

# CO<sub>2</sub> management at ExxonMobil's LaBarge Field, Wyoming, USA

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# Presentation Outline

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- Overview of LaBarge Field
- Role of CO<sub>2</sub> EOR in Carbon Capture and Storage (CCS)
- Technical solutions
- New technology development
- Conclusions

# Overview of LaBarge Field

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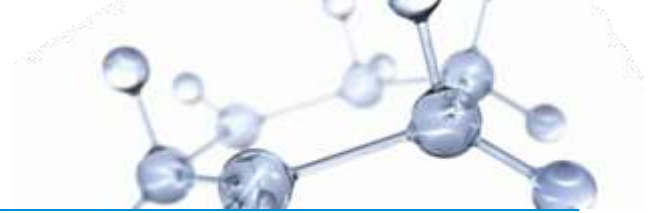
- Gas composition
  - Field discovered in 1963, production startup in 1986
  - Lowest methane content natural gas commercially produced today. Major components are:
    - 65% Carbon Dioxide (CO<sub>2</sub>)
    - 21% Methane (CH<sub>4</sub>)
    - 7% Nitrogen (N)
    - 5% Hydrogen Sulfide (H<sub>2</sub>S)
    - 0.6% Helium (He)
- Advancement in gas separation technologies was necessary
- Logistical challenges include remote location, extreme environmental conditions and sensitive habitat
- Greenfield development of CO<sub>2</sub> Enhanced Oil Recovery (EOR) market
  - Ageing oil fields provided opportunity
  - CO<sub>2</sub> sales since start of production, 1986
- Globally significant helium resource

# Role of EOR in CCS

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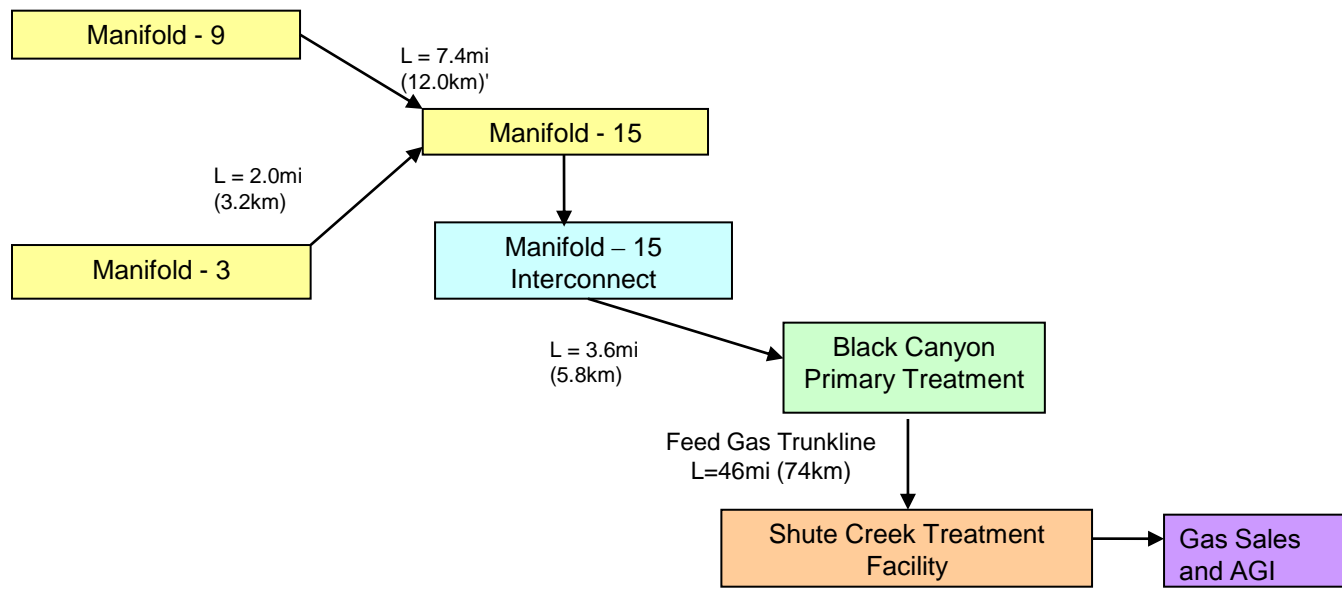


- Technologies and operational experience developed by oil and gas industry directly applicable to CCS
  - Gas treatment/separation
  - Pipeline transportation
  - Injection operations and wells
- CO<sub>2</sub> EOR creates an early opportunity for CCS
  - Economic component supports CCS
  - Facilitates infrastructure development
  - Facilitates testing/development of technology
- Transition to CCS - challenges remain
  - Economic foundation for CCS
  - Energy demand of capture technologies
  - Legal and regulatory framework that enables CCS
  - Management of long term stewardship and responsibility



# Technical Solutions – Field Layout

- Environmental setting dominant factor
  - Public lands with rich wildlife habitat
- Remote well field
- Primary treatment at Black Canyon Primary Treatment Facility, 11 km miles from well field
- Gas separation and process management at Shute Creek Treating Facility (SCTF), over 74 km from well field
  - Isolation provides valuable risk management benefits for sour gas processes



# Technical Solutions – Field Layout



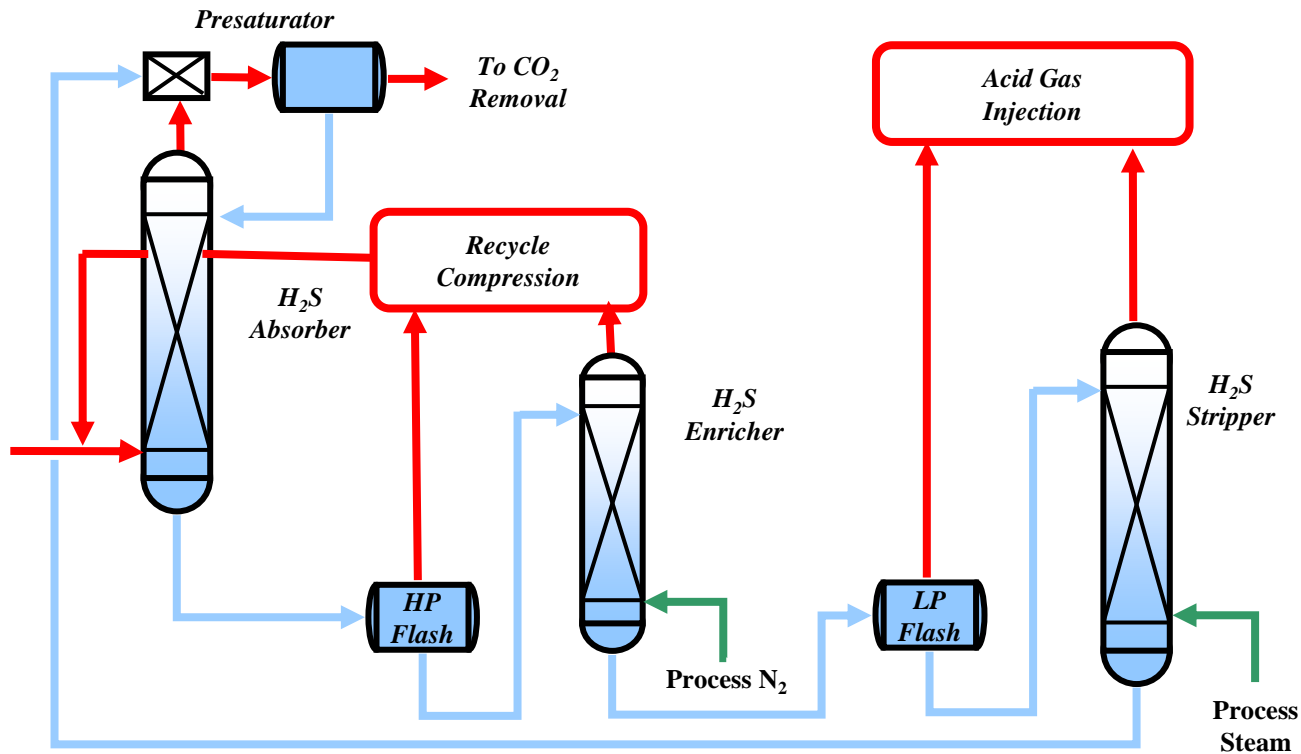
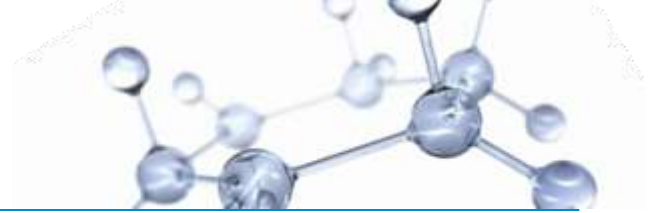


## Technical Solutions – H<sub>2</sub>S/CO<sub>2</sub> Separation

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- Dual train system utilized at Shute Creek Treating Facility (SCTF)
  - Selexol™ physical solvent use for sweetening
  - First train removes H<sub>2</sub>S
  - Second train removes CO<sub>2</sub>
- Majority of the CO<sub>2</sub> sold for EOR or industrial use
- H<sub>2</sub>S disposed of via deep well injection
- CO<sub>2</sub> and H<sub>2</sub>S treatment and management is energy intensive
  - 55 MW for gas treatment
  - 15 MW for acid gas injection
  - 30 MW for CO<sub>2</sub> compression and sales

# Technical Solutions – H<sub>2</sub>S Separation

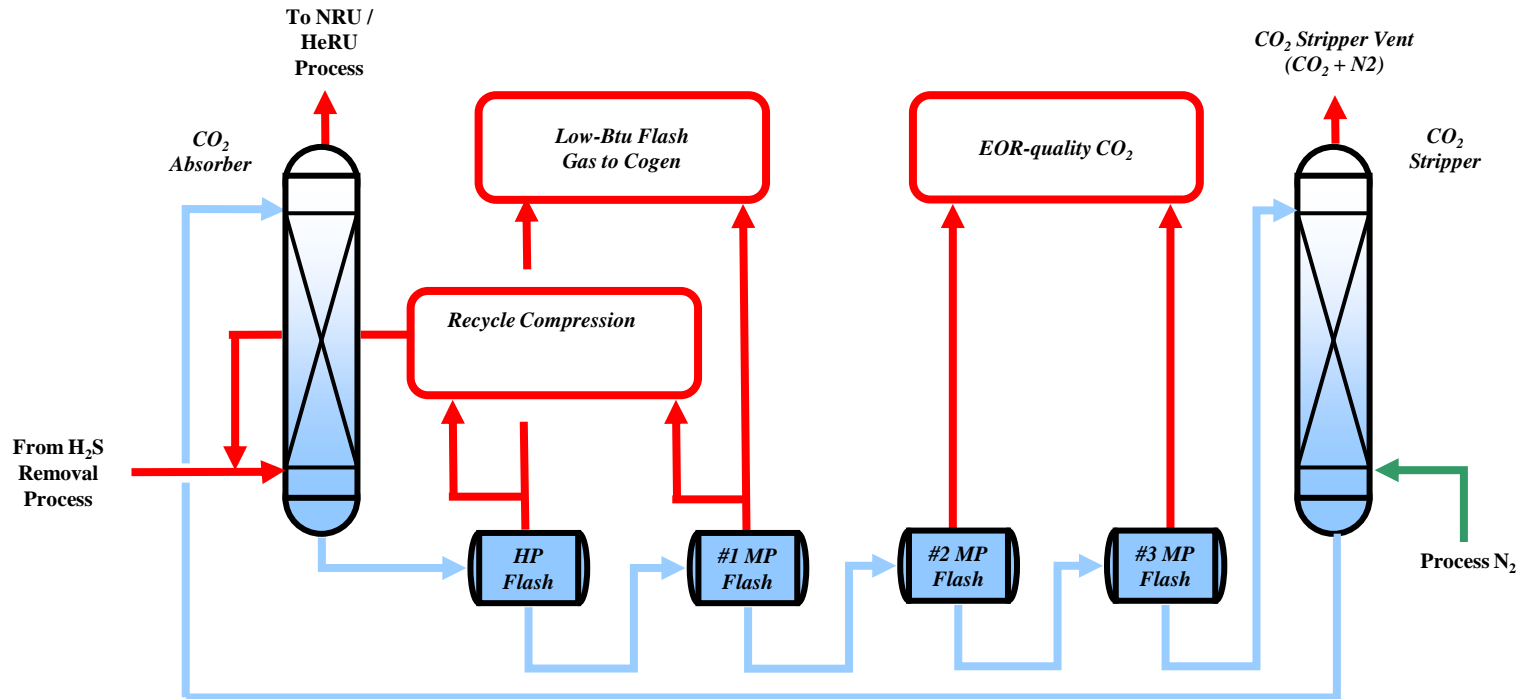


Blue – Selexol

Red - Gas



# Technical Solutions – CO<sub>2</sub> Removal



Blue - Selexol  
Red - Gas



# Technical Solutions – Acid Gas Injection

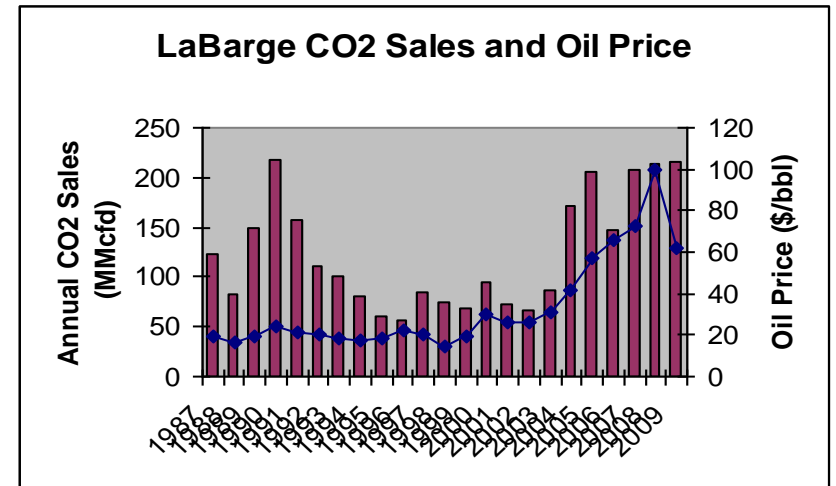
- Original 1,300 LT/D sulphur recovery unit mothballed
- Separated H<sub>2</sub>S/CO<sub>2</sub> blend (60% H<sub>2</sub>S, 40% CO<sub>2</sub>) injected via two built for purpose wells
- 65 MMcfd capacity at 3100 psi
- Injection is into the water leg of the producing formation, 17,000' subsurface
  - Injection and production wells are >50 miles apart.
- Safe operation of system since start-up in 2005.



# Technical Solutions – CO<sub>2</sub> Sales Expansion



- CO<sub>2</sub> sales capacity fully contracted since start-up in 1986
  - Actual takes sensitive to oil price
  - Take averaged ½ contracted volume through early 2000's
- CO<sub>2</sub> sales track oil price
- Recent price increases supported expansion of sales capacity
  - 110 MMcfd increase, 340 MMcfd total sales capacity
  - 3Q2010 start-up

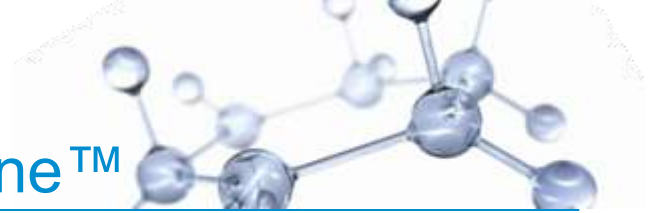


# New Technology – Controlled Freeze Zone™

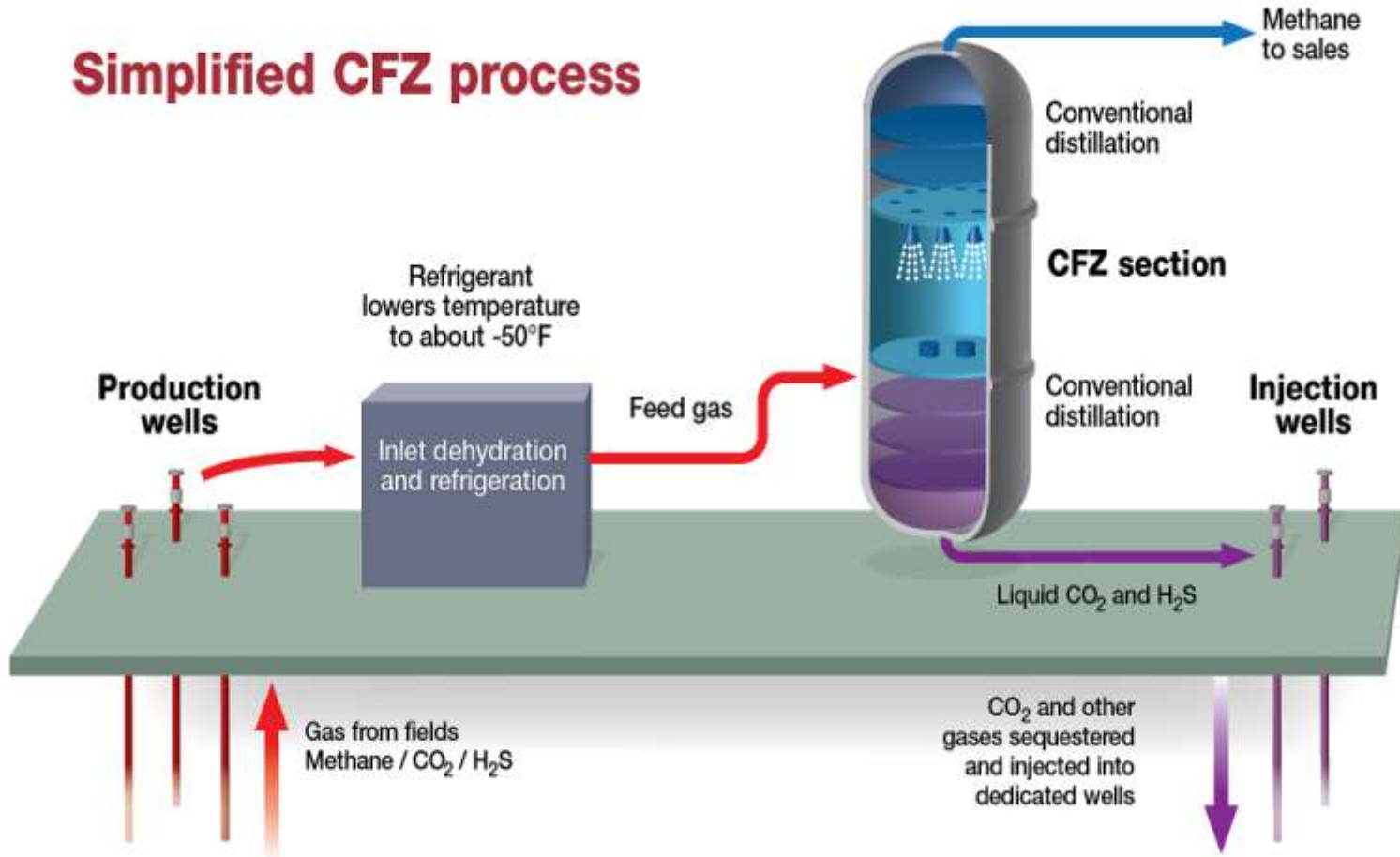


- **Controlled Freeze Zone™ (CFZ) is a single step cryogenic separation process.**
  - Simple process, done at pressure, energy efficient
  - Separates CO<sub>2</sub> and H<sub>2</sub>S
  - Targets sour natural gas treatment
- **Technology developed and tested by ExxonMobil in mid 1980's**
  - Induces controlled freezing and re-melting of CO<sub>2</sub> in a specially-designed distillation tower section
  - CO<sub>2</sub> and H<sub>2</sub>S removed as a readily injectable, high pressure liquid
- **No limits on inlet CO<sub>2</sub> or H<sub>2</sub>S concentration**
- **Commercial scale demonstration under construction at SCTF site**
  - Start-up and initial testing underway
  - Initial test results are positive

# New Technology – Controlled Freeze Zone™



## Simplified CFZ process



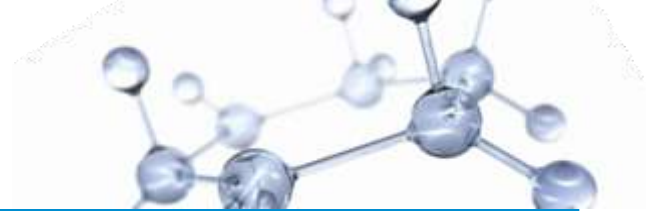
# Conclusions



- Safe CO<sub>2</sub> management and commercialization have been a priority since the start of LaBarge production in 1986
- SCTF operations have demonstrated the safety and viability of large scale CO<sub>2</sub> capture
  - CO<sub>2</sub> avoided equivalent to a 650 MW coal fired power plant
- Over 75% of the produced CO<sub>2</sub> controlled
- ExxonMobil's CFZ™ is being commercially demonstrated



# Questions?



Shute Creek Treating Facility

