



Interstate Oil & Gas Compact Commission

CO2 EOR and Carbon Capture - Regulators in the Know.



Presented by
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June 30, 2020

Agenda

- What are the Carbon Capture Components?
- Sources of CO₂ and Current Pipeline Infrastructure
- CO₂ EOR Fundamentals
 - Why CO₂ enhances Oil Recovery?
 - CO₂ Physics – The Molecule
 - Screening of Oil Reservoirs
 - Can use similar criteria for Saline and Gas Reservoirs
- CO₂-EOR Economics
- 45Q Tax Credits
- What presentation priorities do regulators want in the Fall Workshop?

Carbon Capture Components

CO₂ Sources

Electrical Generation
Refineries
Natural Gas Proc.
Fertilizer plants
Ethanol Plants

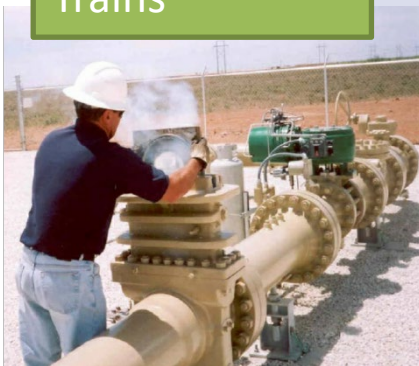
Capture Equipment

Compression
Separation Equip.



Transportation

Pipelines
Trucks
Trains



CO₂ Sinks

Oil and Gas Reservoirs
Saline Reservoirs



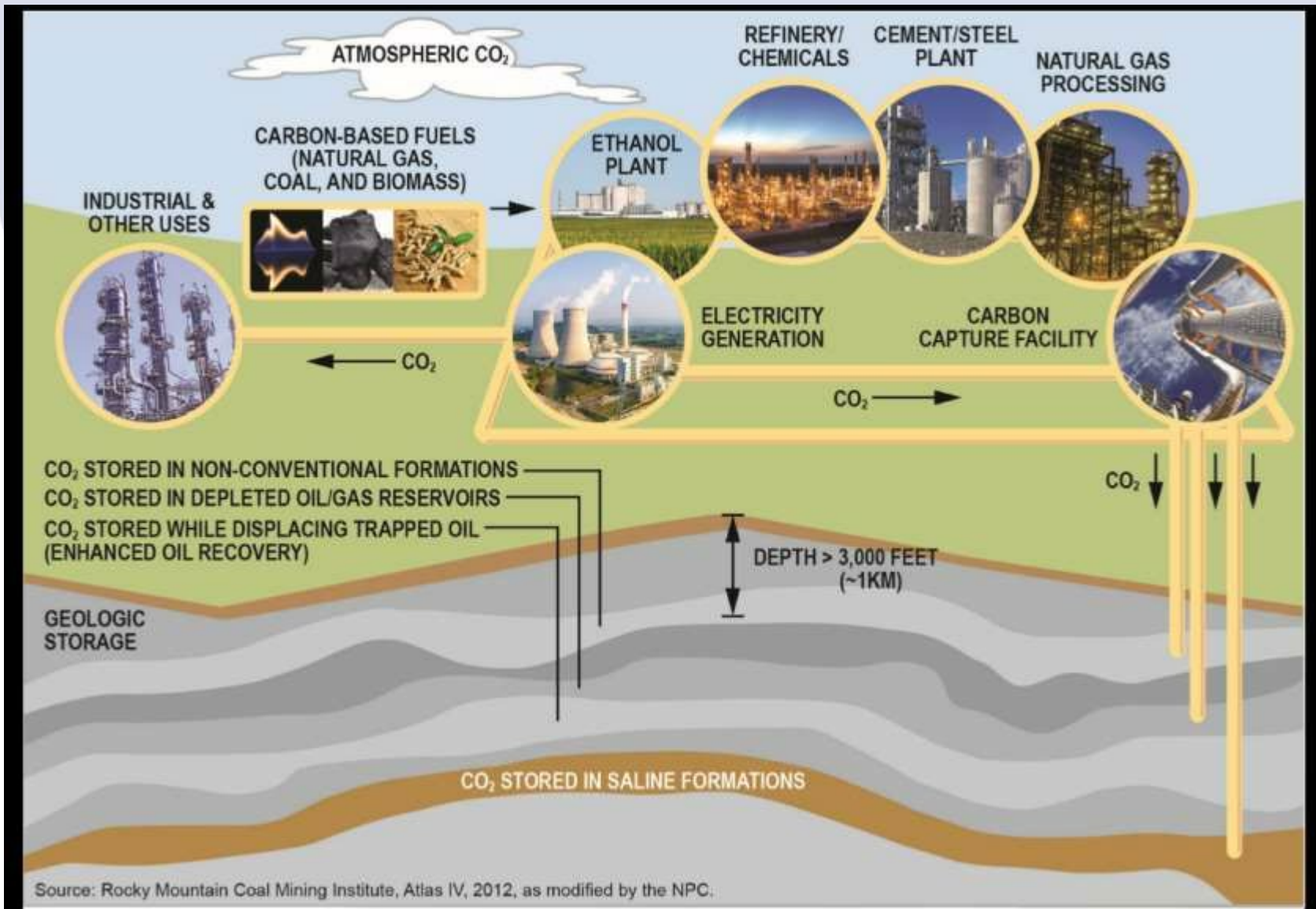
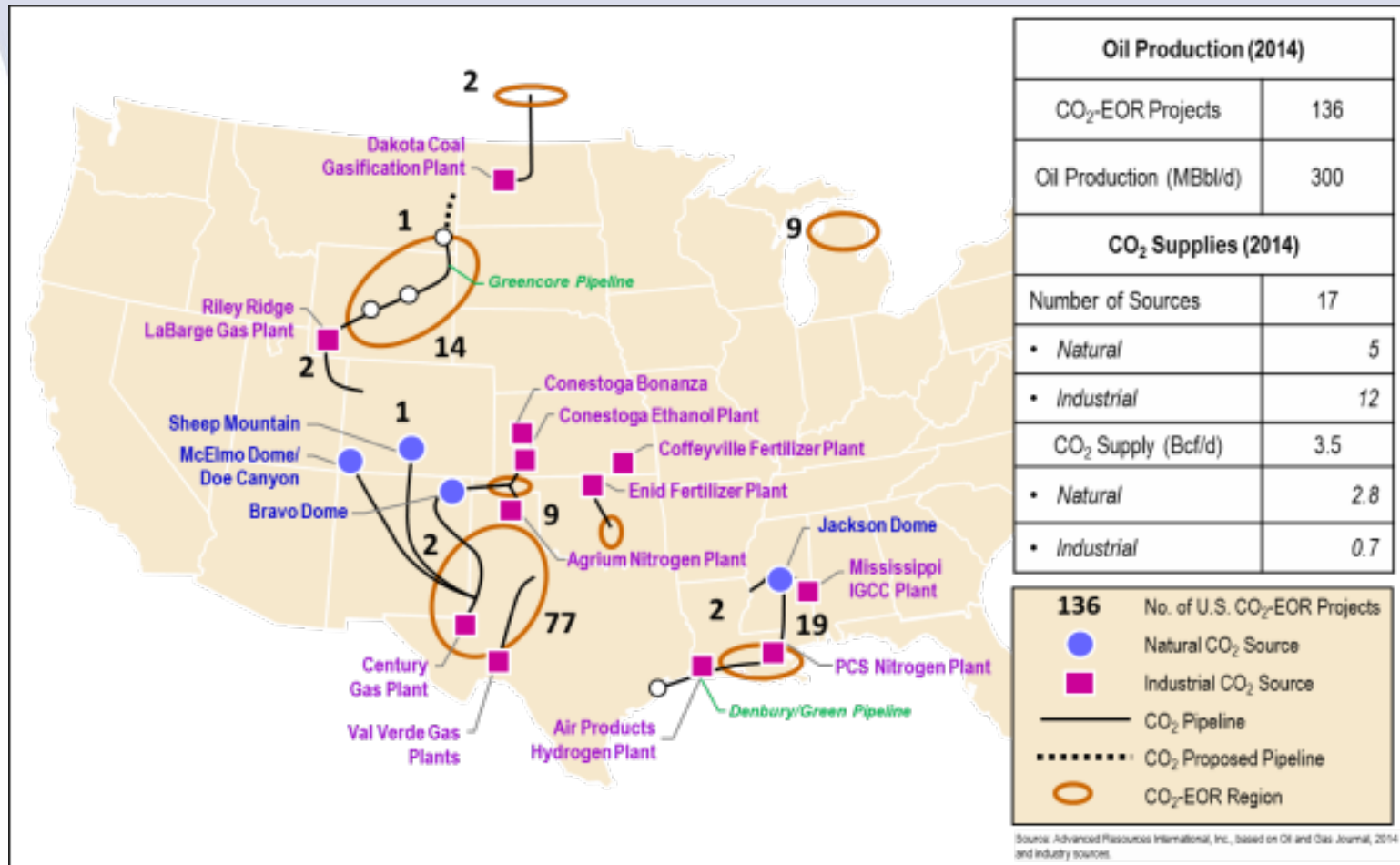


Figure ES-4. Supply Chain for Carbon Capture, Use, and Storage

CO₂-EOR Projects and Infra-Structure

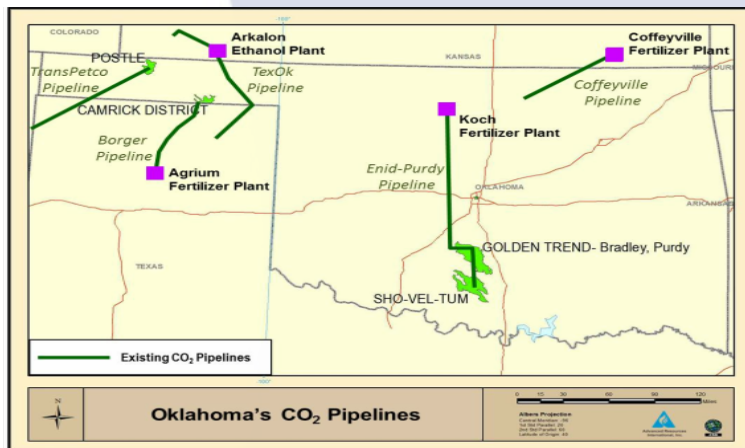
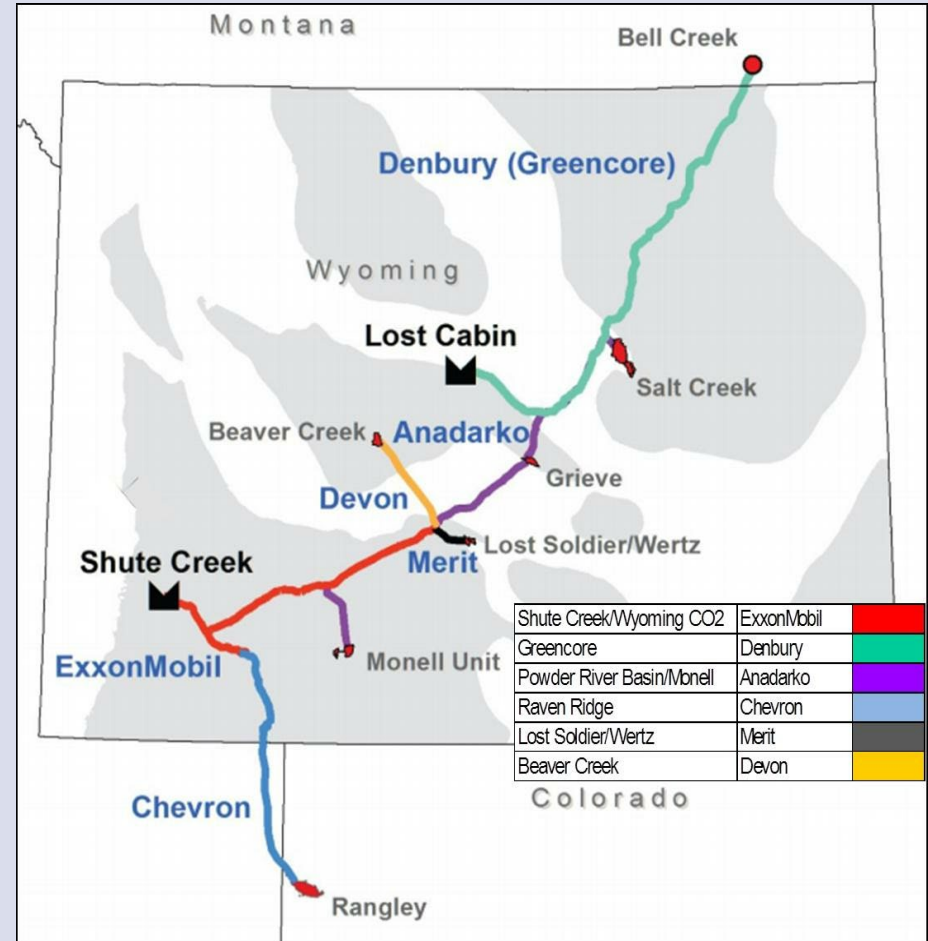
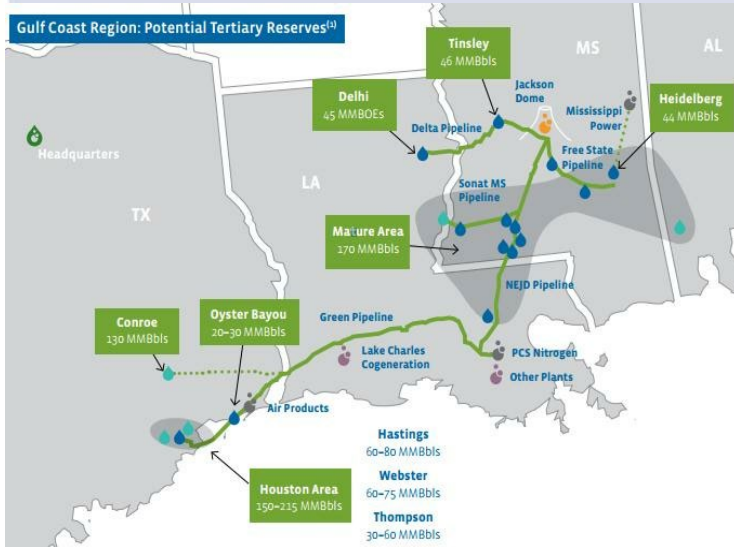


Permian Basin

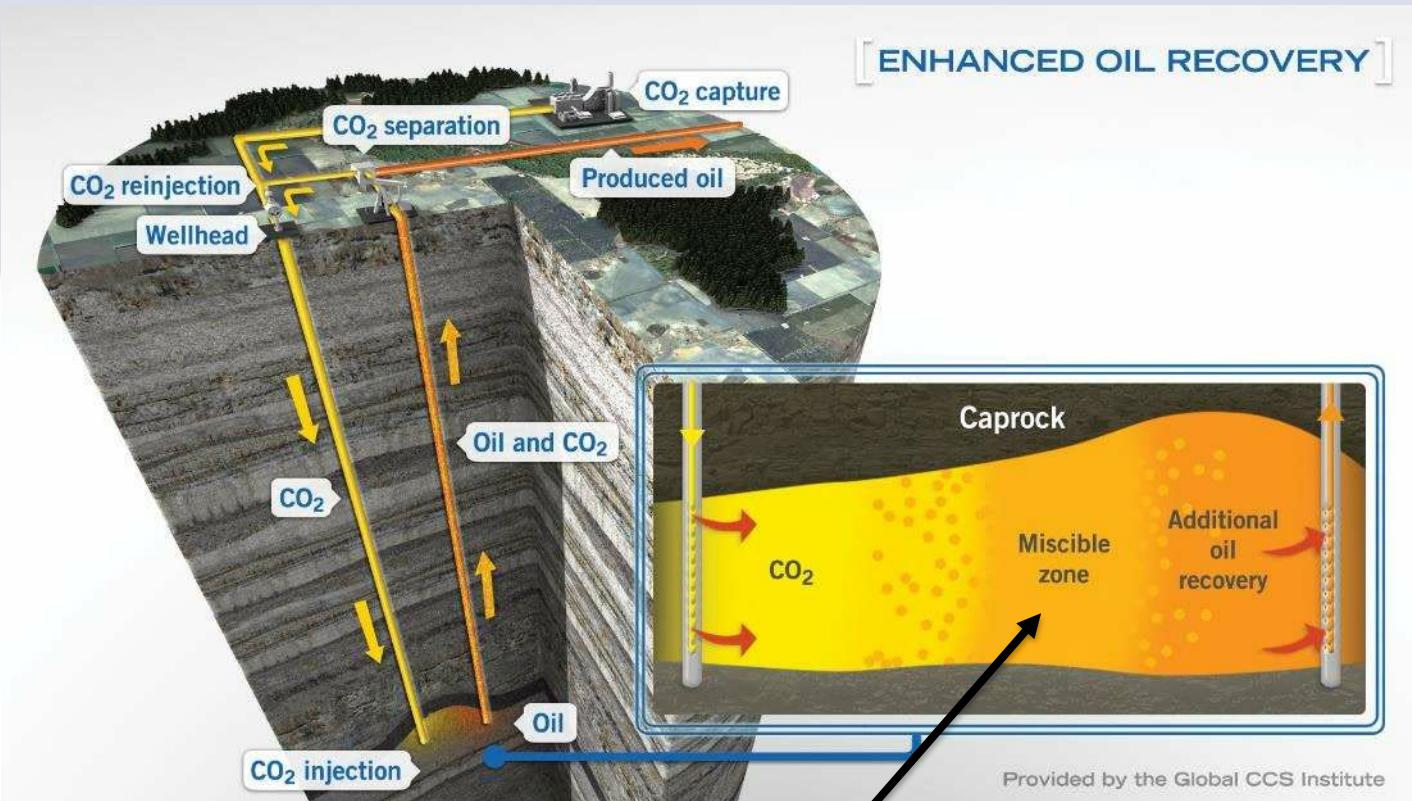
- Over 2,600 miles of CO2 pipelines carrying both natural and anthropogenic CO2.
- Over 40 EOR Conventional Projects
- Estimated 50 more economic fields representing 0.5-1 billion barrels of oil



Wyoming, Gulf Coast, and Oklahoma's Infra-structure

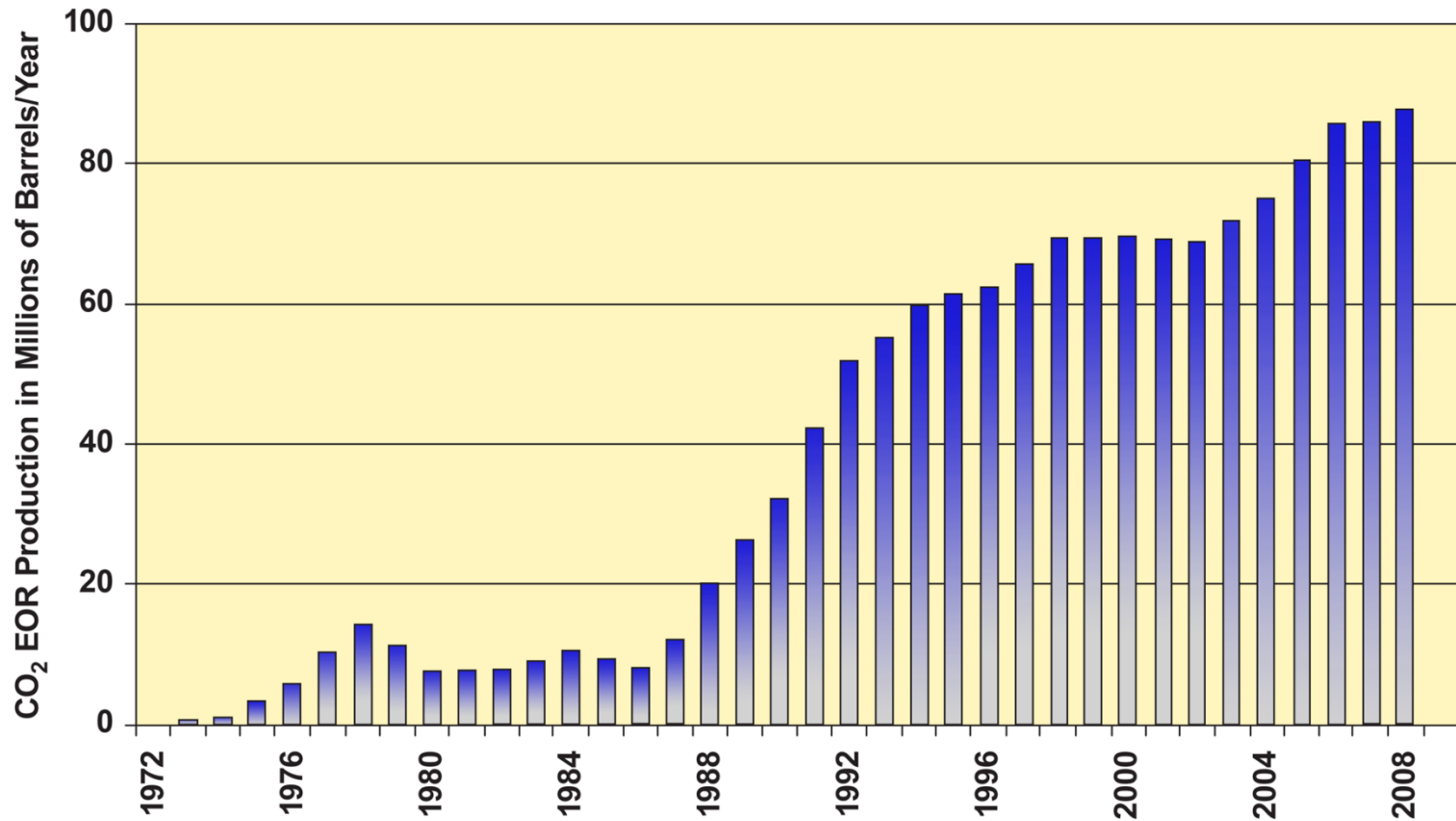


How CO2 Enhances Recovery?



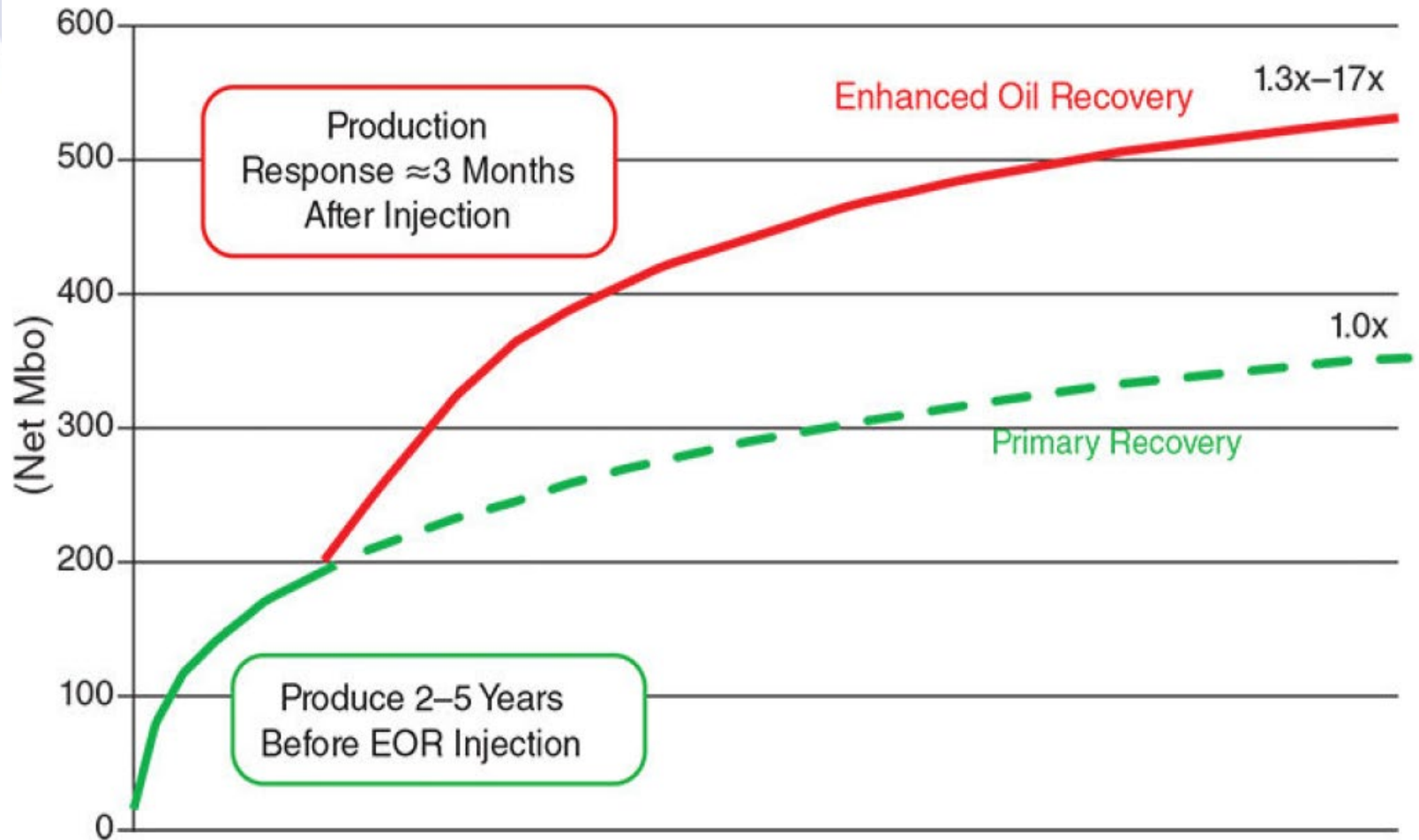
Super Critical CO2 acts as a solvent with the oil when it is injected above the minimum miscible pressure of the oil in the Reservoir

CO₂-EOR Production

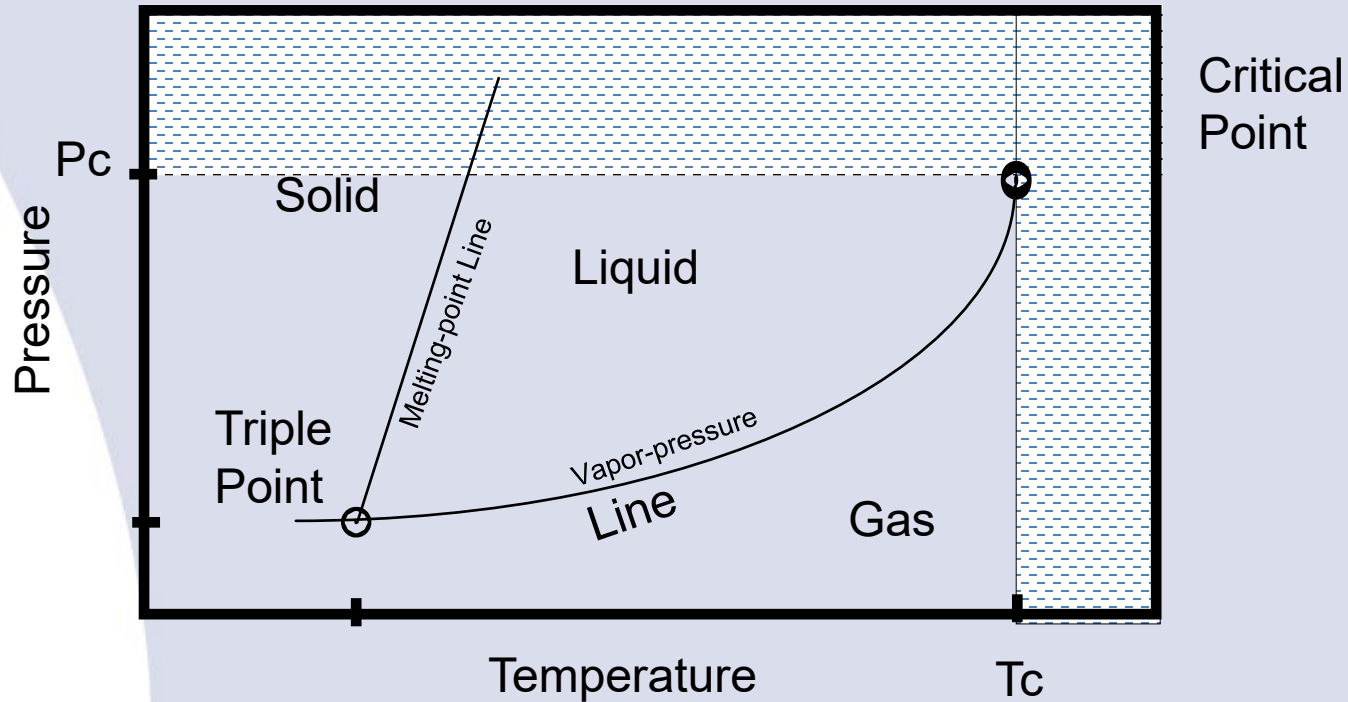


Unconventional EOR

Eagle Ford Enhanced Oil Recovery Cumulative Oil Production per Well



Phase Diagrams

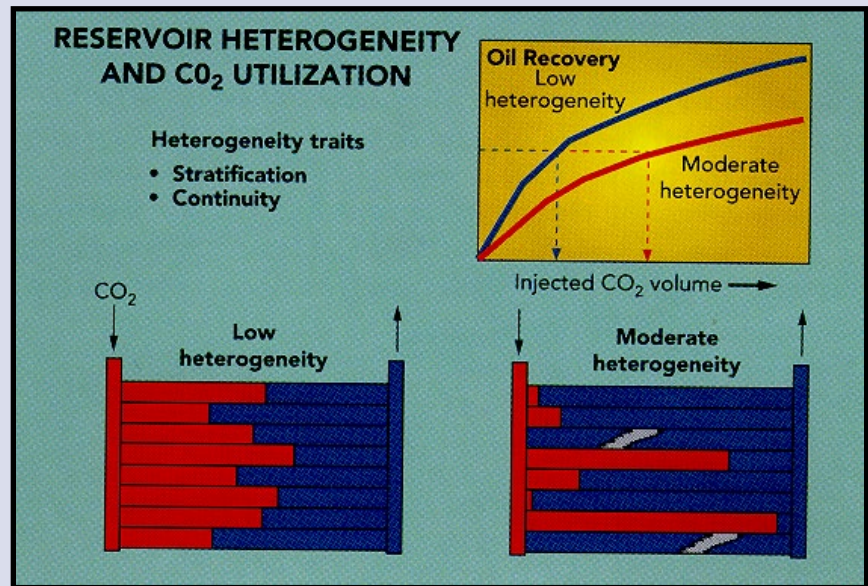


EOR Reservoir Screening Criteria

- Depth, ft 3,000 to 7,000 ft
- Temperature, F < 250 degrees, Lower is better
- Pressure, psi > 1,200 to 1,500
- Permeability, md > 1-5, higher is better
- Oil Gravity, API > 27 to 30 higher is better
- Viscosity, cp < 10 to 12
- Residual Oil Sat. % > 25 to 30 higher is better
- Note: Saline and Gas reservoir screening in Green and similar to EOR due to the need to sequester CO₂ in it's critical state, more CO₂ sequestered per volume of reservoir available

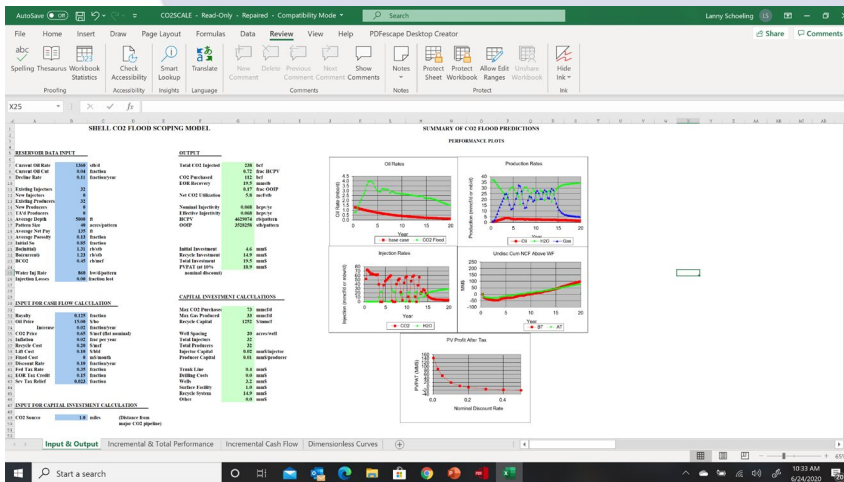
Potential Problems for EOR Projects

- Need Well Integrity
- Knowledge of Past Plugging Techniques
- Knowledge of Orphan Well Locations
- Asphaltene Precipitation
- Viscous Fingering



High Level Economic Parameters

- Capital Costs
 - Drilling and Completion
 - Condition of Current Wells
 - Well Integrity
 - Facilities (Separation and Compression)
 - Pipeline Infra-structure and Gathering Systems
- Operating Costs
 - CO2 Costs
 - Electrical
 - Preventive Maintenance
 - Well Integrity

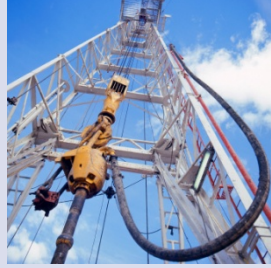
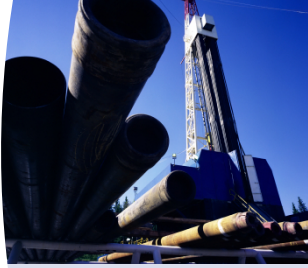


What are 45Q Tax Credits?

- Construction before January 1, 2024
- Qualified projects can claim the credit for 12 years, starting from the date the equipment was first placed into service
- Tax credit to be transferred from upstream carbon capture equipment owners to those involved with downstream operations.
 - Storage in geological formation, EOR, or products
- 45Q can be further leveraged by combining the tax credit with LCFS, or other incentives.

Q&A

- What are the topics of EOR and Carbon Sequestration that you want prioritized in the Workshop?
 - CO2 Properties (Phase Behavior)
 - Wellbore Integrity
 - Completion Technology
 - Regulatory Requirements
 - Facilities
 - Screening Criteria for all Reservoir Types
 - CO2-EOR Monitoring
 - 45Q Credits
 - Economics
 - EOR
 - Unconventional
 - Saline and Gas Reservoirs



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