Reducing Vented Flowback Emissions from CO2 Fractured Gas Wells Using Membrane Technology

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Agenda

• General flowback details
• Benefits of using a membrane system
• Noble’s green flowback pilot project assumptions and results
• Factors that affect future use of a membrane system
Flowback Emissions From CO2 Fractured Well: Without Membrane

- Mixture of CO2 and methane emissions
- Multiple days of venting/flaring
- Sold once CO2 concentration decreases to pipeline specification
Membrane Separation Process

Feed (Flowback Gas) → MEMBRANE →

- Residue (Hydrocarbon)
- Permeate (CO2 Rich)
Flowback Emissions From CO2 Fractured Well: With Membrane

- Decreased venting/flaring
- Increased sales gas
- Potential for carbon credits
- Environmental stewardship
Portable Membrane System

CO2 separation unit
Assumptions

• Gas savings is defined as “traditionally flared gas that is sold instead”

• Acceptable pipeline CO2 concentration of $4\text{%}_v$

• Gas sales price = $3.12 / \text{mmbtu}$
Noble’s Green Flowback Pilot Project

Net profit = $340,000
Gas savings = 170 MMcf
Cost = $325,000
10 Noble flowbacks
Noble’s Green Flowback Pilot Project – Average Per Flowback

Net profit = $34,000

Gas savings = 17 mmcf

Cost = $33,000
Potential For Carbon Credits

Potential Carbon Credits = Flowback Emissions Without Membrane - Flowback Emissions With Membrane = Gas Savings

1300 to 5300 tonnes CO2eq earned per flowback
Many Factors Affect Future Membrane Use

• Commodity prices
• Rental cost
• Availability of unit
• Ability to improve logistics
• Ability to comingle flowbacks from multiple wells
Questions