GOMCARB INFRASTRUCTURE GROUP OVERVIEW AND STATUS

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Task 5

Partnership for carbon capture & offshore geologic storage GoMCarb

GCCC Gulf Coast Carbon Center

Bureau of Economic Geology

NETL National Energy Technology Laboratory

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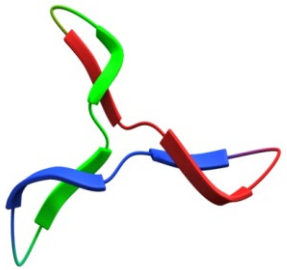
Presentation Outline

- Trimeric Overview and Background
- Infrastructure Task Overview
- Previous Work and Background
- Progress to Date
- Planned Next Steps

Trimeric Overview and Background

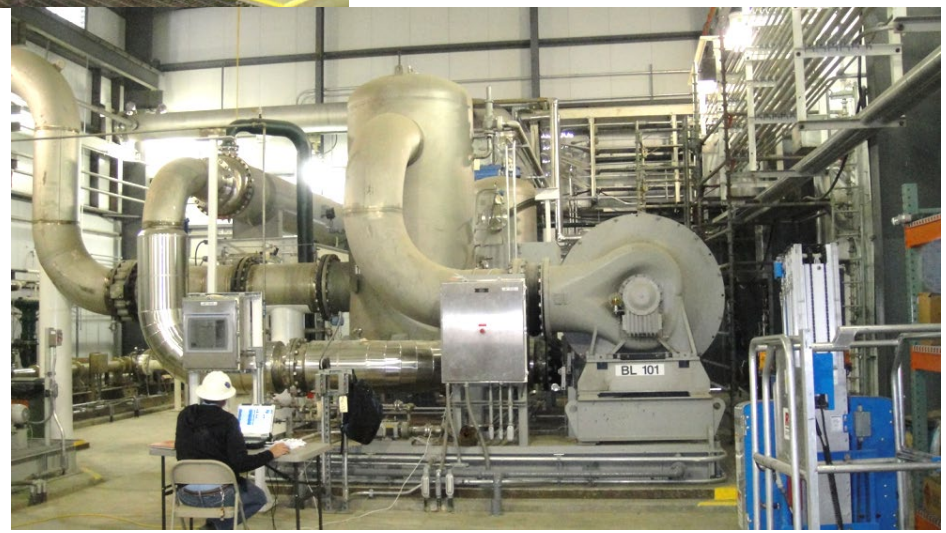
- We provide Chemical and Process Engineering services to industry, government agencies, and consortia
  - We do not represent any equipment, process, chemical suppliers
  - We are unbiased advocates for our clients
- 18 Chemical Engineers on regular, full-time staff;7 Senior Associates
- Founded in 2003
- Austin / Buda, TX location



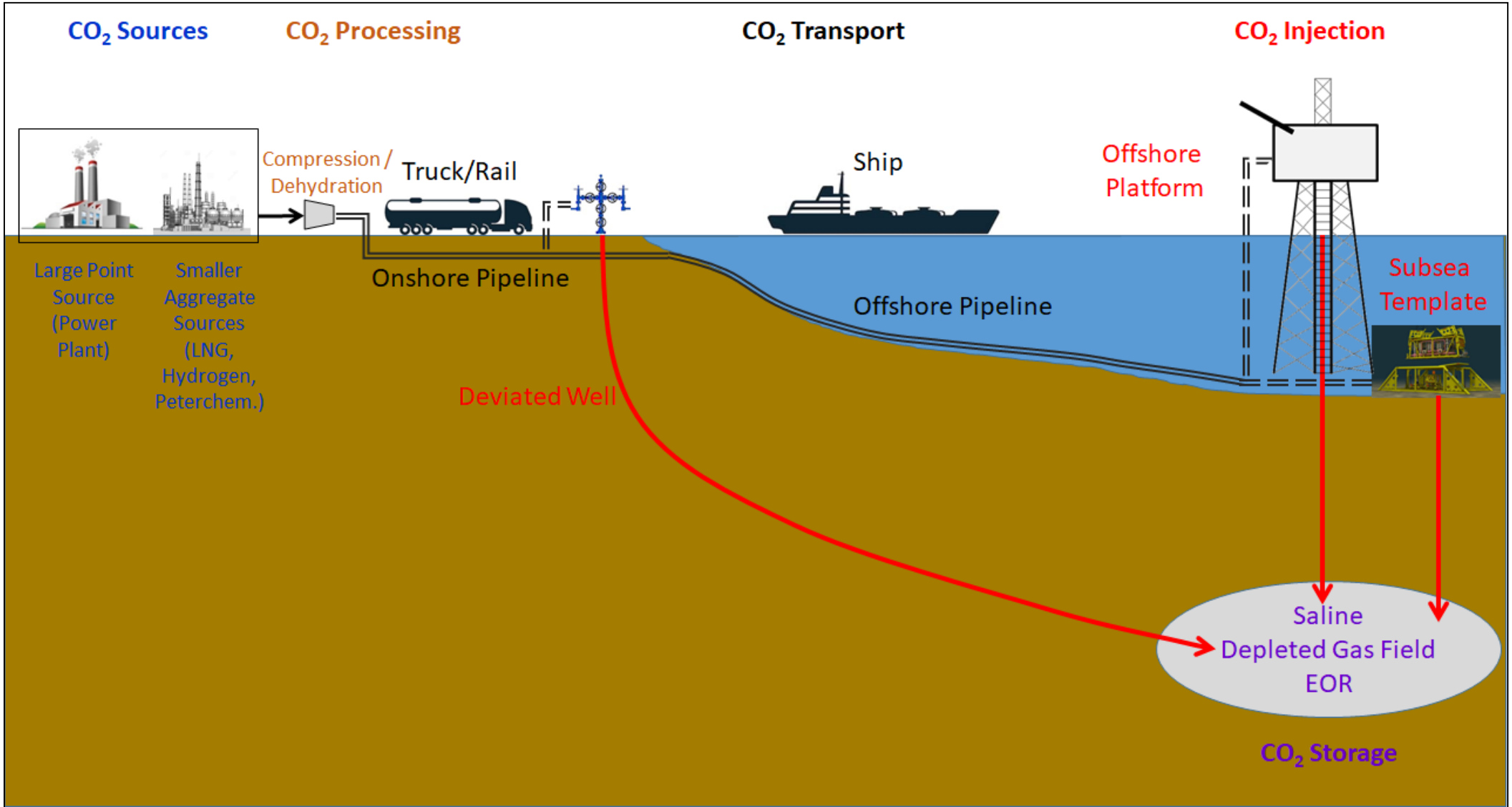
Trimeric Support of GoMCarb

- Provide CO_2 Process Expertise from the Source to the Wellhead
- Process design and techno-economic evaluation of CO_2 processing and transport facilities
- Industry liaison to generate interest/awareness for GoMCarb activities
- Project lead for larger infrastructure team

$ 20 MM, 8,000 hp CO_2 Compression System for 1 MMtonne DOE Saline Storage Test



Task 5: Infrastructure, Operations & Permitting



Task 5: Infrastructure, Operations & Permitting

- Identify/evaluate existing infrastructure (pipelines, wells, platforms) for re-use
- Feasibility of subsea templates in GoM
- Risk assessment of early stage CO_2 transport operations (truck & barge)
- Generate source-transport-sink networks for scenario optimization
- Use analog sites (e.g., High Island area) to develop methods and analysis

Leveraging Previous Work

<u>CarbonSAFE Phase I with UT BEG</u>

- Identified/screened potential CO_2 sources along upper-Texas coast
- Developed initial network of industry contacts
- Preliminary assessment of land-based CO_2 transport costs (i.e., trucks/tube-trailers)
- Brainstorming for CO_2 transport risks

Leveraging Previous Work: CO_2 Transport Risks

Transport Method	Transport Volume/Vessel Size	Typical CO_2 Transport Conditions (Approximate Only)	Failure Methods, Scenarios, Considerations
Pipeline	• 4" Pipeline • 100K tonnes CO_2/yr continuous transport	• Pressure =2000 psig • Temperature = 70°F • Supercritical/Dense Phase	• Leak/Breakage of pipeline • Corrosion (e.g., cathodic deficiency) • Typically no more than 10 miles between automated shutdown valves (isolates volume of CO_2 lost during failure)
Refrigerated Truck Transport	• 20 tonnes CO_2/truck	• Pressure =250 psig • Temperature = -10°F • Saturated Liquid	• Loading/Unloading Failures (loss of a single truck volume or storage tank volume on site). • Truck transport accident (loss of single truck volume) • Note: Multiple trucks & trips required to transport CO_2. Increases probability of failure. • Risk of dry ice formation/rupture
High Pressure Tube Trailer Transport	• 8 cylinders/truck • 83 ft^3 per cylinder • 68% liquid full cylinders • 10.5 tonnes CO_2/truck	• Pressure =760 psig • Temperature = 60 - 65°F • Saturated Liquid	• Loading/Unloading Failures (loss of a single cylinder volume or storage tank volume on site). • Truck transport accident (loss of single truck volume) • Note: Multiple trucks & trips required to transport CO_2. Increases probability of failure.
Barge/Ship Transport	• ~100K – 1MM ft^3/ship • Cylindrical tanks: 100 ft3 – 200k ft^3 can be carried • 1000 – 20,000 tonnes CO_2 /ship	• Pressure =100-400 psig • Temperature = -60 - 0 °F • Saturated/Subcooled Liquid	• Loading/Unloading Failures (loss of a single cylinder volume or storage tank volume on site). • Leak of single transport vessel • Risk of dry ice formation/rupture

Leveraging Previous Work: CO_2 Transport Risks

Transport Method	Transport Volume/Vessel Size	Typical CO_2 Transport Conditions (Approximate Only)	Failure Methods, Scenarios, Considerations
Pipeline	• 4” Pipeline • 100K tonnes CO_2/yr continuous transport	• Pressure = 2000 psig • Temperature = 70°F • Supercritical / Dense Phase	• Leak/Breakage of pipeline • Corrosion (e.g., cathodic deficiency) • Typically no more than 10 miles between automated shutdown valves (isolates volume of CO_2 lost during failure)

GoMCarb Progress

- Preliminary analysis of offshore pipeline costs
- Identified existing wells and pipelines in High Island Block 10-L region (analog site)
- Interviewed industry experts to develop existing infrastructure assessment method
- Expanded CO_2 source list across Texas coast
- Developed near-term project schedule, data needs assessment, and action item list

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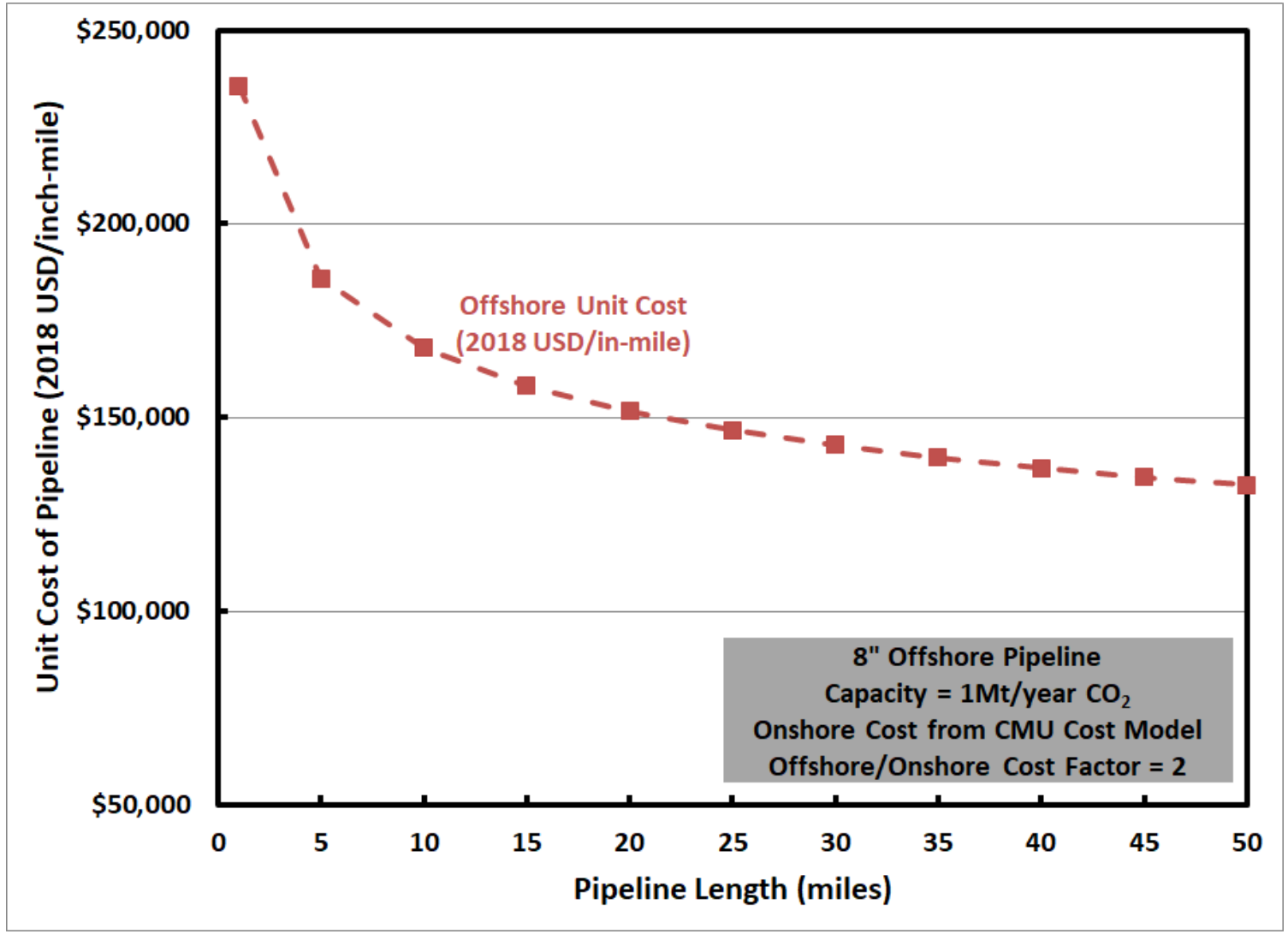
GoMCarb Progress: Offshore CO_2 Pipeline Cost



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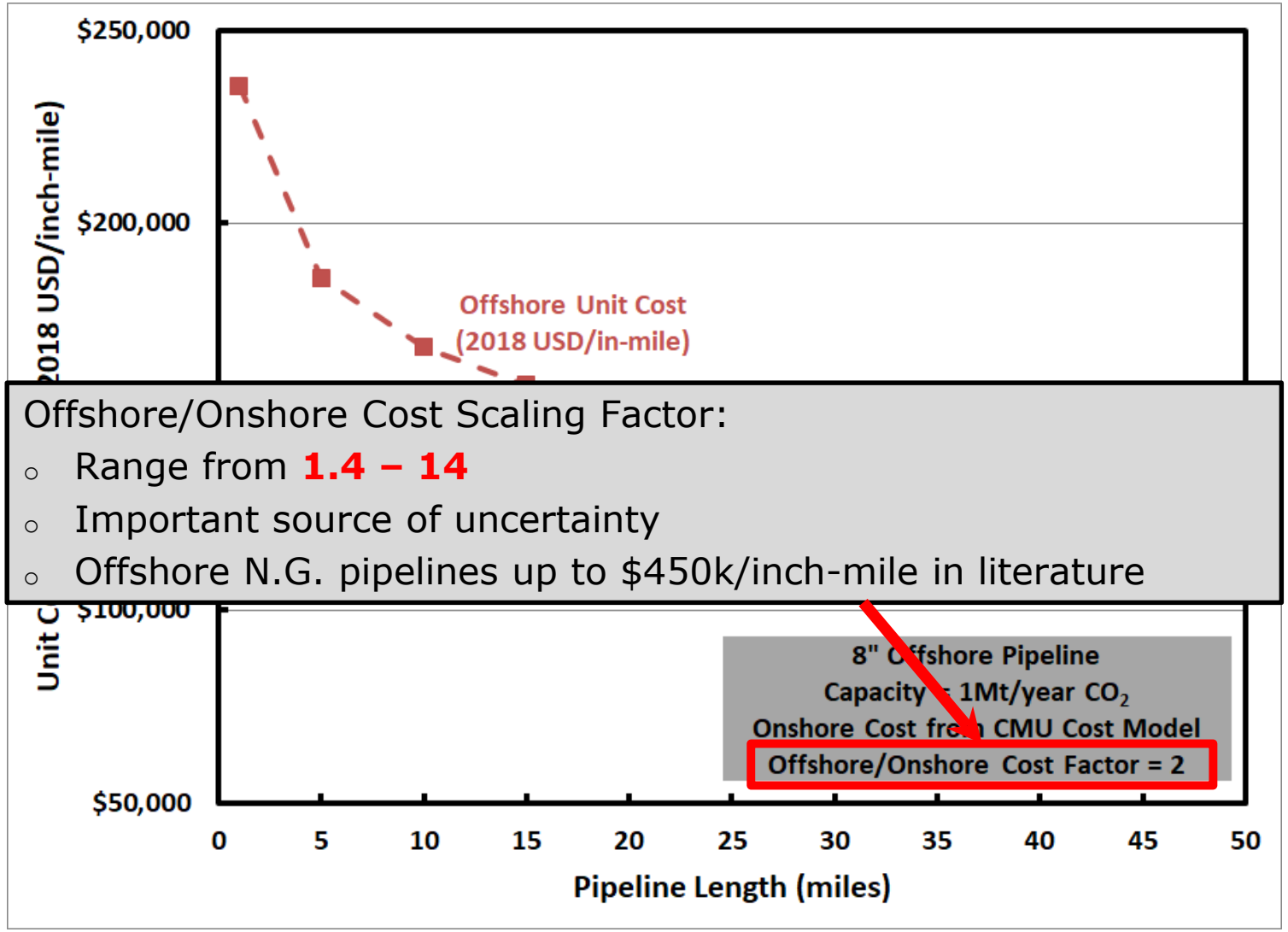

Offshore/Onshore Cost Scaling Factor:

- Range from **1.4 – 14**
- Important source of uncertainty
- Offshore N.G. pipelines up to $450k/inch-mile in literature

GoMCarb Next Steps

- Expand existing infrastructure "database" to include platforms, other regions within GoMCarb
- Use literature review and interviews with experts to determine "consensus" views on infrastructure re-use
- Develop and apply screening methodology for infrastructure re-use
- Engage industry stakeholders in region (e.g., LNG facilities) to gauge interest

Thank You

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