATORY AGENCIES WILL BE A KEY BUILDING BLOCK AND MAKE POSSIBLE IMMEDIATE PROGRAMS**
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