



DEVELOPING CCUS STRATEGIES FOR COST REDUCTION AND COMMERCIALIZATION

FORREST CHURCHILL
CANUSA EPC



AGENDA

Saturated CO₂ Processing

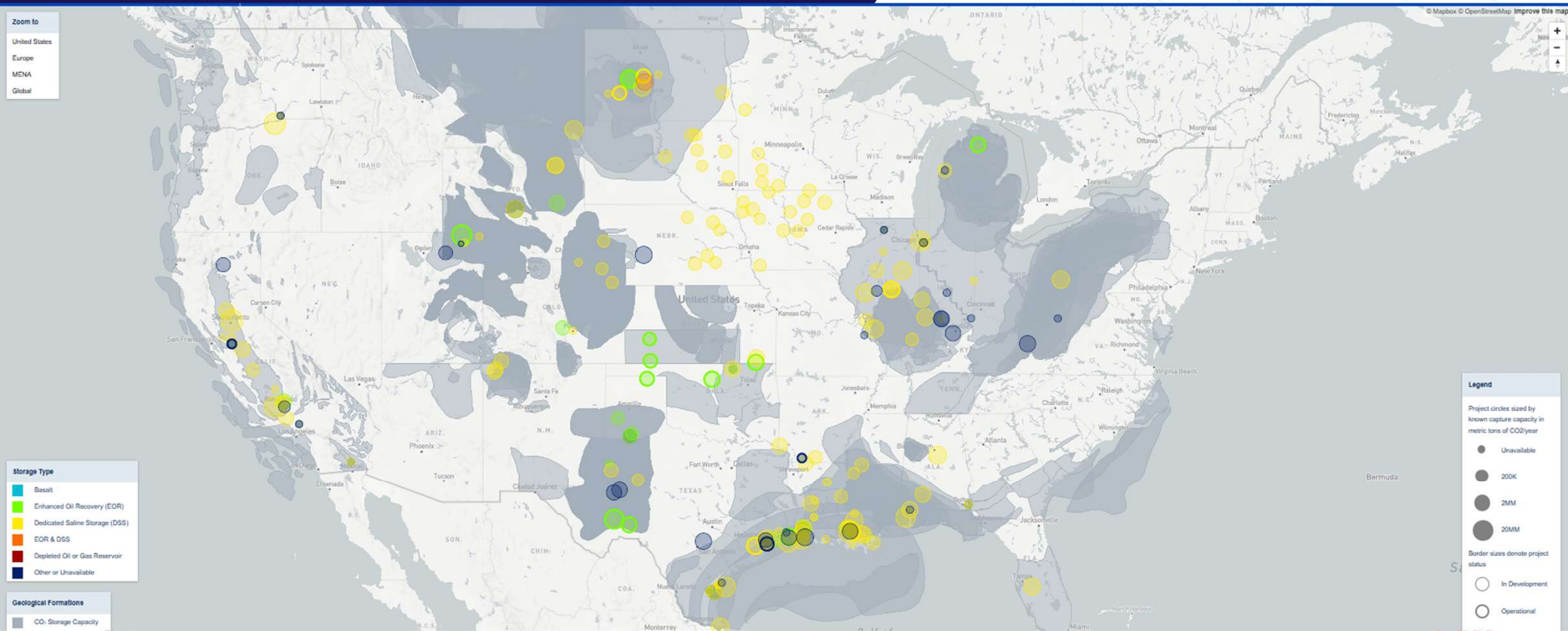
Cost impacts from technical decisions

Execution for commercial success

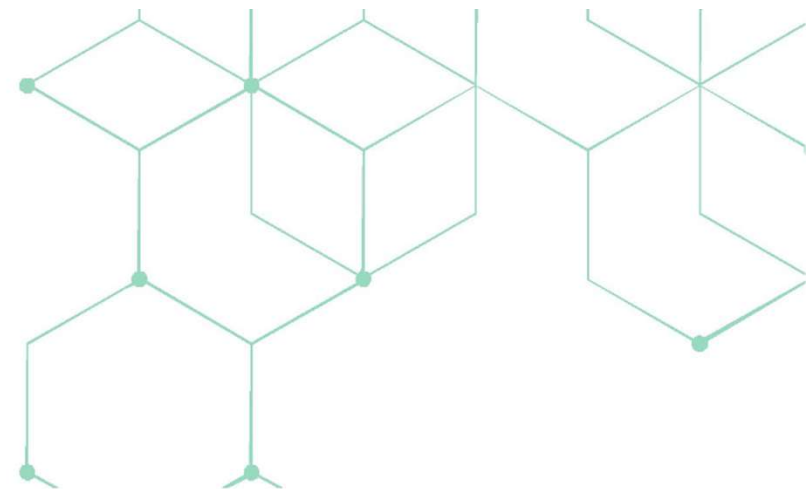
Where is injection going?



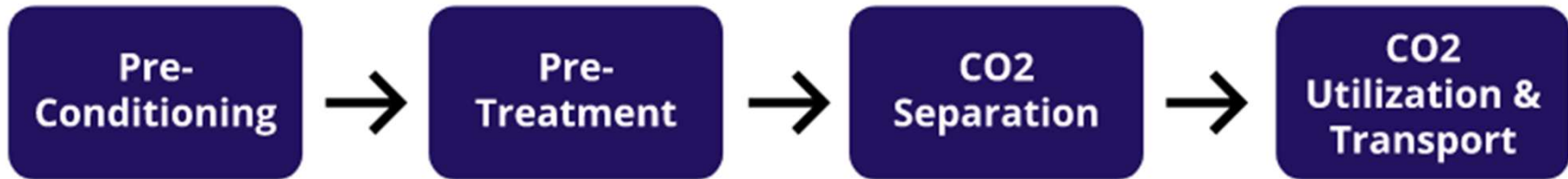
What is the current landscape of projects in US?



TECHNOLOGY SATURATED CO2



CARBON CAPTURE PROCESS



CHALLENGE

- Increasing atmospheric stream to manageable pressures (200 psig)
- Temperature removal

CHALLENGE

- Removing containments with caustic or acid wash
- Reducing free water
- Combustion of O₂

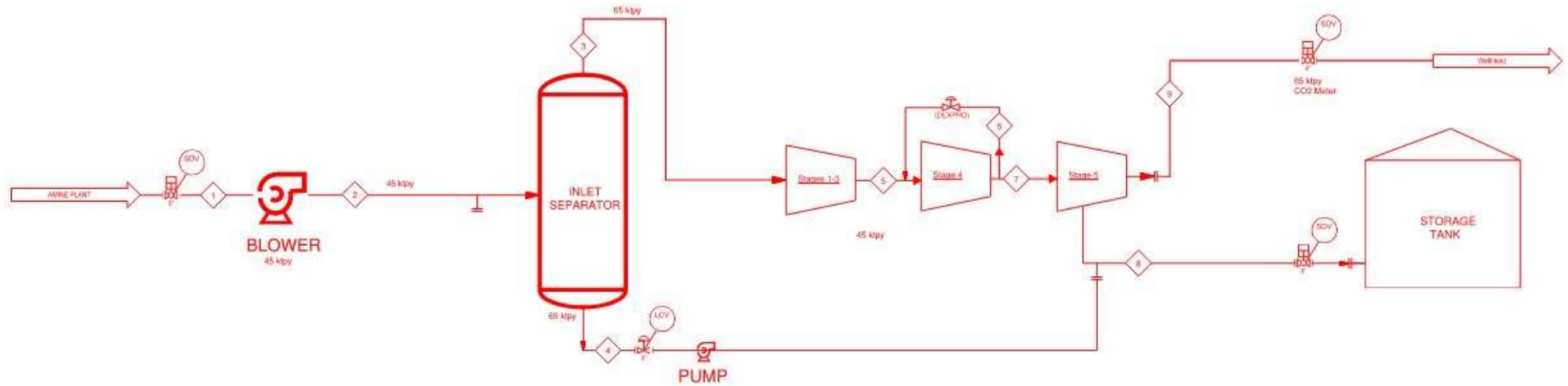
CHALLENGE

- Selection technology will be proprietary
- Capital and operational costs are specific to the technology

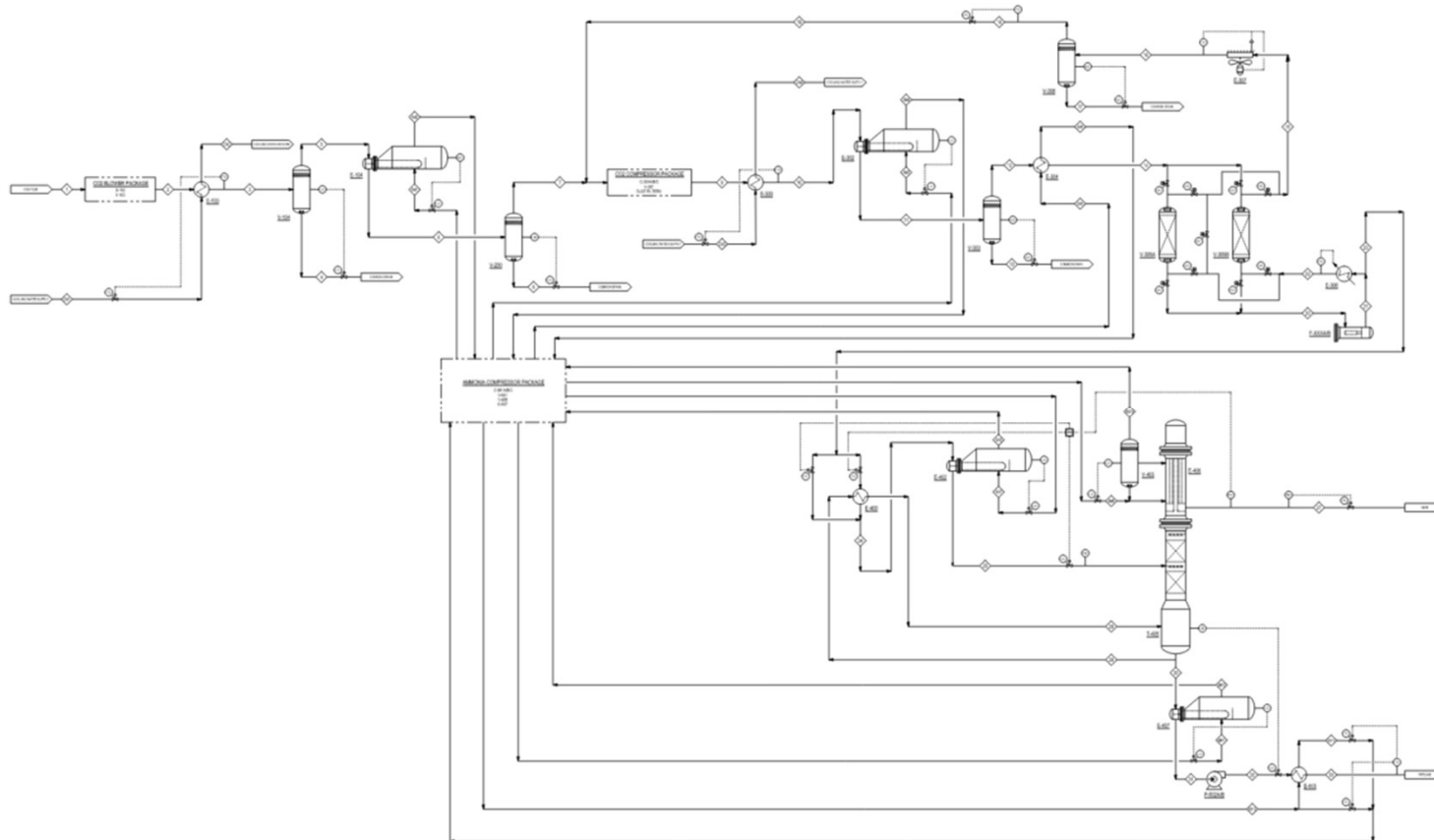
CHALLENGE

- What are sales specifications?
- Is there capacity considerations?
- How will the use impact the value of the CO₂?

CO2 Treatment and Injection Processing



CO2 Treatment and Transport Conditioning



Traditional Dehydration Approaches

1
TEG

2
Chillers

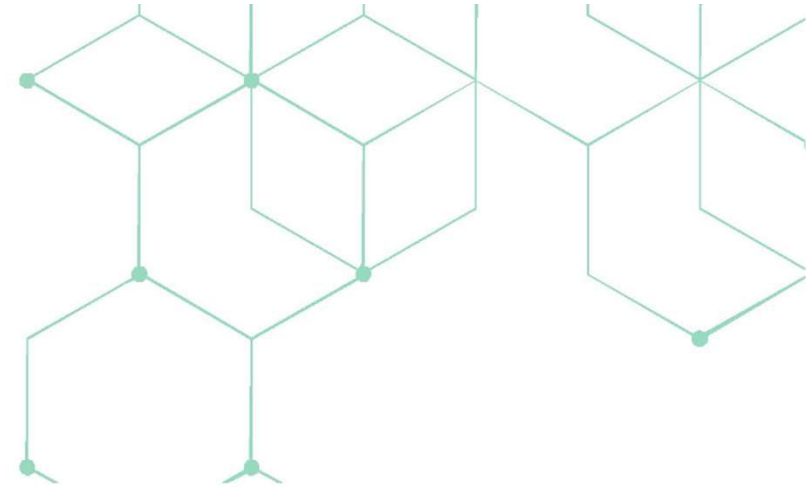
3
DEXPro™

4
Mole Sieves

DEHYDRATION SUMMARY

	TEG	CHILLER	DEXPRO	MOLE SIEVE
Reliability	Medium	Low	High	Medium
CAPEX	Medium	Low	High	High
OPEX	Mid/High	Mid/High	Mid	High
Water Content	7 LB/MMSCF	30 LB/MMSCF	20-25 LB/MMSCF	<10 PPM
Environmental Impact	High	Medium	Low	Medium

PROJECT PROFITABILITY



BALANCING COSTS AND PERFORMANCE

CAPEX OPEX

RETURN

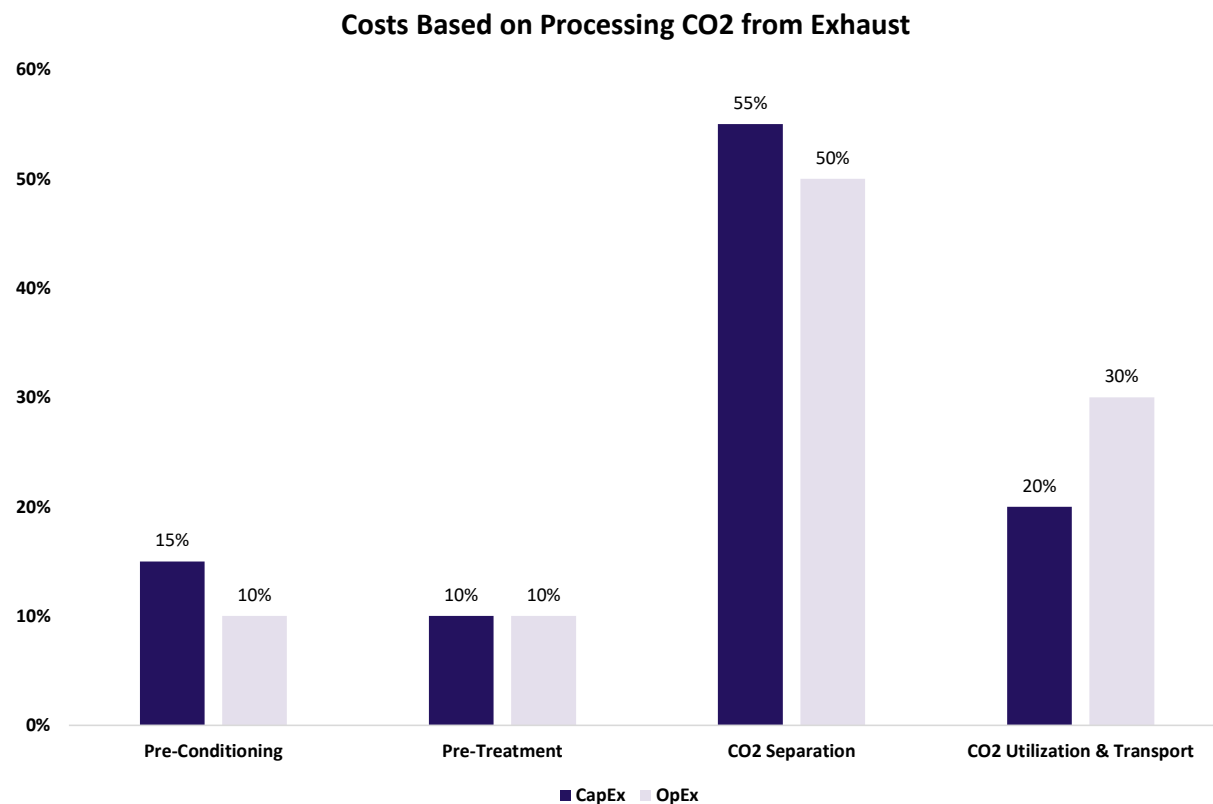
**COST OF COMPRESSION –
POWER**

**LOCALIZED NEAR
DISPOSAL WELLS**

**PERFORMANCE
REQUIREMENT**

**ENVIRONMENTAL
ATTRIBUTES**

**COST TO
TRANSPORT STATE =
\$15 / METRIC TON***





1 Metric Ton of CO₂

Cost Trends



Power Required

7.5 - 11 HP

Horsepower per metric ton



CapEx Cost

\$140 - \$170

USD per metric ton per year

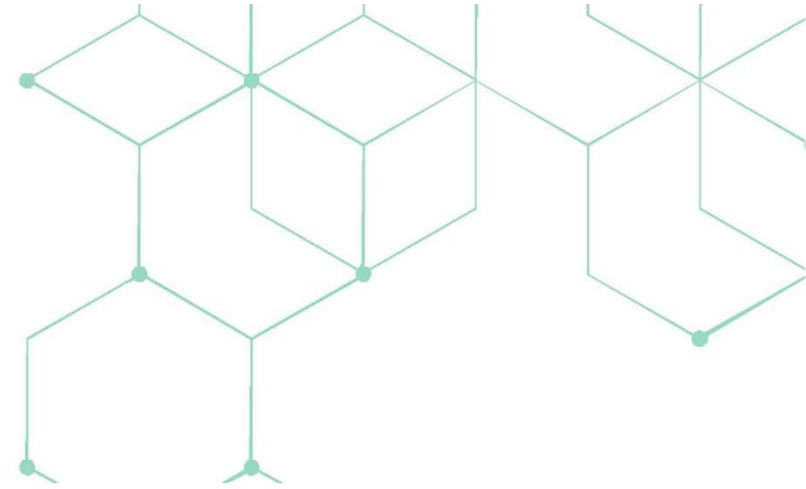


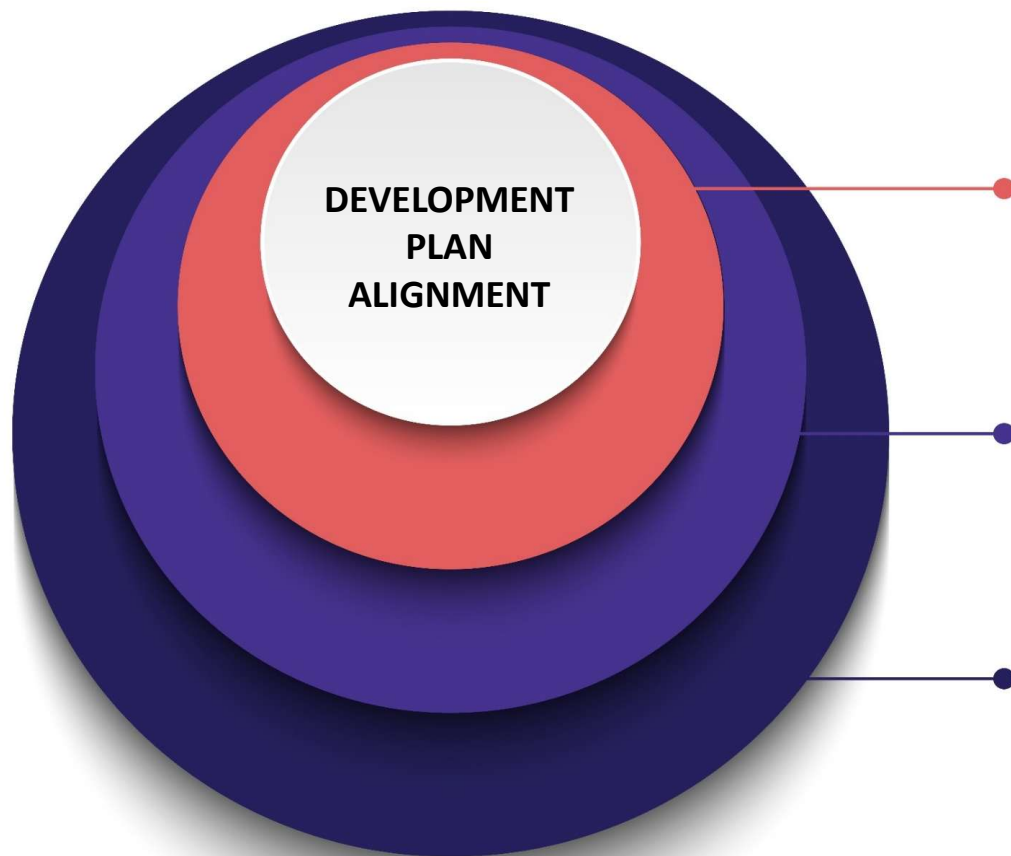
Energy Consumption

165 - 200 kWh

Kilowatt-hours per metric ton

THE PRICE NEEDS A PLAN





COMMERCIAL ALIGNMENT

- 45Q requirements
- Environmental attributes

CONTRACT STRUCTURE

- Performance based requirements
- Risk assignment

EXECUTION BEST PRACTICES

- AACE Definitions and Risk Determination
- Operator control and input

KEY 45Q CONSIDERATIONS



Contractual Provisions

Requirements:

- PWA Language in Contracts
- Documentation Standards
- Assess QA Documentation
- Compliance Monitoring

Goals:

- Centralized control
- Clear responsibilities
- Liability of compliance



Vendor Selection

Requirements:

- Review Payroll Systems
- Minimize Onsite Exposure
- Certification Requirements
- Track Record Review

Goals:

- Proven compliance
- Lower PWA exposure
- Quality workforce



Offsite Scope Strategy

Requirements:

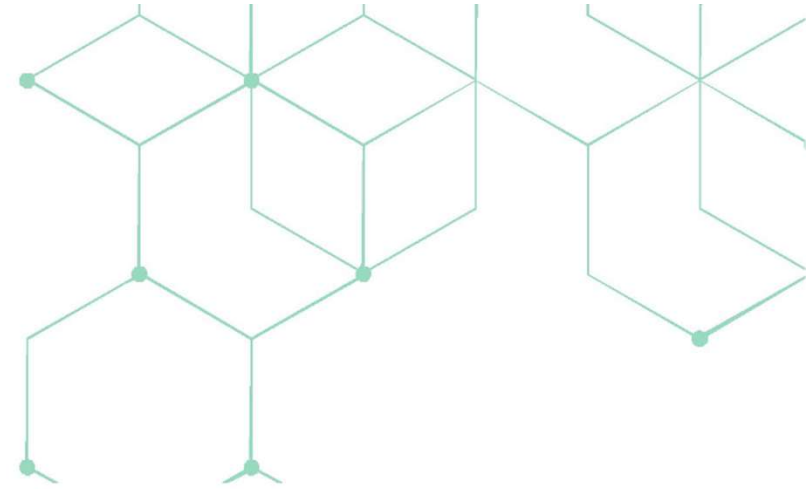
- Maximize Offsite Fabrication
- Start with Modularity Built-In
- Split Contract from Onsite Services

Goals:

- Reduced complexity
- Penalty Avoidance
- Strategic advantage



WHERE IS INJECTION GOING?



MINIMIZED RISK FOR DEPLOYMENT



EOR Applications

Risk Profile:

- Established Technology
- Proven Track Record
- Geological Monitoring
- Revenue Generation

Key Benefits:

- Decades of experience
- Enhanced oil recovery
- Permanent storage
- Economic viability



Onsite Co-Injection

Risk Profile:

- Integration Complexity
- Short Transport
- Process Control
- Site Characterization

Key Benefits:

- Reduced transport risk
- Direct capture & store
- Lower infrastructure
- Immediate deployment



Pure CO₂ Sources

Risk Profile:

- No Separation Needed
- Minimal Processing
- Stream Purity
- Quality Assurance

Key Benefits:

- Lowest cost option
- Simplified operations
- High efficiency
- Reduced complexity



FUTURE DEPLOYMENT FOCUS



Non-Saline Injection New Storage

Key Advantages:

- Broader geological targets
- Reduced environmental risk
- Flexible site selection
- Lower permitting barriers

Market Potential:

Expanding beyond traditional saline aquifers to depleted oil/gas fields and unconventional formations



Power Generation Data Center Growth

Key Advantages:

- Co-located capture & use
- 24/7 baseload operations
- High volume CO₂ streams
- Grid reliability synergy

Market Potential:

AI boom driving massive data center expansion with integrated carbon management



Regional Market Merchant Markets

Key Advantages:

- Premium product revenue
- Established distribution
- Quality differentiation
- Dual revenue streams

Market Potential:

Growing demand for food-grade CO₂ with premium pricing over industrial applications



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Project Development and Execution

Carbon Capture, Utilization & Storage

Power Generation

Natural Gas Processing

Industrial Gas Processing

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CARBON CAPTURE
USA 2025