

A Status Report on North American CO₂ EOR Production and CO₂ Supply

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OUTLINE

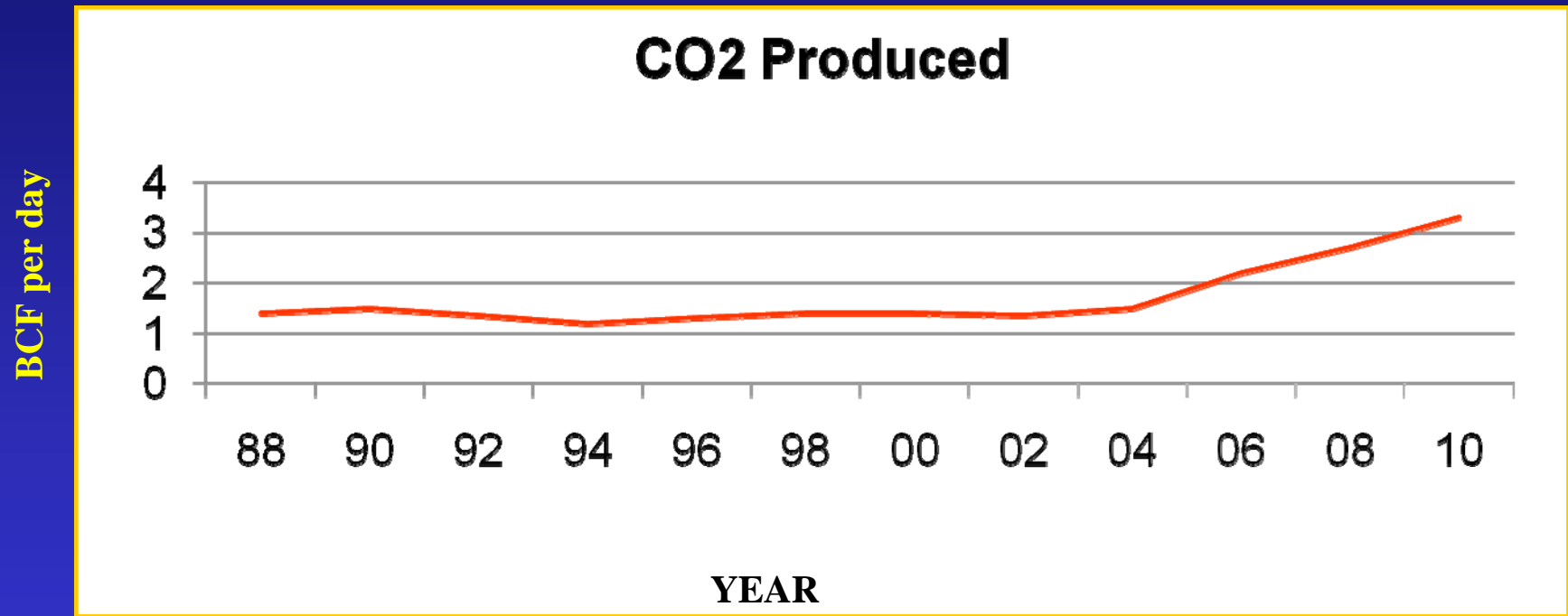
- I. U.S. CO₂ SUPPLY STATUS
- II. U.S. OIL PRODUCTION AND CO₂ EOR
- III. WYOMING
- IV. PERMIAN BASIN
- V. POTENTIAL CO₂ SUPPLY

UNITED STATES CO₂ SOURCES AND PIPELINES EXPANDING and NEW MARKETS

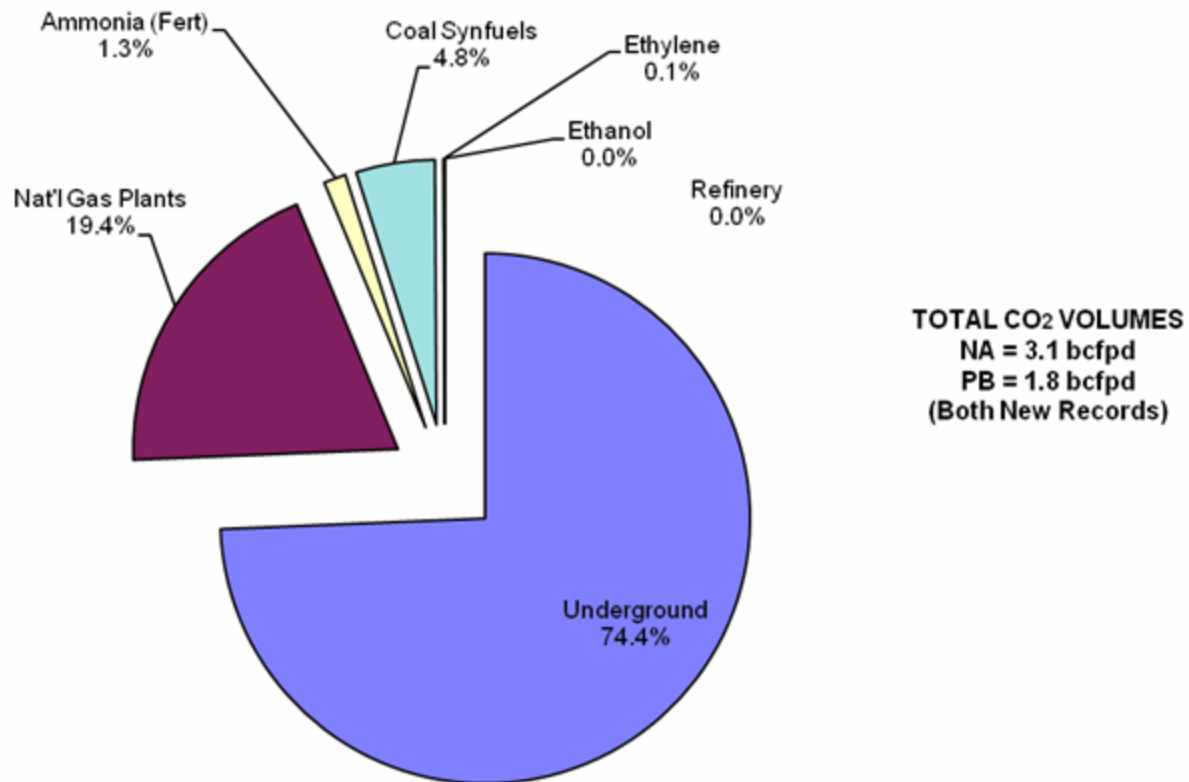


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U.S. CO₂ SALES FOR EOR



Estimated Daily North American CO₂ Source Deliveries for CO₂ EOR - Dec '10



Melzer CO₂ Consulting

LARGE CO₂ SUPPLIERS AT MAXIMUM CAPACITY

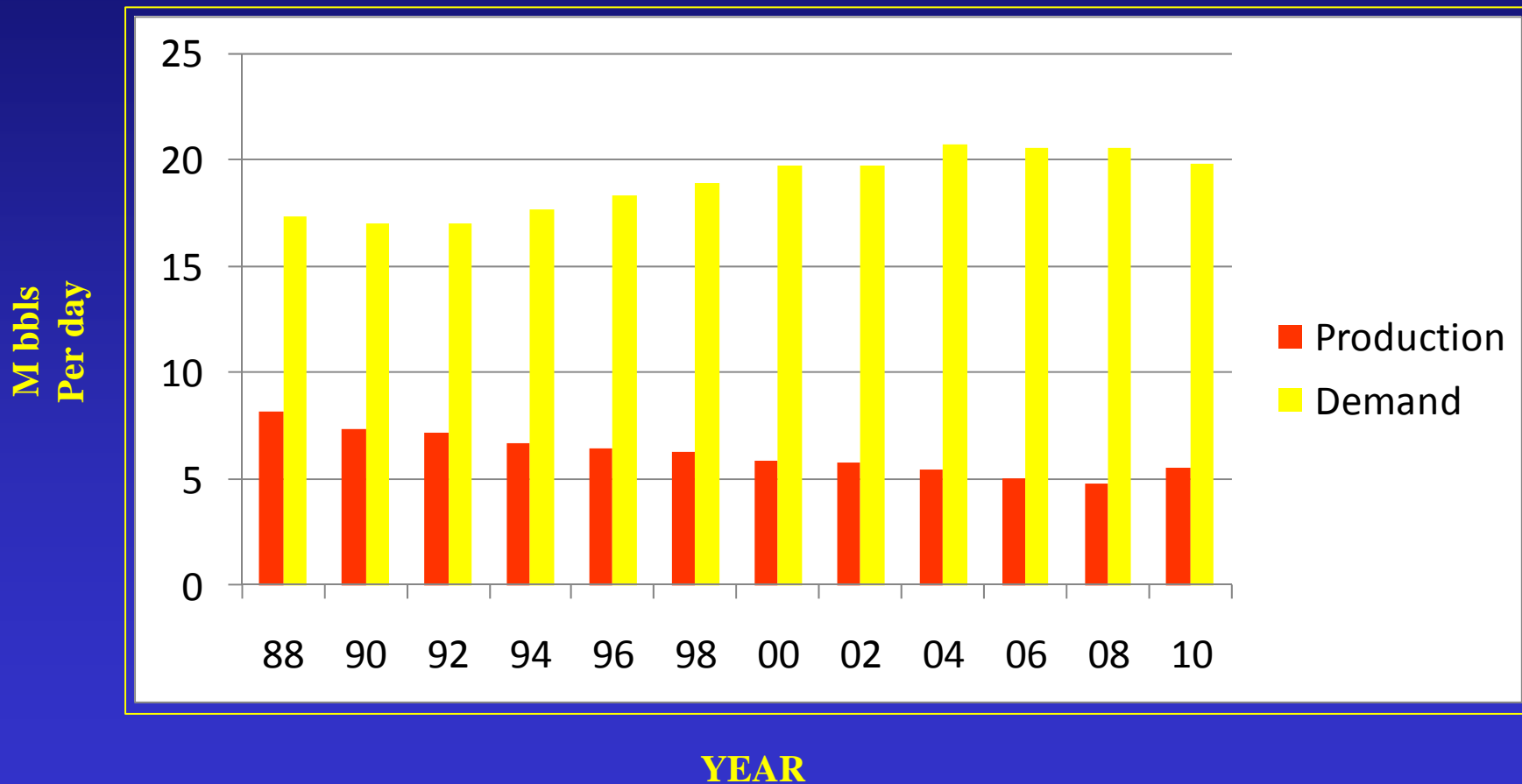
| | |
|--|-------------------|
| • McElmo Dome/Doe Canyon Source Fields | 1200 mmcfpd |
| • Sheep Mountain | 30 mmcfpd |
| • Bravo Dome | 250 mmcfpd |
| • LaVeta and West Bravo | 60 mmcfpd |
| • Century Plant | <u>180 mmcfpd</u> |
| Total Permian | 1.72 bcfpd |
| • Shute Creek Wyoming | 320 mmcfpd |
| • Denbury Resources Mississippi | 900 mmcfpd |
| • Dakota Gasification | <u>150 mmcfpd</u> |
| Total non-Permian | 1.37 bcfpd |

Late 4th Q 2010 CO₂ Sales: 3.09 bcfpd

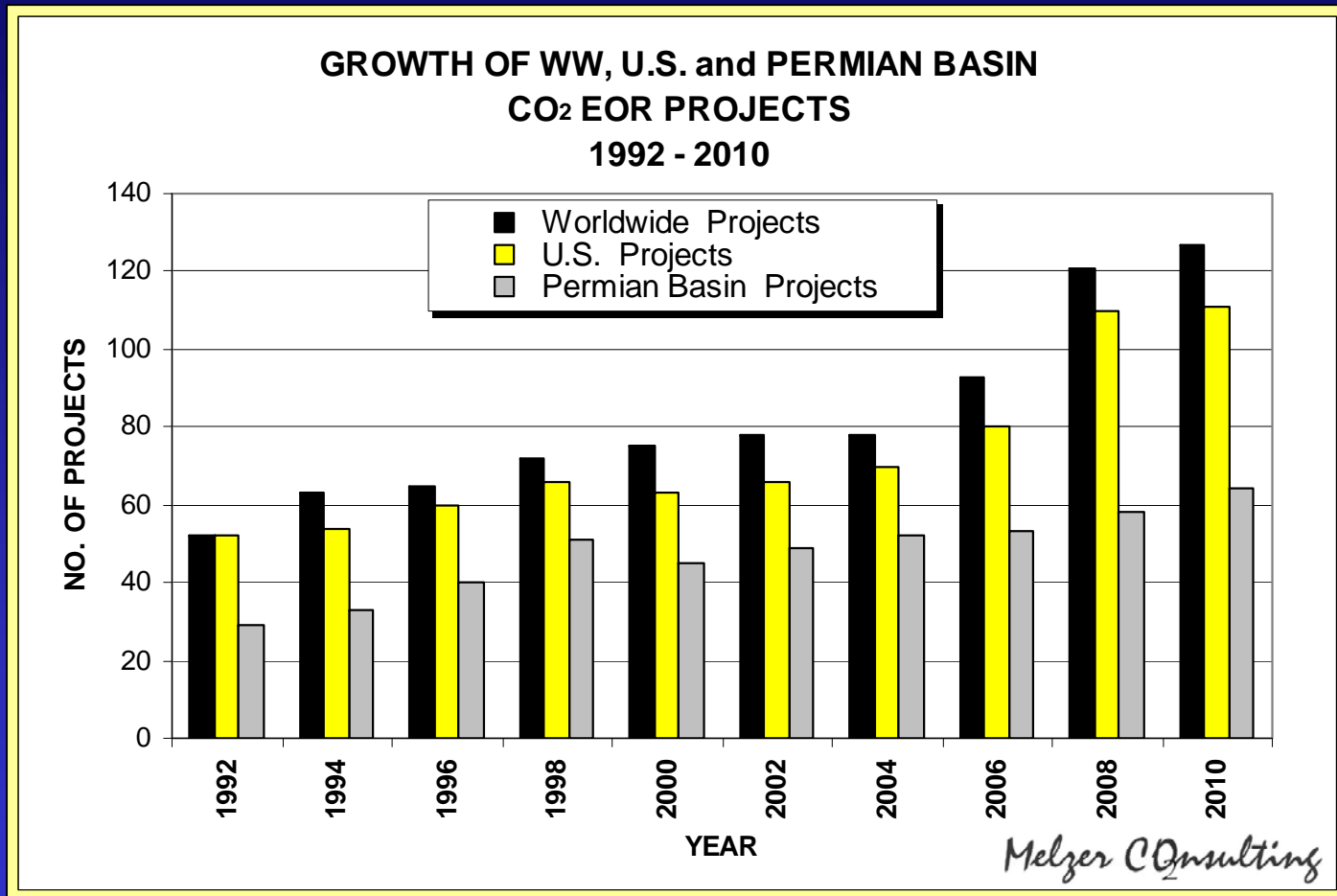
SECTION II

U.S. CO₂ EOR OIL PRODUCTION AND PROJECTS

U.S. CRUDE OIL PRODUCTION & CRUDE OIL DEMAND



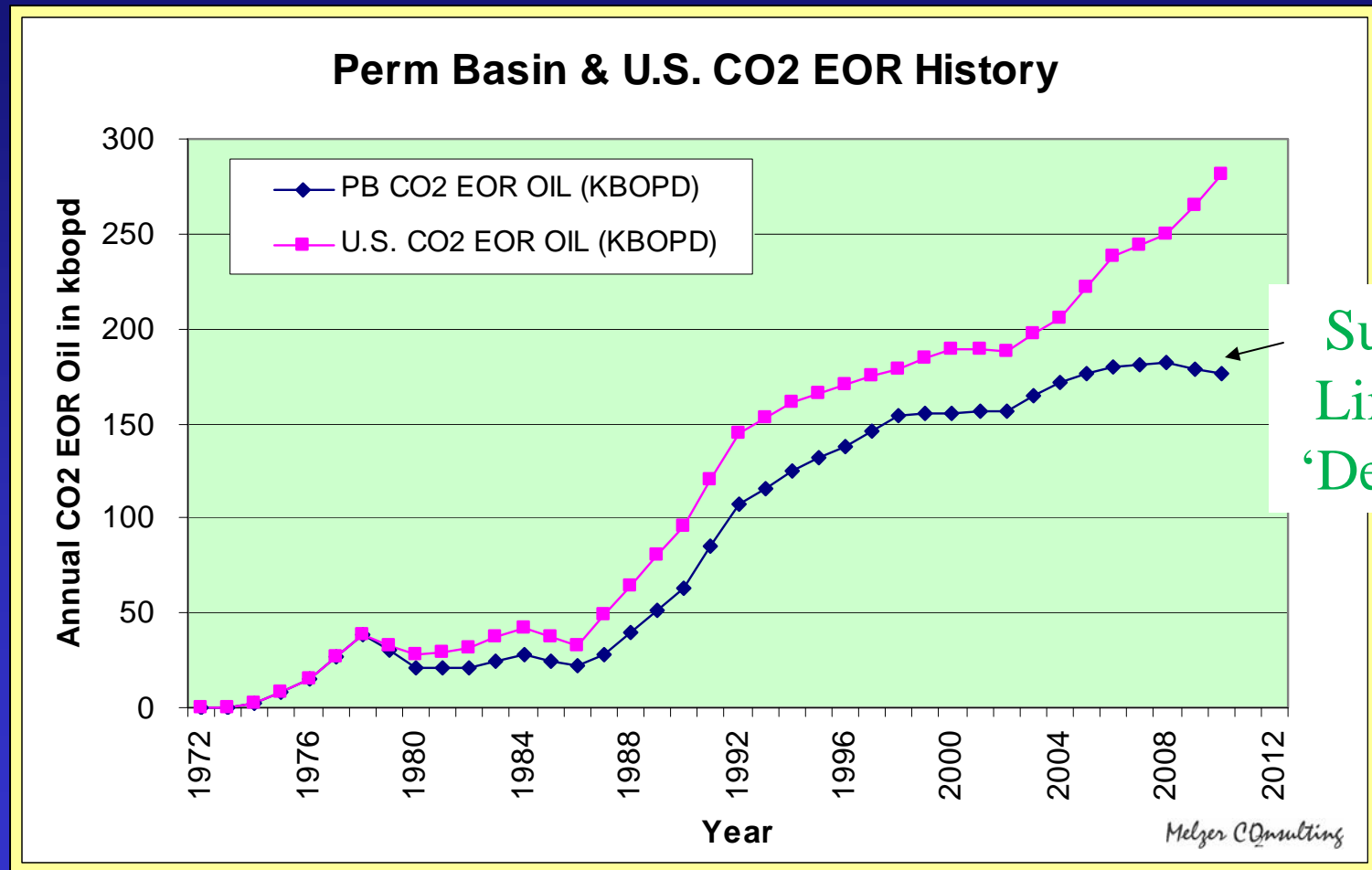
Worldwide, U.S. and Permian Basin CO₂ EOR Projects*



* Includes CO₂ only Miscible Floods (Source: Data source: Oil & Gas Journal Annual Production Report, Apr 19, 2010, and APTA CO₂ School (5/2010))

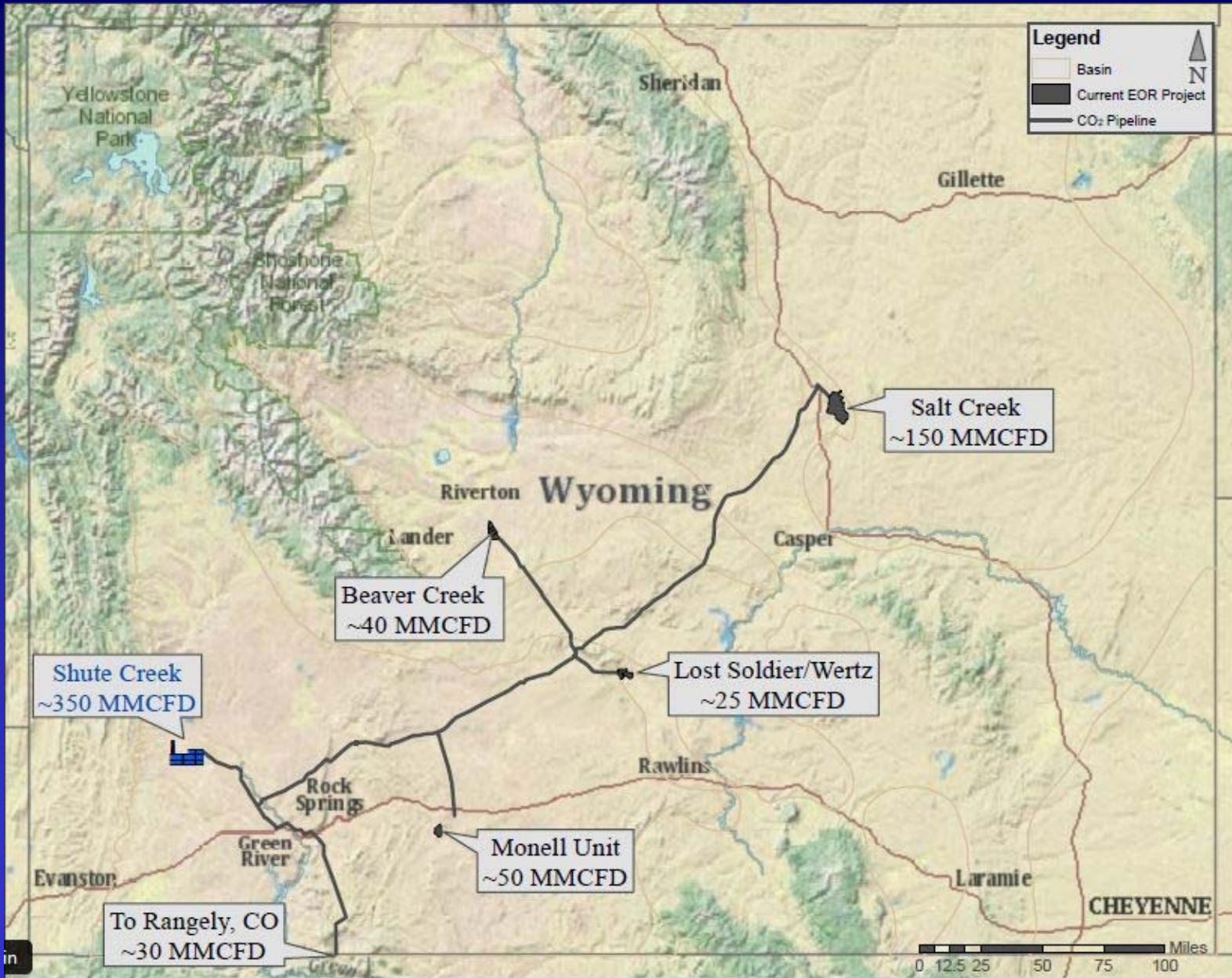
U.S. & Permian Basin CO₂ EOR Production Growth (1972-2010)

Case History (PB) of a CO₂ Supply Constrained Market



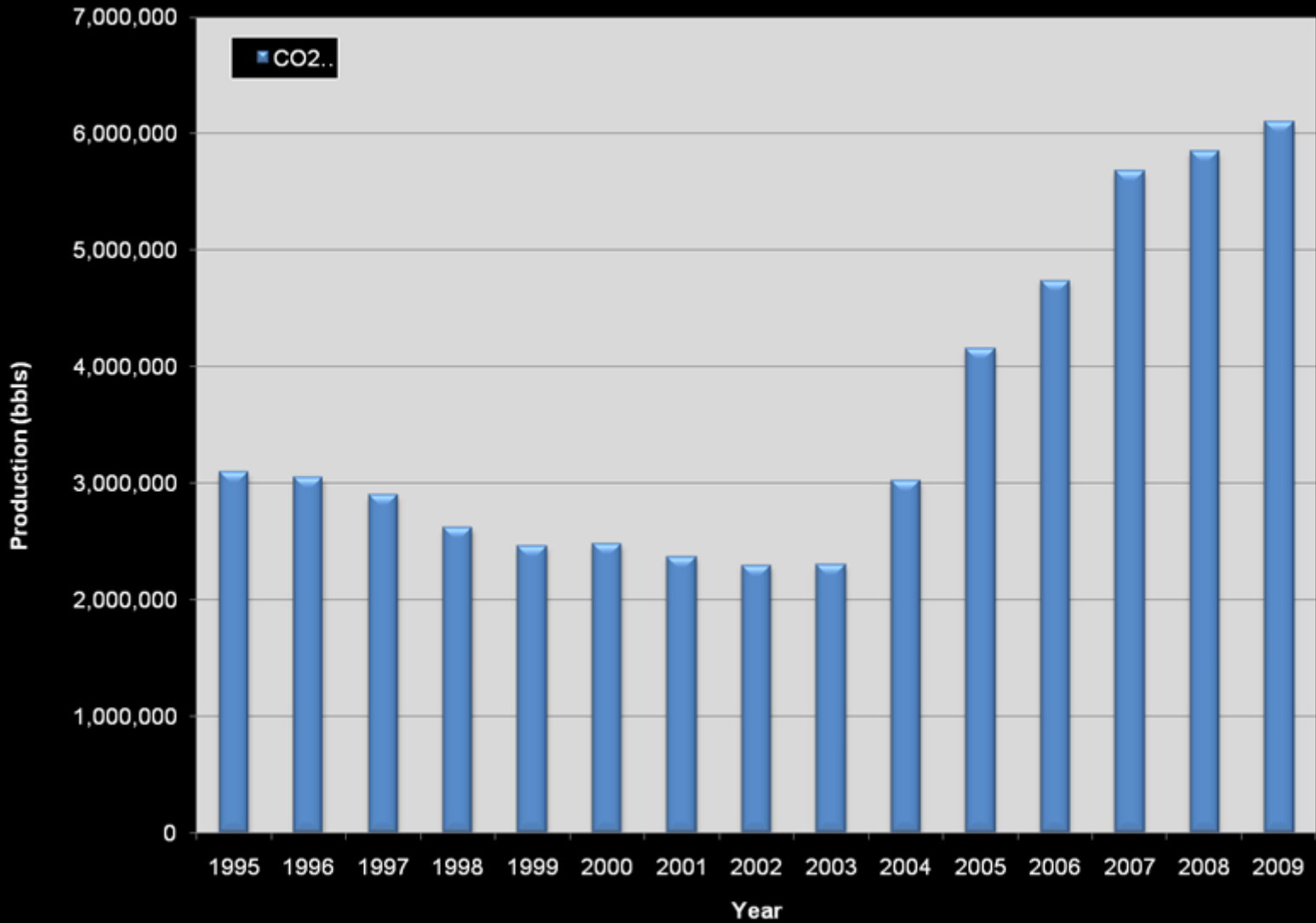
Section III

Wyoming





Wyoming CO2 Oil 1995 - 2009



SECTION IV

INCREMENTAL CO₂ DEMAND

New Permian Basin Projects

| <u>Field</u> | <u>Formation</u> | <u>CO₂ Vol. MMCFD</u> |
|--------------|------------------------|----------------------------------|
| Goldsmith | San Andres (MPZ + ROZ) | 40 - 50 |
| Katz | Strawn Sand | 40 - 50 |
| Yates | GBSA | 20 - 25 |
| Caprock | Seven Rivers | 10 - 15 |
| East Vacuum | GBSA (MPZ + ROZ) | 15 - 20 |
| George Allen | San Andres (MPZ + ROZ) | <u>20 - 25</u> |
| | Total | 145 - 185 |

HOW LARGE IS THE SUPPLY SHORTFALL?

QUANTIFYING UNSATISFIED DEMAND IS ALWAYS SUBJECTIVE

- Producers must be confident of an acceptable long-term oil price
- It is all about supply and demand project timing
- Targets
 - Current EOR lateral field expansions
 - Business as usual with new Projects
 - Natural evolution of water flood conversion to EOR flood (Clearfork, San Andres, Canyon Reef, etc.)
 - ROZ in both current projects (deepening) and expanded sections on prospective EOR floods
- We believe that in the Permian alone we can very conservatively document 200 – 400 MMCFD waiting on a reliable long term CO₂ supply

SECTION V CO₂ SUPPLY

NATURAL vs. INDUSTRIAL CO₂

- NATURAL
 - Jackson Dome
 - Bravo Dome
 - 4 Corners Area (McElmo + Doe Canyon)
 - INDUSTRIAL
 - SandRidge/Oxy Project (PB)
 - Next Phase @ Shute Creek
 - Others in Wyoming (Lost Cabin, Riley Ridge, etc.)
 - Denbury Activity in Gulf Coast Region
-
- Pet Coke and Coal Gasification
 - St. Johns Project
 - Post Combustion Power Generation Emissions

Potential Permian Basin CO₂ Supply

- Short Term (Next 2 years)
 - Supply is tight; new project demand filled by reallocation of resources
- Medium Term (2-4 years)
 - West Bravo Expansion
 - McElmo Dome and Doe Canyon Expansion
 - Century Plant Expansion
- Long Term (>4 years)
 - Anthropogenic CO₂ from Power Projects (i.e., Tenaska @ Sweetwater, Summit Energy @ Penwell)
 - St. Johns CO₂
 - Pipelined in from GC or East Texas?

CO₂ Supplies as an EOR 'Driver'

Paradigm Shift from Oil Price as the 'Driver'

- Wyoming (Lost Cabin, Riley Ridge, ExxonMobil Expansion)
- Gulf Coast (Denbury et al)
- Permian Basin (SandRidge/Oxy)

SUMMARY

- A New Driver for EOR has emerged: Project development dependent upon CO₂ supply rather than simply oil price
- Most Current CO₂ supplies are effectively at capacity
- Permian Basin EOR production growth is again growing due to enhancements in early 2009 but also reflective of lack of more recent supply growth (new projects are limited also as a result)
- Mississippi growth in both # of EOR projects and CO₂ supplies have shown dramatic growth: EOR production rising quickly as a result
- Cost of CO₂ capture vs. EOR affordability
- Badly in need of ground rules (incentives vs. barriers) for CCS