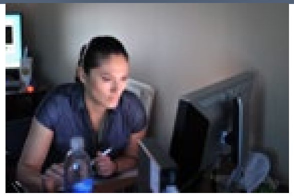
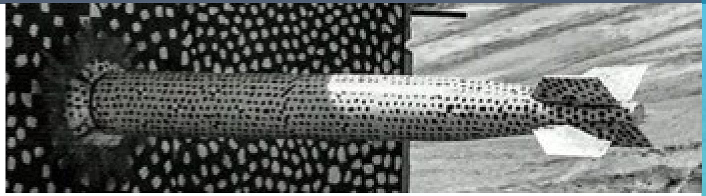
CUSP West

Sandia National Laboratories

ECONOMIC ANALYSIS OF GEOLOGIC CARBON SEQUESTRATION





PRESENTED BY

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U.S. DEPARTMENT OF ENERGY NNSA

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ACKNOWLEDGEMENT

Sandia National Laboratories

THE UNIVERSITY OF TEXAS PERMIAN BASIN

TARGA

NEW MEXICO TECH
SCIENCE • ENGINEERING • RESEARCH UNIVERSITY

Carbon Solutions LLC.

KU THE UNIVERSITY OF KANSAS

Includes - Four graduate and undergrad students interns

Background & Introduction

- To realize the climate and socioeconomic benefits of CCUS, such projects need to be implemented at scale, which warrant
  - Technical feasibility
  - Economic viability
  - Social acceptability
- The sector of midstream gas processing facilities in the Permian Basin is gaining interest to implement CCS (CUSP, Craig et al., 2023; Pimenta & Romero, 2022)
  - Section 45 Q Tax credits
  - Existing infrastructure
  - Available skilled workforce and high potential storage sites
- Where does midstream facilities stand in the cost of CCS?
  - CCS cost - \$52 - \$60/ MT CO2 for Coal, \$80-90/MT NG fired power plants, and \$32-\$242/MT bioenergy with CCS (Schmelz et al., 2020; Langholtz et al., 2020)

Source: Sandia https://www.osti.gov/servlets/purl/1503847

Tasks and Deliverables

Reports

1. Site Specific Technoeconomic Analysis

    I. Mishra SK, Gagarin H, Potter J, Ford M, Heath J, Trentham R, Henderson M, El-kaseeh G. Site specific Techno-economic analysis of Geologic Carbon Storage in Acid Gas Injection Wells

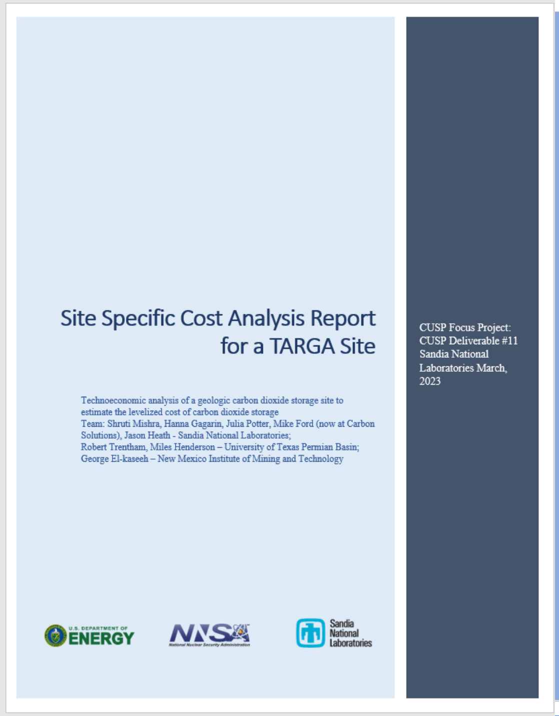
2. Benefit Cost Analysis Framework

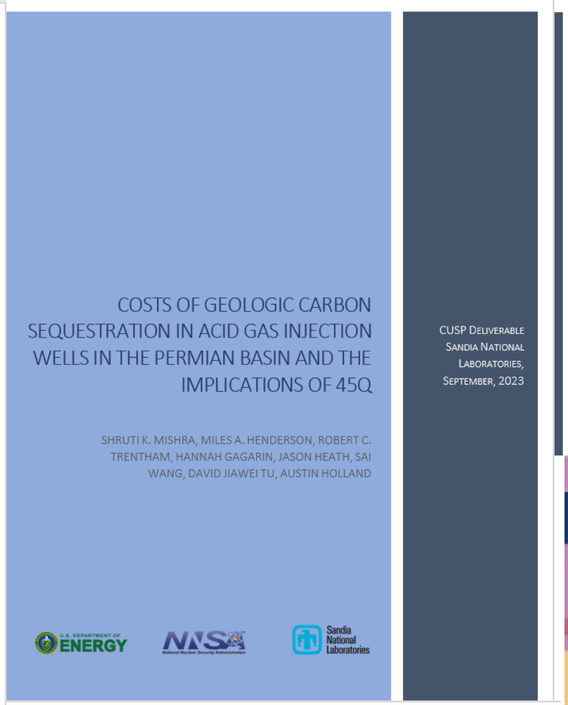
    II. Mishra SK, Heath J. Ford M. A Blueprint for Economic Analysis of Geologic Carbon Sequestration

3. Regional Cost Analysis and Implications of 45 Q Tax Credits for the Permian Basin

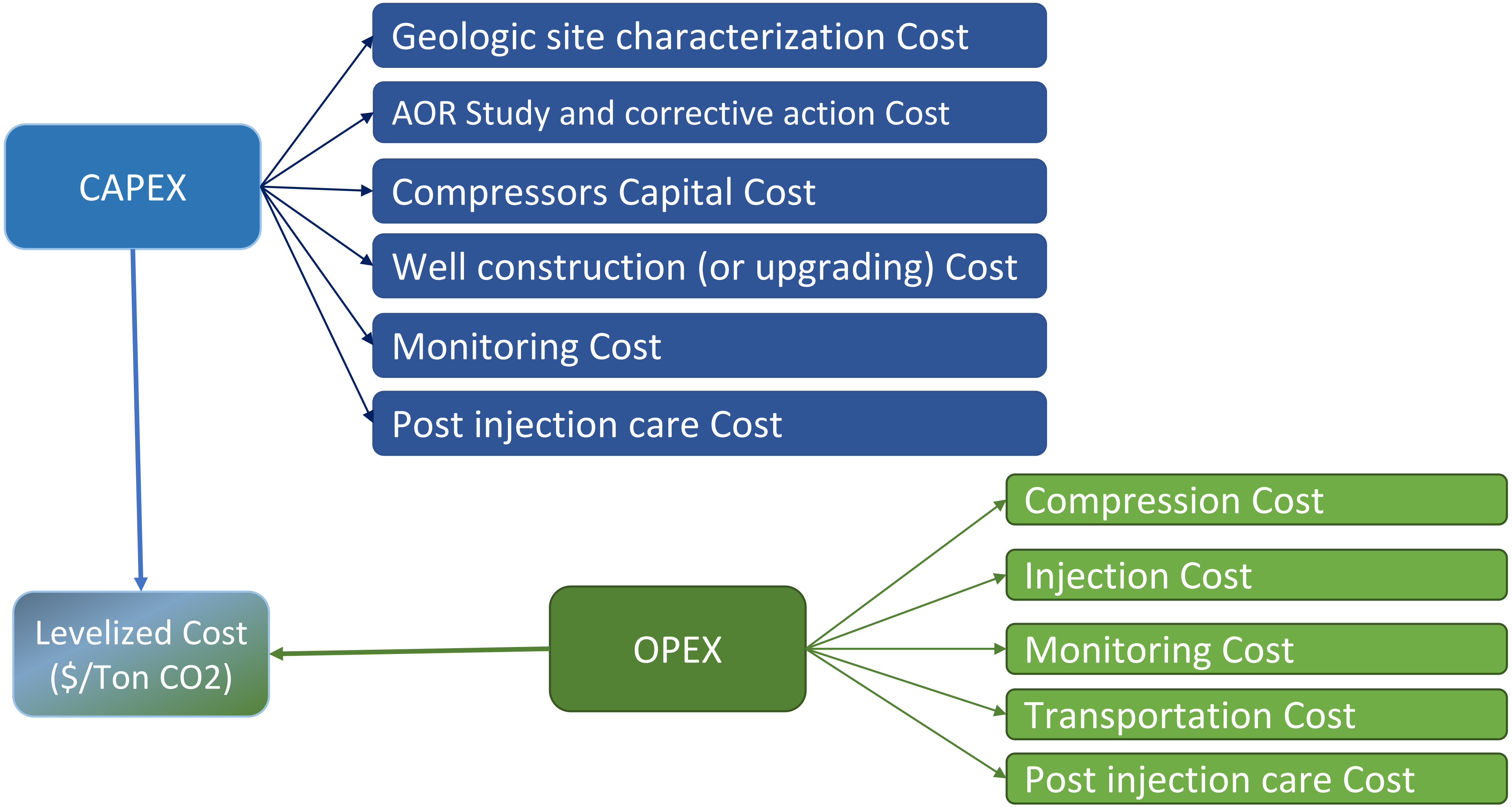
    III. Mishra SK, Henderson M, Heath J, Trentham R, Tu D, Wang S, El-kaseeh G. Regional cost analyses of carbon dioxide sequestration in AGI wells of the Permian Basin

Peer Reviewed Publication:
Manuscript under review (revised and resubmitted)





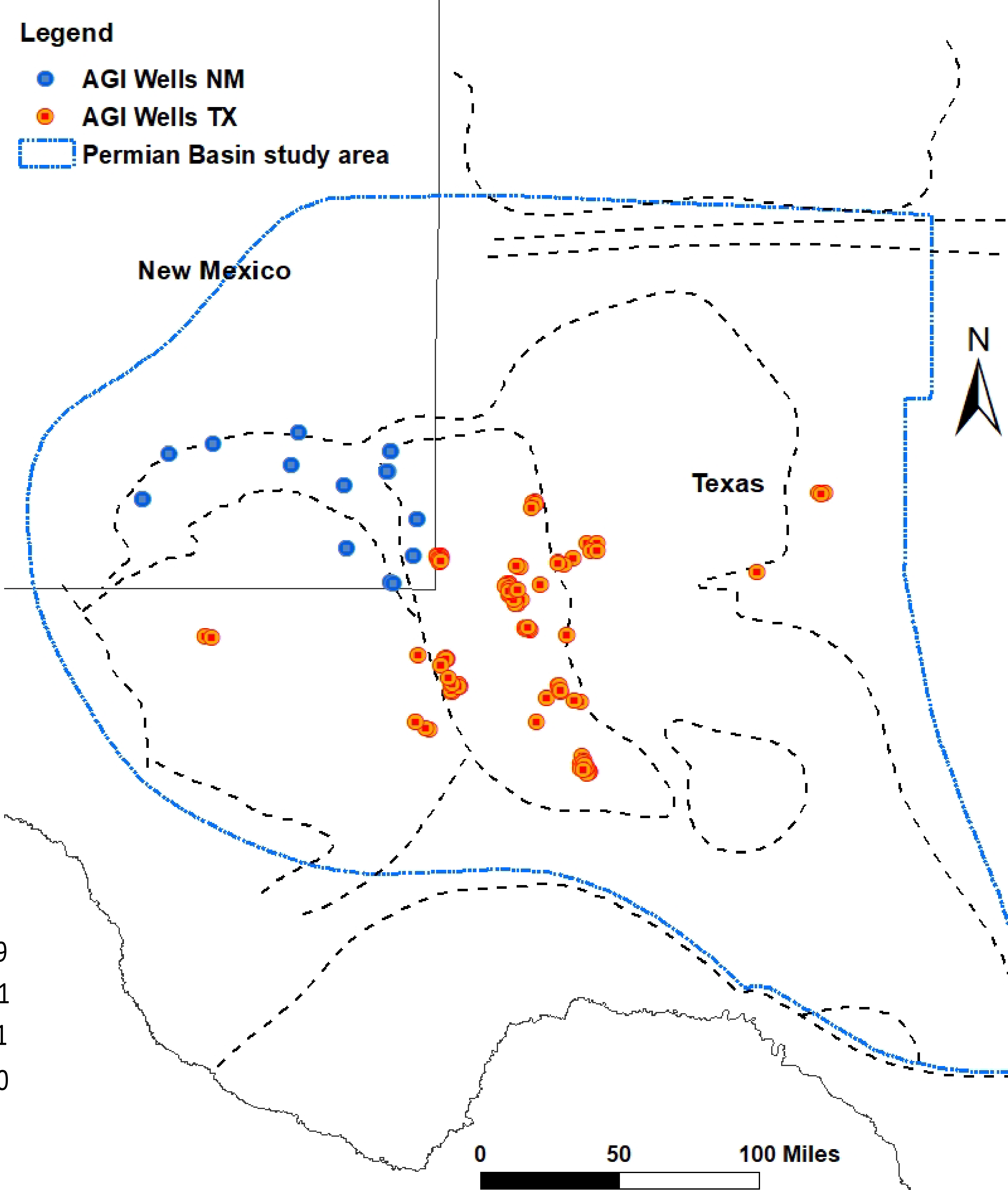
Technoeconomic Analysis Framework for CO_2 Storage Cost



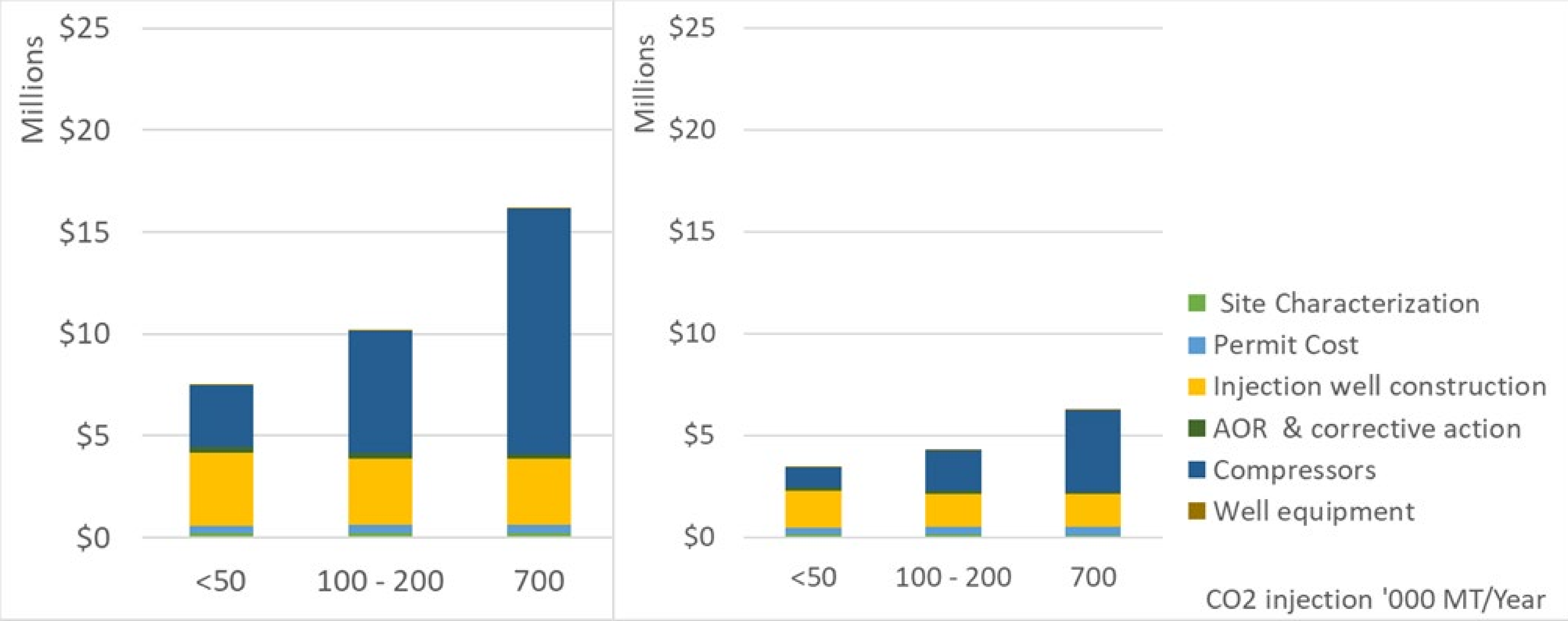
Study Site

- We developed the framework using 1 AGI well – TARGA.
- We expanded the framework to conduct TEA at regional scale.
- We selected 10 AGI wells in the NM and 22 in TX from the 25 AGI wells in New Mexico and 267 wells in Texas to conduct cost analysis

	Permian Basin		
	Min	Median	Max
Injection Rate MMFCD	300,000	3,299,663	37,302,169
CO_2 sequestered (MTons/Year)	5,460	60,053	678,891
Toal CO_2 sequestered in 20 years	109,199	1,201,062	13,577,811
Depth of wells	4,200	7,274	14,750



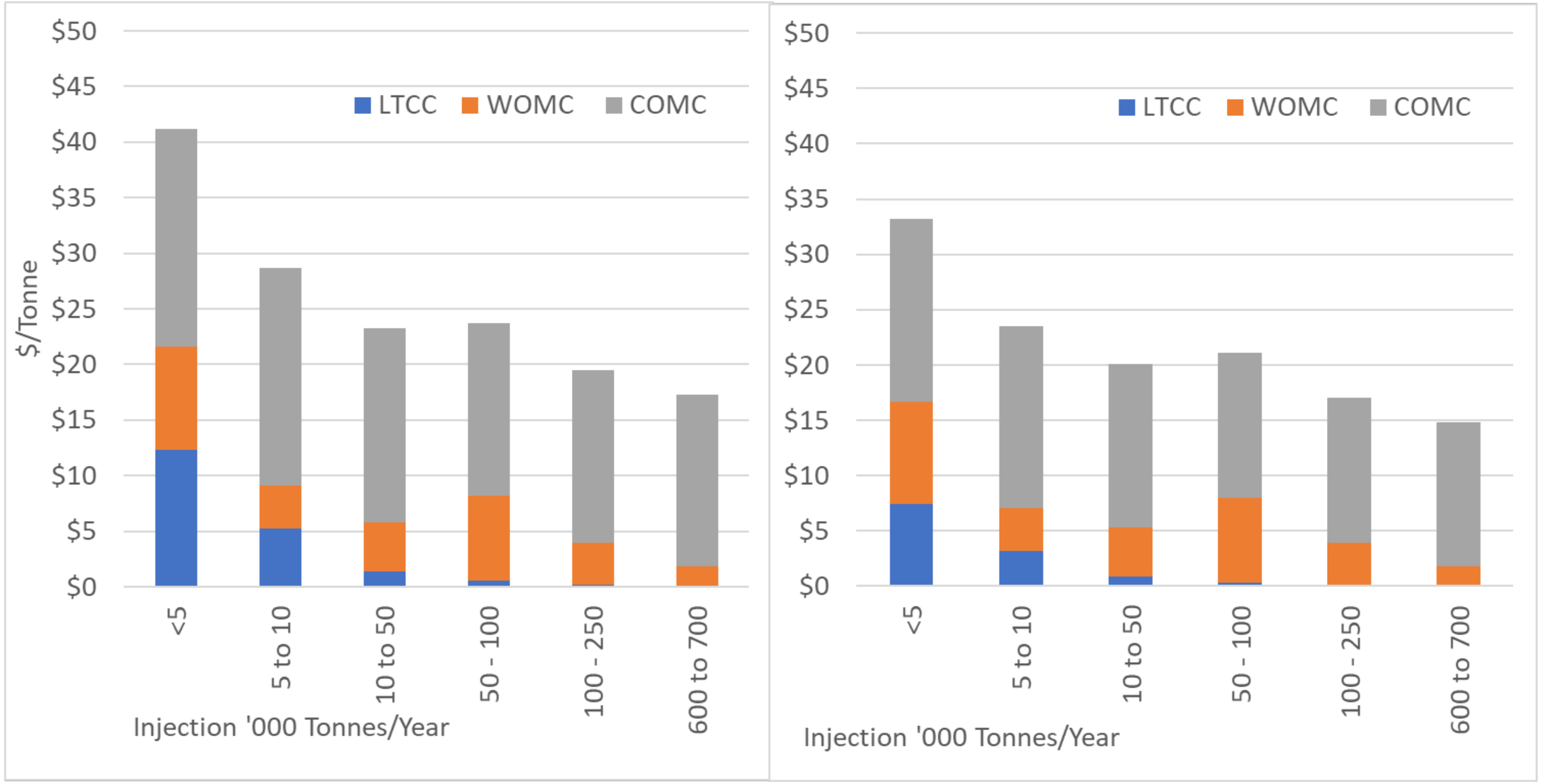
CAPEX drivers and costs variabilities across various capacity sites and new construction/repurposing sites



NEW CONSTRUCTION

REPURPOSING EXISTING AGI WELLS

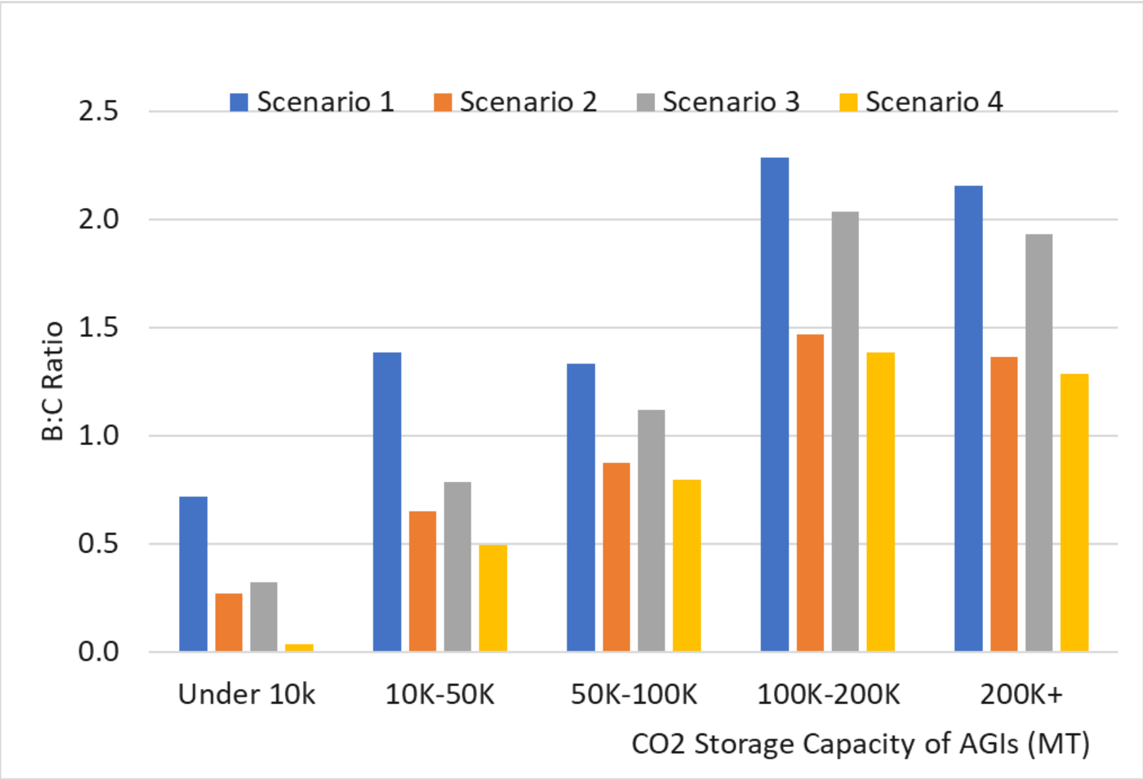
Storage costs varies across the CCS sites in the Permian Basin

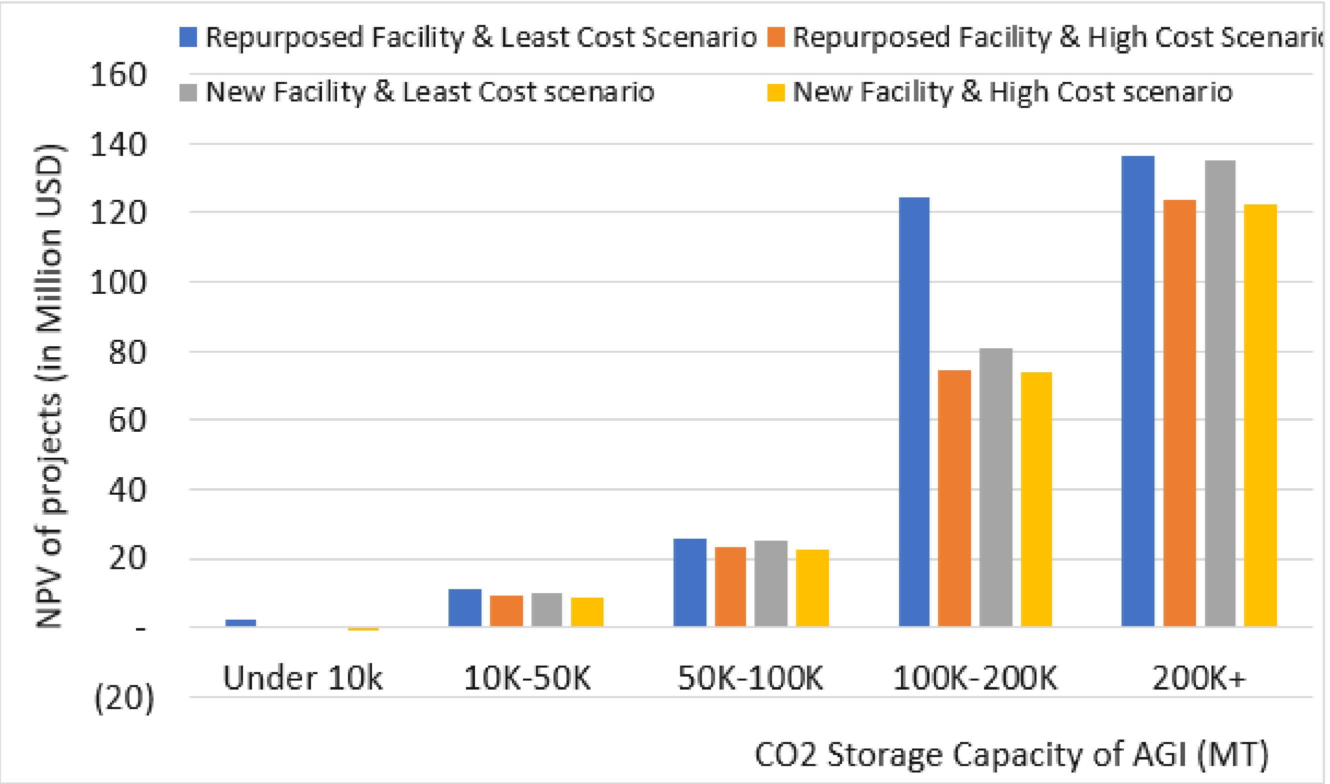


LTCC- Levelized total capital cost,
WOMC – Well O&M cost,
COMC – Compressors O&M cost

- The costs we calculated ($14-$41/MT CO2) are comparable to the $LCCO_2$ $8-$40/CO_2 in prior studies
- Our findings indicate that a 20% reduction in electricity prices can lead to a 12% - 14% reduction in LCCO2 for new AGIs and a more substantial reduction of 15% - 42% for repurposed facilities

Economic Feasibility Analysis – Net Present Value and B:C Ratio of CCS at AGIs





Scenario 1 Repurposed and lower bound cost
Scenario 2 Repurposed and Upper Bound Cost
Scenario 3 New Facility and lower bound Cost
Scenario 4 New construction and Upper Bound Cost

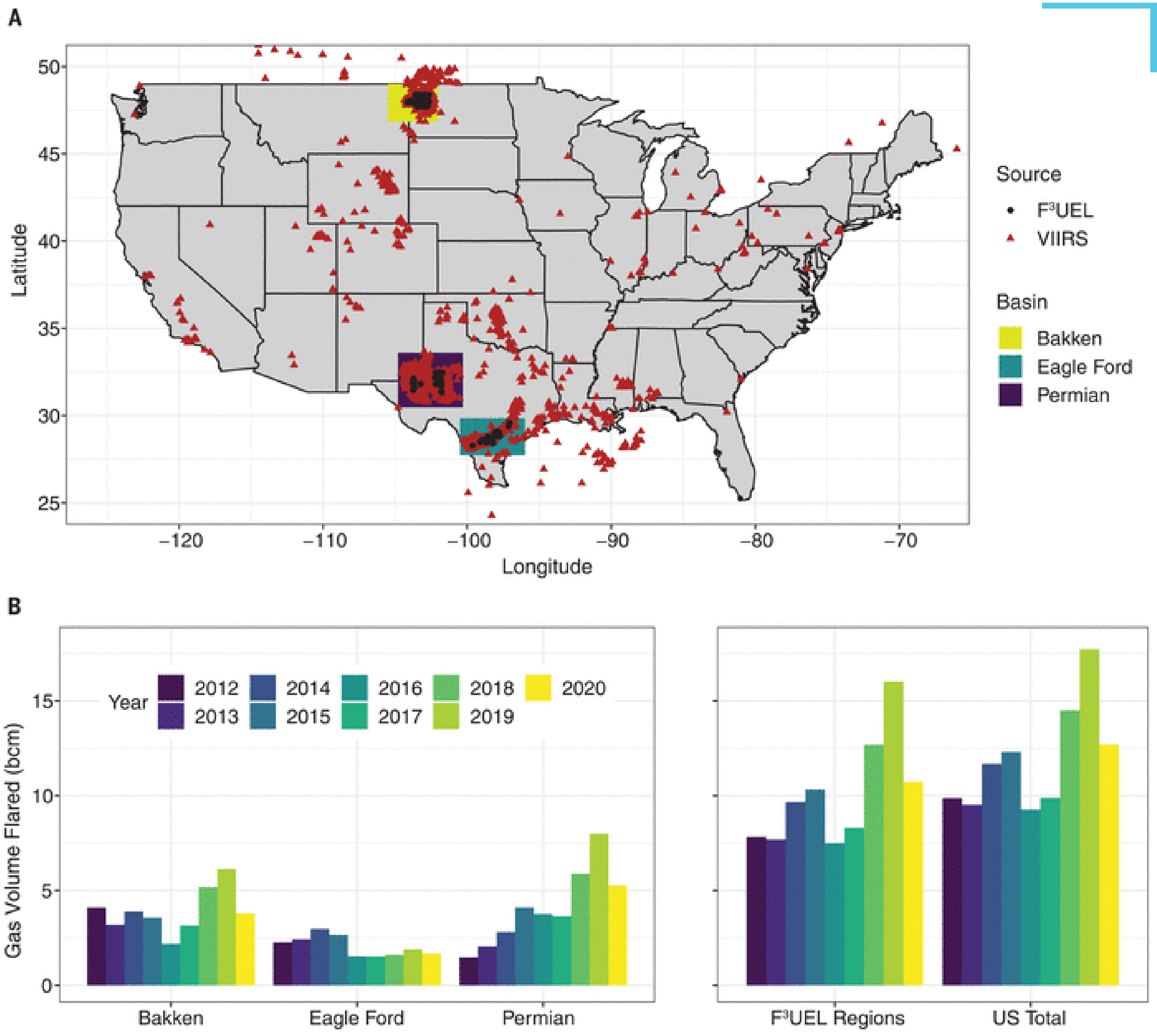
Limitations

- We used data from secondary sources for this calculation, which has own limitation.
- Due to proprietary nature, we could not collect data from primary source. We used the secondary source of data that was available in the literature.
- We validated the data used with multiple sources – industries and academia. We finalized our calculations using the validated data and assumptions.

Summary

- Our analysis suggests that adoption of CCS at most of the facilities (138 out of 144 scenarios studied) in the Permian Basin could be economically feasible with Section 45 Tax Credits,
- The Permian Basin houses more than 7,000 fields producing oil and natural gas (TRRC, 2023) and adoption of CCS has potential for significant technological, climate, societal, and economic benefits for the region.

- Gas flaring in 2023 was valued at $9 to $48 billion (World Bank, 2024) -148 bcm .
- According to the NZE scenario, eliminating all non-emergency flaring globally by 2030 can avoid 95% of emissions - 365 million MT of CO2e GHG emissions per year.



Plant et al., 2022. Science DOI: (10.1126/science.abq0385)