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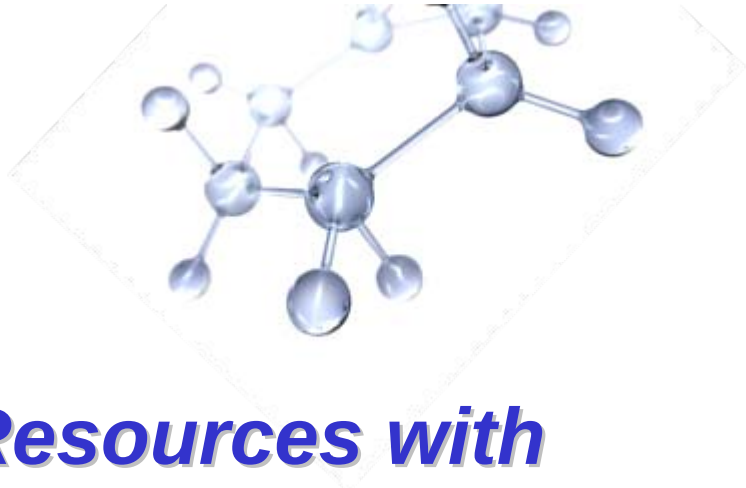
Upstream Research



Developing Sour Gas Resources with Controlled Freeze Zone™ Technology

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Global Perspectives:

Outlook for Natural Gas Supply/Demand

- **Natural gas expected to be the fastest growing fuel source for the next 20 years**
- **Demand growth expected in power generation sector because of lower emissions and greater efficiency with natural gas fired units**
- **Domestic and imported supplies will be needed to meet regional gas demands via pipeline and LNG deliveries**

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Global Perspectives:

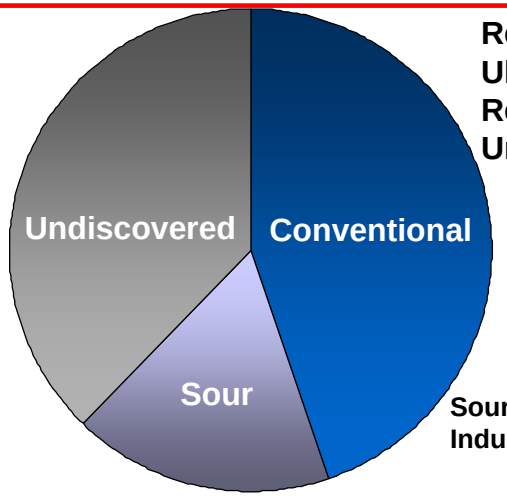
Challenges with Sour Natural Gas Resources

- **Provide clean-burning natural gas from increasingly sour gas resources**
  - **As much as 1/3 of global conventional resources have significant amounts of CO_2 and H_2S**
  - **Fields with CO_2 contents greater than 30% and H_2S content greater than 10% are encountered more frequently**

- **Management of contaminants**
  - **Increased focus on CO_2 removal and disposition**
  - **Alternatives to sulfur production**
  - **Geosequestration of CO_2**

- **Challenging economics for developing sour gas reserves**
  - **Smaller amounts of valuable hydrocarbon**
  - **Remote gas developments**

Global Gas Resource Distribution



Remaining Ultimate Recoverable - Undeveloped

Source: USGS; Industry databases

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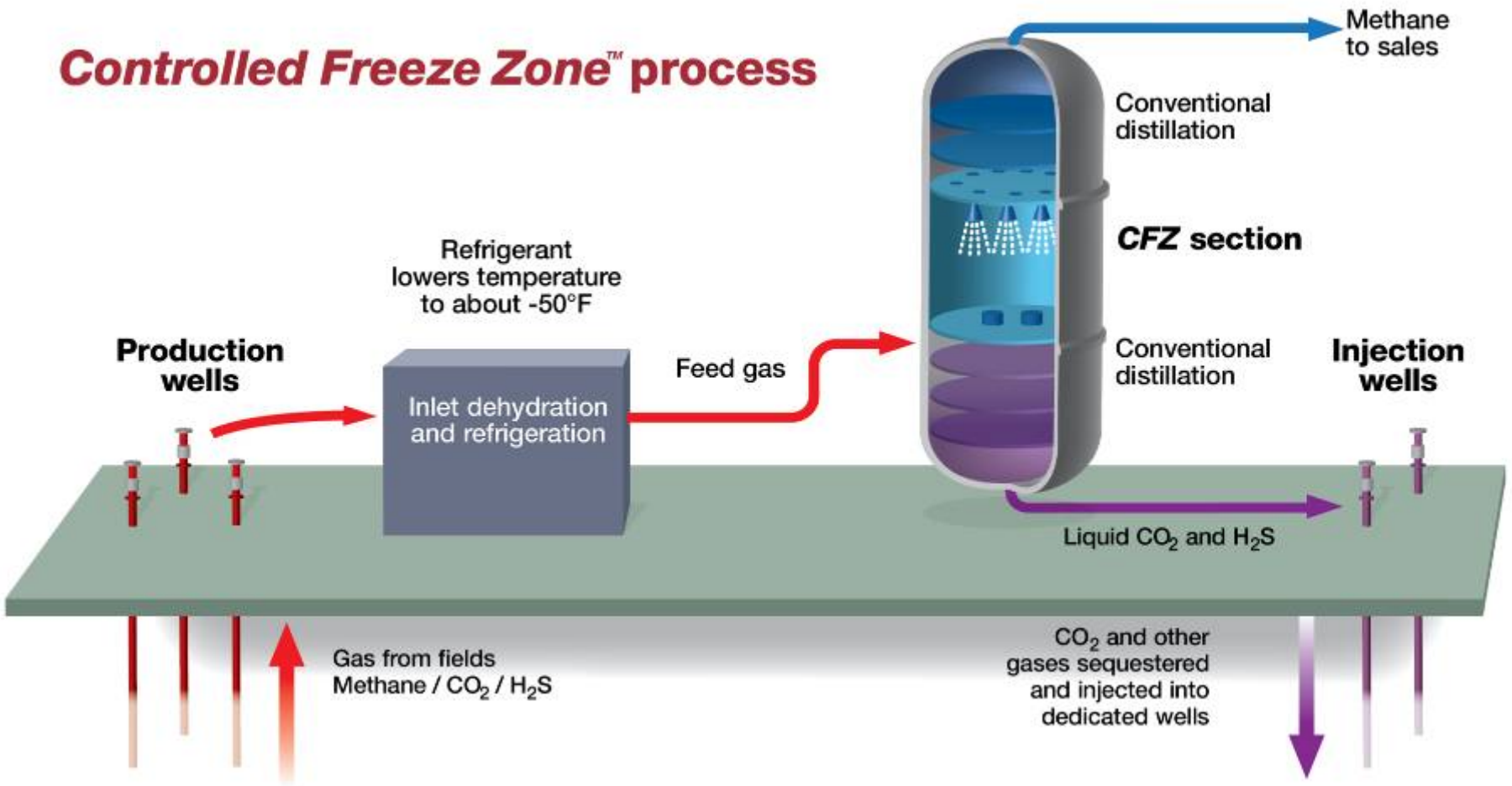
Controlled Freeze Zone™



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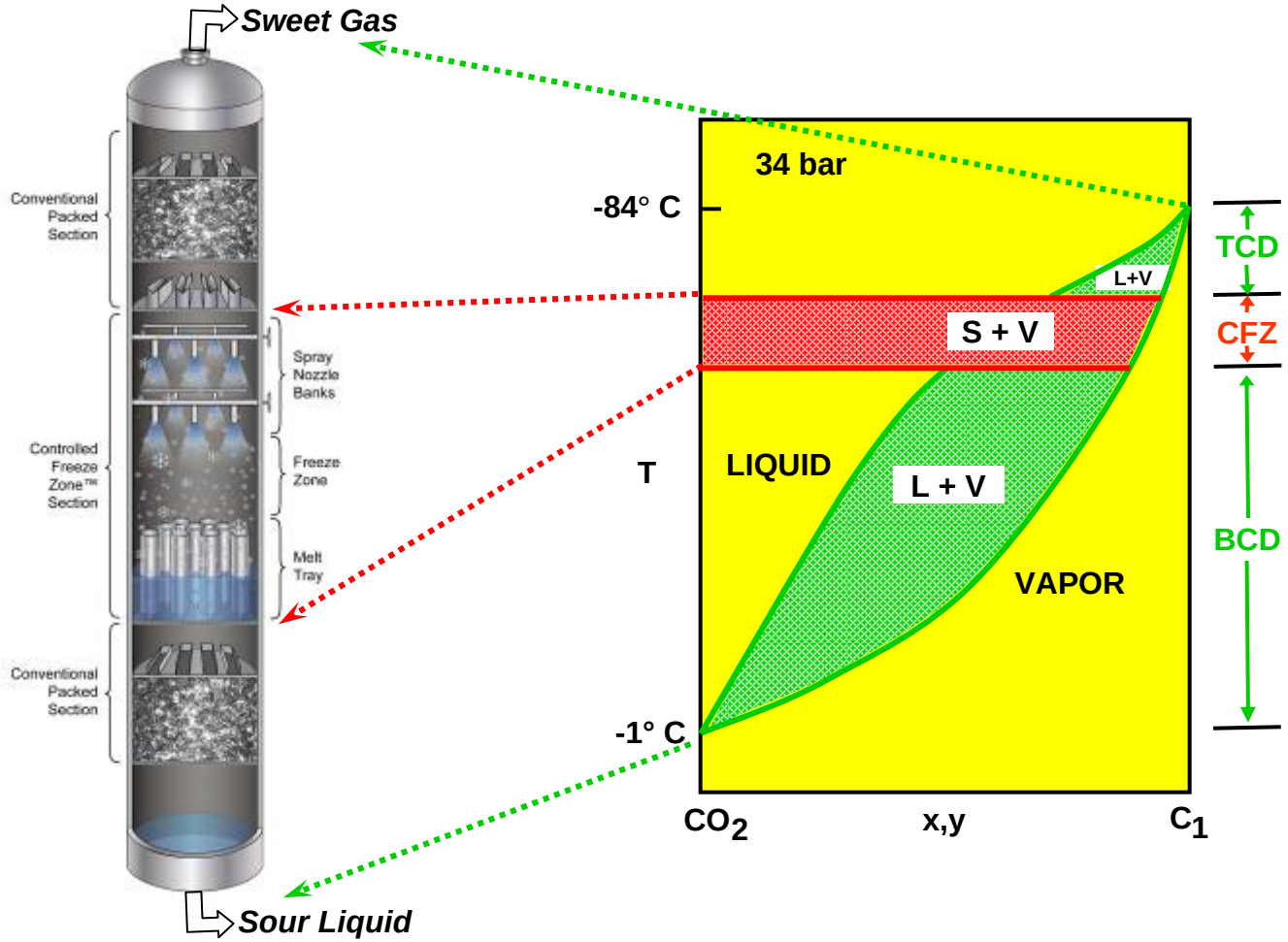
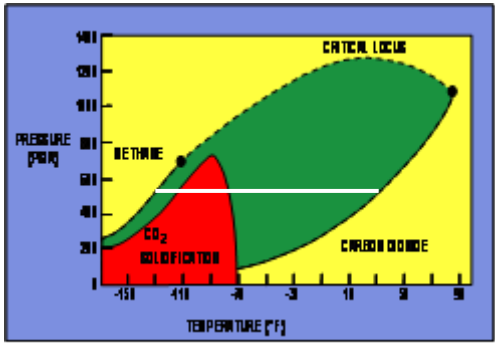
Controlled Freeze Zone™:

Technology Uses a Different Approach

Rather than avoiding solidification of CO_2,

***control* it and *confine* it to specially designed section in distillation column**





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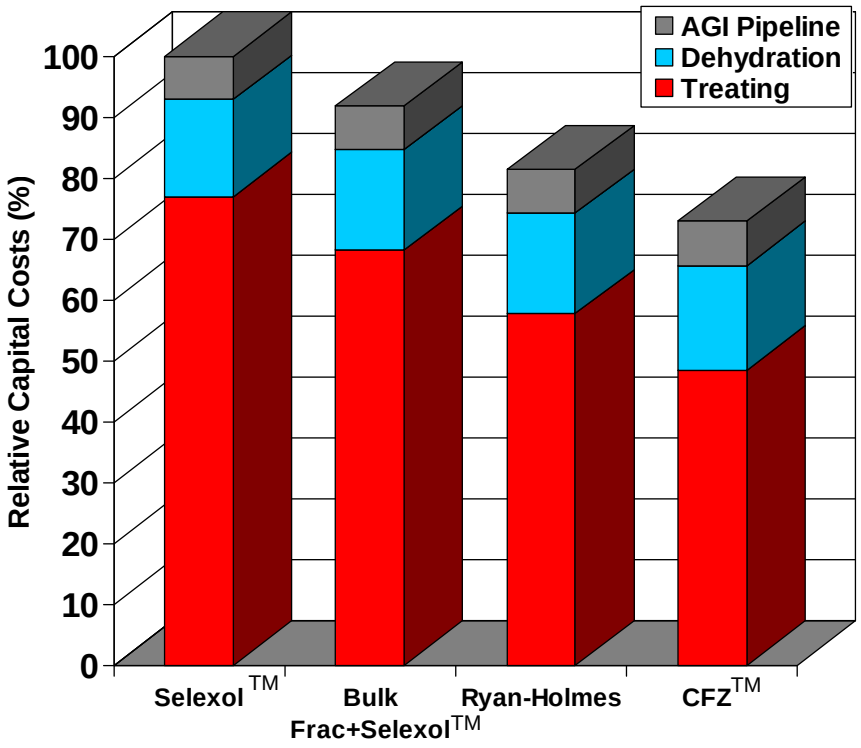
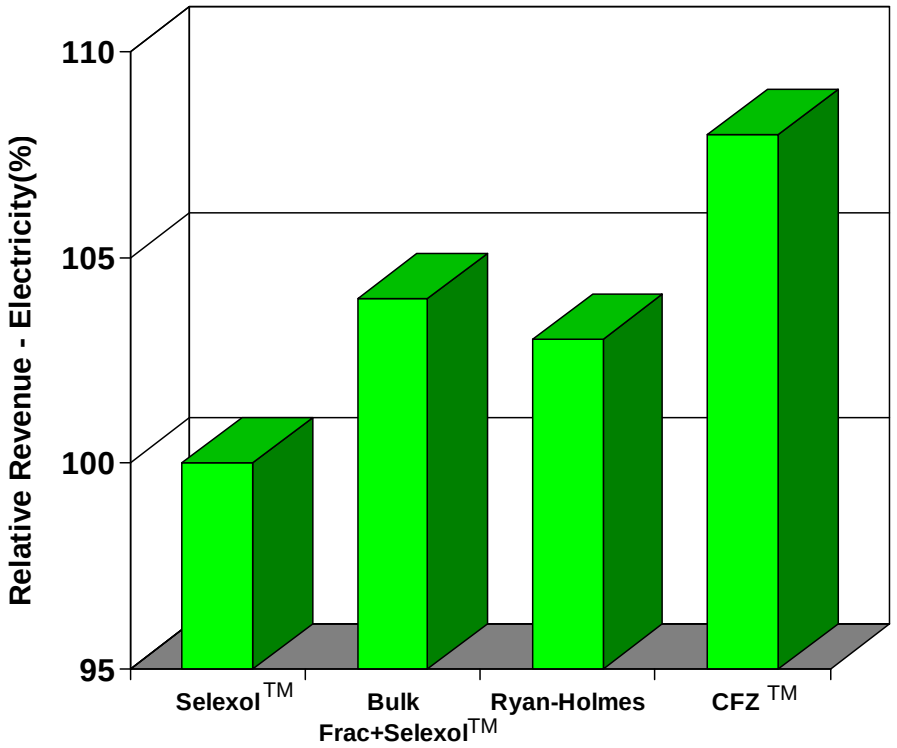
CFZ™ Advantages:

Capital Costs and Energy Efficiency

Overall Costs



Sales Revenue



- 10 - 27% lower overall capital costs
- 12 - 37% cost savings for treating

- 5 - 16% more energy efficient
- 4 - 8% greater sales

Less Equipment
Lower Costs

Lower Emissions
More Gas Supply

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Controlled Freeze Zone™:

History of Technology Development

- **Invented at Exxon Production Research Co. in 1983**
  - **Original patent granted in 1985**
- **Pilot plant operated in 1986**
  - **Proved CFZ™ concept for CO_2 removal**
- **Engineering studies and process improvements 1987+**
  - **Six additional patents**
  - **Nine pending patent applications**

- **Commercial Demonstration Plant operation to begin in 2010**
  - **Test wide range of compositions, with CO_2 and H_2S**
  - **Integrate with acid gas injection**
  - **Provide design basis for world-scale plant**

Case Study:

Summary of CFZ™ Incentives

- **Significant capital and operating expense savings**
  - **Fewer processing steps and less equipment for all applications**
  - **Reduction or elimination of solvents and additives**
  - **Lower acid gas injection costs**
    - + **High pressure separation**
    - + **Liquid acid gas stream can be pumped for reinjection vs. costly compression**
  - **Provides alternative for sulfur plants**
- **Higher efficiency provides more clean gas supply**
- **Environmental benefits**
  - **Allows economic CO_2 injection for geosequestration or EOR**

Equipment Not Needed by CFZ™

The Higher the Sour Gas Content, the Greater the Benefits