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CO_2 Pipelines: Delivering a Green Future

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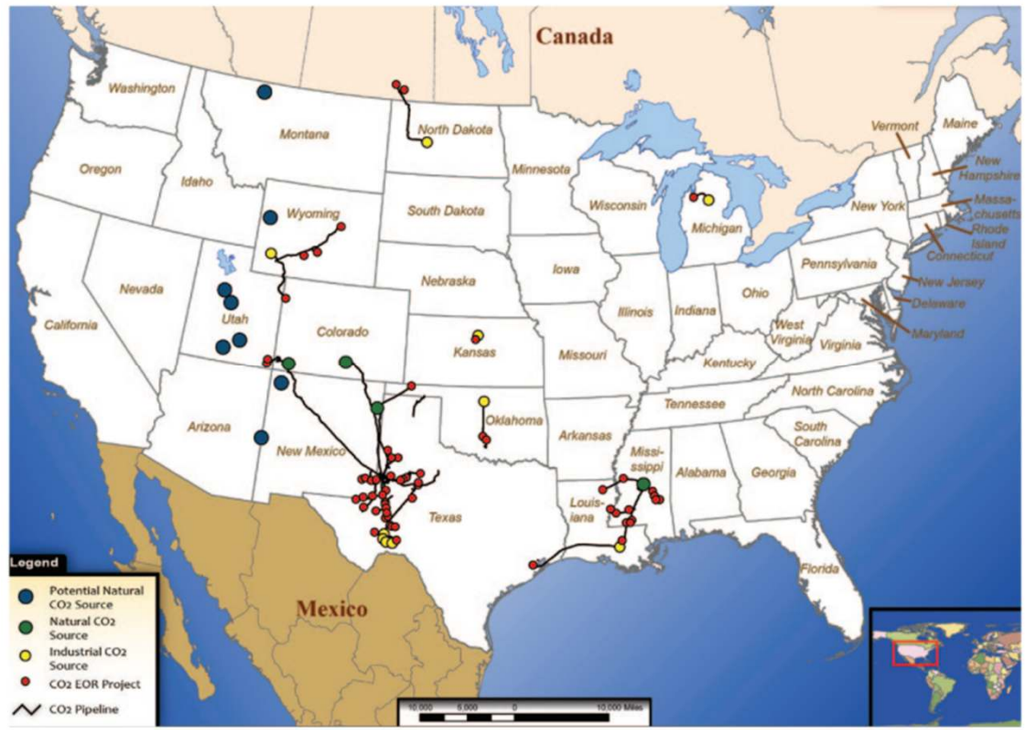
ExxonMobil Pipeline Company

A Limited Network of CO_2 Pipelines Has Been Operating in the U.S. for Decades

- More than 5,200 miles of CO_2 pipelines exist
- Transport approximately 80 million metric tons of CO_2 per year from natural and industrial sources
- Nearly all CO_2 is used for Enhanced Oil Recovery
- EOR helps produce more energy and sequester carbon emissions
- Increased interest in creating EOR projects to sequester CO_2

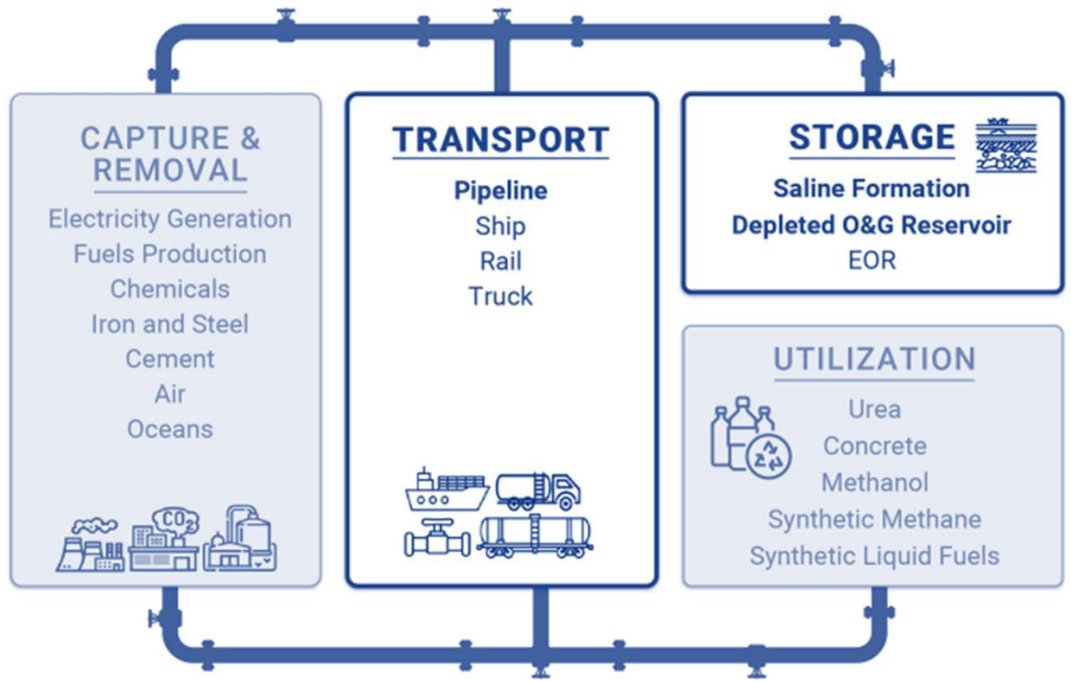


Source: Hart Energy/Rextag

Carbon Capture, Use and Storage Represents a Major Opportunity for the Pipeline Industry

- Win-Win: Opportunity to expand into new business area and to reduce carbon emissions
- Experts claim attaining Carbon goals requires a wide range of emission reduction technologies
- CCUS is becoming recognized as an important element of the overall reduction strategy
- CCUS cannot be realized without a network of gathering and transmission CO_2 pipelines
- Increased attention on CO_2 transport is needed

CCUS … Should be CCTUS



Source: Labor Energy Partnership, "Building to Net-Zero: A U.S. Policy Blueprint for Gigaton Scale CO_2 Transport and Storage Infrastructure," June 2021.

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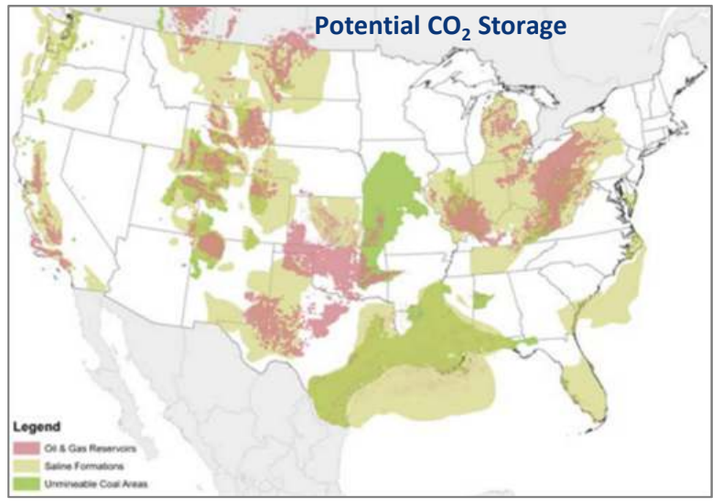
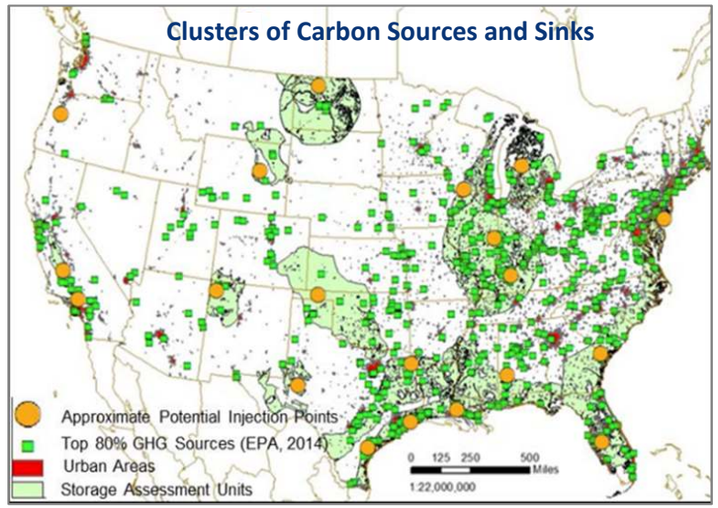
Opportunity Rests in Gathering Emissions and Transporting Them to Regional Storage Facilities

- U.S. has one of the largest known CO_2 storage capacities in the world
  - Depleted oil and gas reservoirs
  - Deep saline sedimentary formations
  - Deep saline basalt formations
  - Coal seams
- Gulf Coast area has the largest and most economical capacity
- Policy makers envision carbon capture and storage hubs being developed across the country
  - Hubs allow CO_2 sources to form "capture clusters," connected to CO_2 storage sites using strategically-sized, shared infrastructure





Sources: 1. U.S. Department of Energy, NATCARB. 2. ExxonMobil Upstream Research Company, "Evaluation of Practicable Subsurface CO_2 Storage Capacity and Potential CO_2 Transportation Networks, Onshore North America," 2018.

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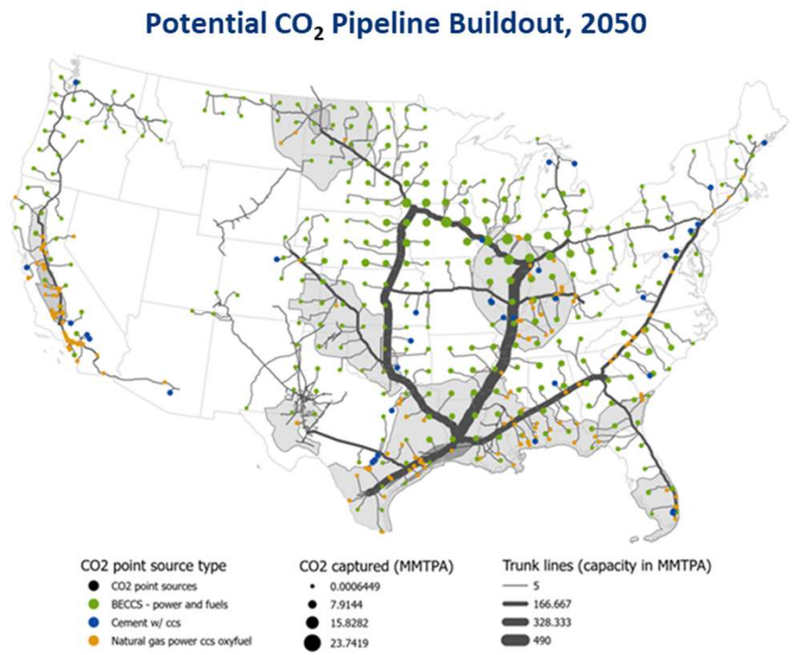
Estimates Point to a Major Expansion of the CO_2 Pipeline Network

- Projections anticipate needing more than a increase in the size of the CO_2 network by 2050
- CO_2 is shipped long distances at very high pressures in a liquid / supercritical fluid state
- Long distance, high-capacity CO_2 pipelines are typically built to ANSI Class 900 standards
- There are challenges to repurposing natural gas pipelines, typically built to ANSI 600 standards
- Captured CO_2 contains impurities, requiring injection standards and drying mechanisms
- Design, build and operating standards are still being enhanced



Source: Center for Energy and the Environment, Princeton University, "Princeton's Net-Zero America Study, Annex I: CO2 Transport and Storage Infrastructure Transition Analysis," 2020.

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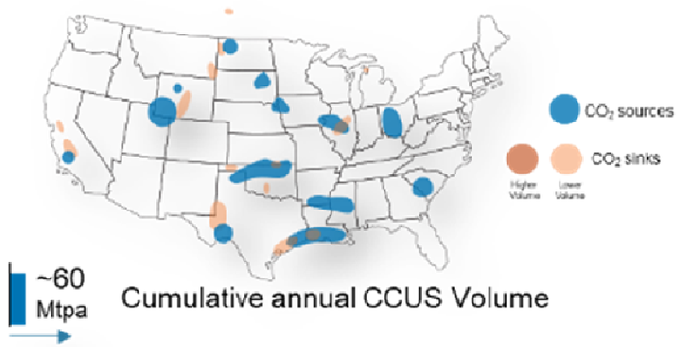
As CCUS Is Expected to Grow, So Is the Scale of CO_2 Pipeline Investment

2025

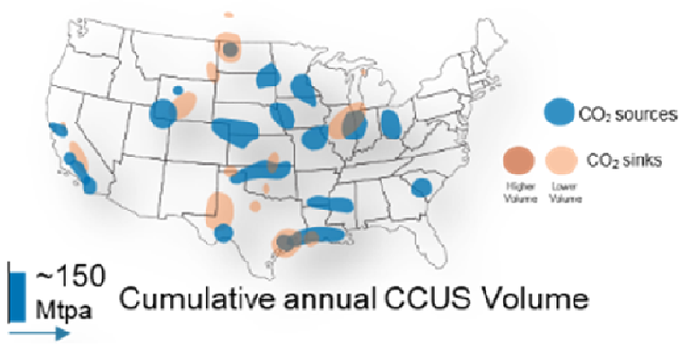
U.S. Activation Phase



- $50 B cumulative investment
- $2 B pipeline investment
- 10,000 annual jobs

2035

U.S. Expansion Phase



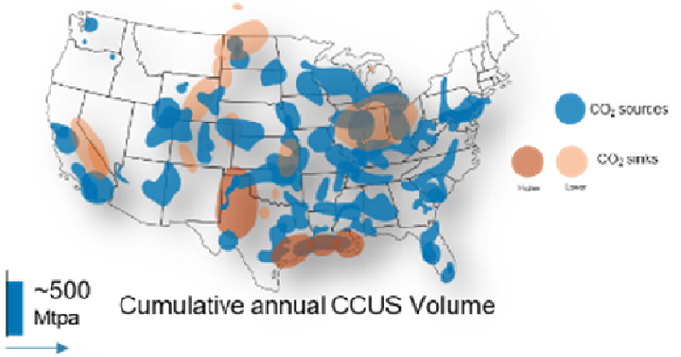
$175 B cumulative investment

$9 B pipeline investment

40,000 annual jobs

2045

U.S. At-Scale Deployment



$680 B cumulative investment

$28 B pipeline investment

230,000 annual jobs

Source: McKinsey and ERM Modeling for NPC, 2019

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More Pipeline Regulatory Clarity Would Help Development

- Federal safety regulation is clearly established
  - PHMSA regulates the safe transport of CO_2 in a liquid state as a hazardous liquid under 49 CFR 195
  - 49 CFR 192 does not govern CO_2 in a gaseous state because it is neither flammable, toxic or corrosive
- Federal siting, access and rate regulation is lacking
  - No siting process
  - No eminent domain authority (except for federal lands)
  - No tariff rate setting provisions
- Some states have supplemented federal regulation
  - Texas, New Mexico and Louisiana have well established CO_2 pipeline regulatory frameworks covering siting, common carrier status and eminent domain

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There Are Issues to Consider As the Opportunities Develop

- Safety
  - The safety record of CO_2 pipelines is generally good
  - Better understanding of the effects of the potential release of CO_2 is needed
- Construction standards
  - New standards may be needed for new levels of service
  - Siting of pipelines will shift from rural to urban areas
- Lack of public awareness / understanding
  - Potential for misinformation to take hold
- Pipeline regulations
  - Lack of federal siting provisions creates hurdles for pipeline projects

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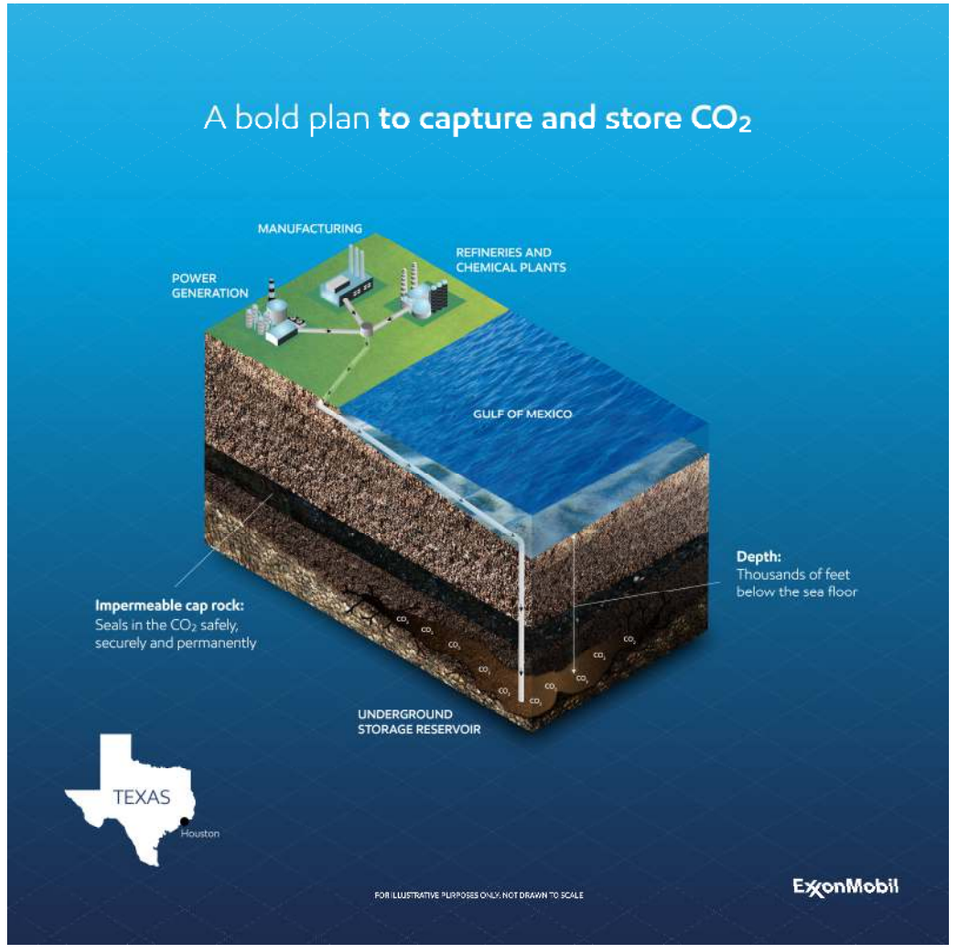
There Is Work to Be Done in Anticipation of the Buildout

- Refine **economic case** for commercializing CO_2 transport
- Promote **public-private partnerships** to incentivize the development of pipeline infrastructure
- **Activate an education campaign** to explain the benefits of the pipeline network
- Seek **regulatory clarity**
- **Reach out** to communities along likely corridors
- Continue research into **CO_2 pipeline standards**
- Create options for compatible **odorants**
- Develop a **CO_2 emergency response training** program



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