Economic Analysis of Potential for CCUS in the Gulf of Mexico

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network

injection

for offshore CCUS growth

metered storage hub system

individual stakeholders



Recommendations

Explore solutions promoting an ecosystem

Integrated infrastructure - reduce capital

costs for projects and provide EOR/storage operators with a "pay as you go" service using a toll-based offshore transportation

Supply pooling – reduce the risk of offtake for capture operators and risk of long-term contracts to EOR/storage operators with a

Complementary incentives – align goals and drive collaboration between capture operators and EOR/storage operators by designing a <u>supply chain</u> incentive program that targets pain points of the

Flexible storage – allow EOR/storage operators flexibility to transfer between permitted EOR to storage operations depending on how a field responds to CO₂

Defining regulations – develop monitoring and liability regulations for federal waters that allow storage programs for power and industrial sources and provide the ability of EOR/storage operators to assess the risk

Summary

Offshore CCUS economic viability requires a favorable market environment, including

Storage – tax credits	EOR – oil prices >
of $75/tonne of CO_2$,	\$90/bbl, capture sites
storing 2 million tonnes	within 25 miles of
CO ₂ /year, 30%	coast or CO ₂ pipeline
reduction in capture	deep water fields
technology costs	within 100 miles of
	shore, reserves > 40
	million bbls

Roadblocks extend beyond economics for CCUS supply chain

Storage – lack of	EOR – uncertainty of					
federal offshore	field performance					
regulations detailing	limits operator					
safety &	willingness to commit					
environmental	to long-term					
requirements, timing is	partnerships					
aggressive to qualify						
for incentives						
Start with Brownfields utilizing existing						

Start with Brownfields utilizing existing knowledge of fields and estimated financials

Storage – ability to	EOR – brownfield
leverage existing	financials on par wit
infrastructure, reduces	greenfield, but
exploration &	greenfield bears
development costs	significantly more ris

Offshore CCUS Success

 Supply chain – optimized, and incentives aligned

 Infrastructure scaling – integrated transportation networks

 CO2 supply pooling – storage hubs to reduce supply uncertainty

 Cost reduction – improved capture technology efficiency

 Incentive matching – clear regulatory definitions & benefits provided throughout supply chain

Supply Chain for Offshore CCUS

Biggest supply chain costs - CO₂ capture through operations

Cap	oture		Transportation			Operation		
Reservoir Identification & Concept Selection	CO ₂ Capture (Onshore Only)	Transport (Onshore)	Coastal Staging	Transport (Offshore)	CO ₂ Injection -	CO ₂ Monitoring	Oil Processing	
Subsurface Analysis & Modeling (seismic survey, well log analysis, etc.) Exploration & Appraisal (exploratory wells, petrophysical	Capture & Process (equipment, purification) Transportation Prep (compression, monitoring, CO ₂ processing)	Pipeline Construction (permitting, pipeline construction) Transport (CO ₂ processing facilities, compression stations, monitoring)	Compression Station (compression equipment) Storage Hub (land acquisition, s storage tanks, monitoring)	Pipeline Construction (permitting, pipeline construction) Shipping (vessel CAPEX)	Surface Infrastructure Mods (platform expansion/ addition, injection and production equipment) Subsurface Infrastructure (well workovers, new wells, subsea injection)	Surface Monitoring (instrumentation, reporting, fugitive gas monitoring) Subsurface Monitoring (monitoring wells)	Oil Separation/ Processing Operations (OPEX only) CO ₂ Recycling Operations (OPEX only)	
analysis, etc.) Concept Selection & Design							Enhanced Oil Recovery (EOR) Only	
Operation & Maintenance								

Most Economic Supply Chain Model Results

Changing one variable and holding others constant - Ceteris Paribus

Brownfield – State Shallow Water CO₂ Storage Sensitivity



Brownfield storage – leverages existing infrastructure & data resources to offset supply chain costs

• Increased Rate of CO₂ Injection has the most significant impact on Net Present Value

Greenfield – Federal Shallow Water EOR Sensitivity



Greenfield EOR - economical viability is reliant on combinations of market factors

- Increased Oil Price has the most significant impact on Net Present Value
- Increased Oil Recovery over life of project has the most significant impact on Cost per Barrel

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*"A" is the base-case scenario