



U.S. DEPARTMENT OF
ENERGY

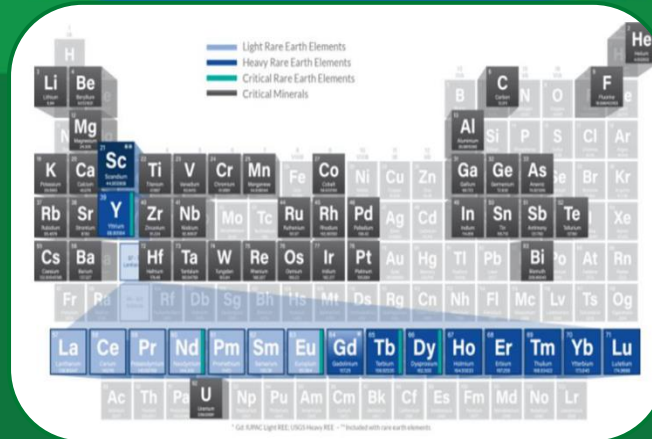
Fossil Energy and
Carbon Management

DOE Strategic Planning and R&D Priorities

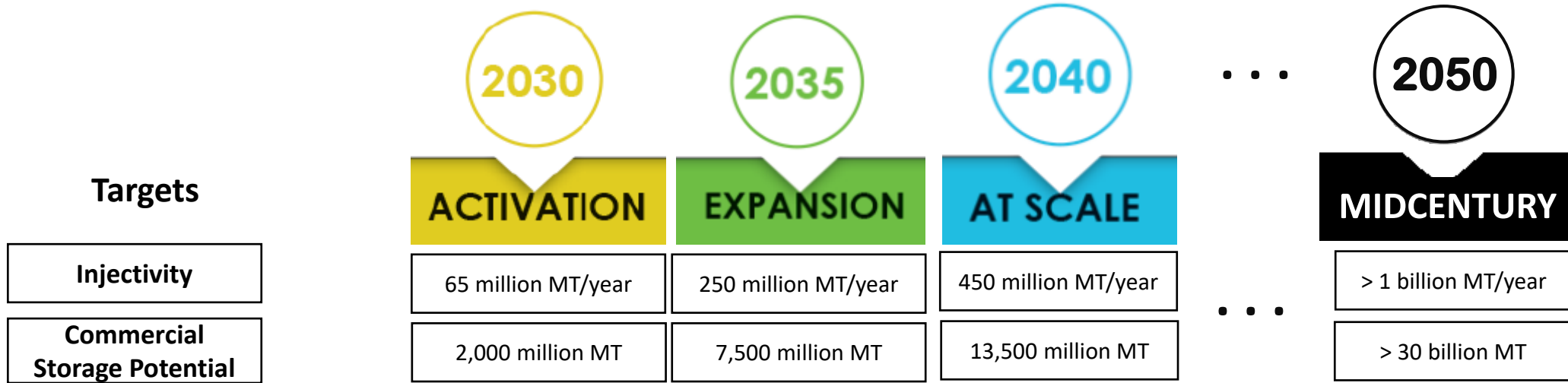
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July 2024



Rapid CCUS and CDR Industry Growth Needed to Achieve U.S. Decarbonization Goals



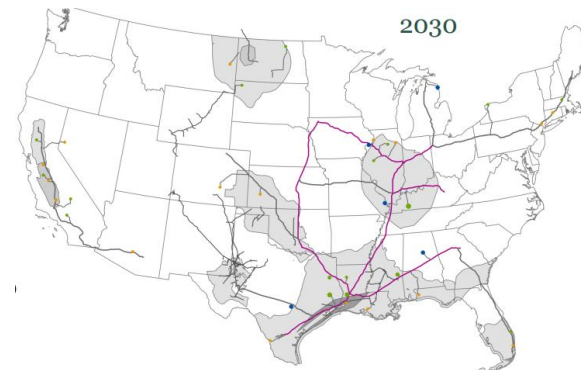
CO2 Transport Modeling

Today: 5,300 miles of pipelines



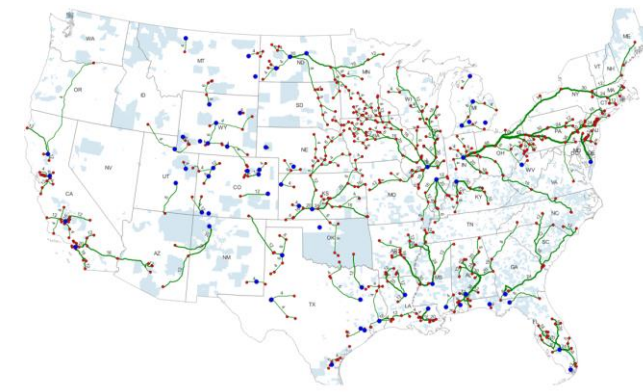
NPC: Meeting the Dual Challenge (2019)

2030: 11,000+ miles of pipelines



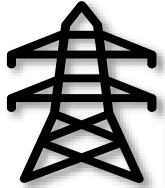
Modeling from Princeton's Net-Zero America Study (2020)

2050: 25,000+ miles of pipelines



Modeling from Los Alamos National Laboratory (2023)

Carbon Transport Program RD&D: An Iterative Process towards Deployment

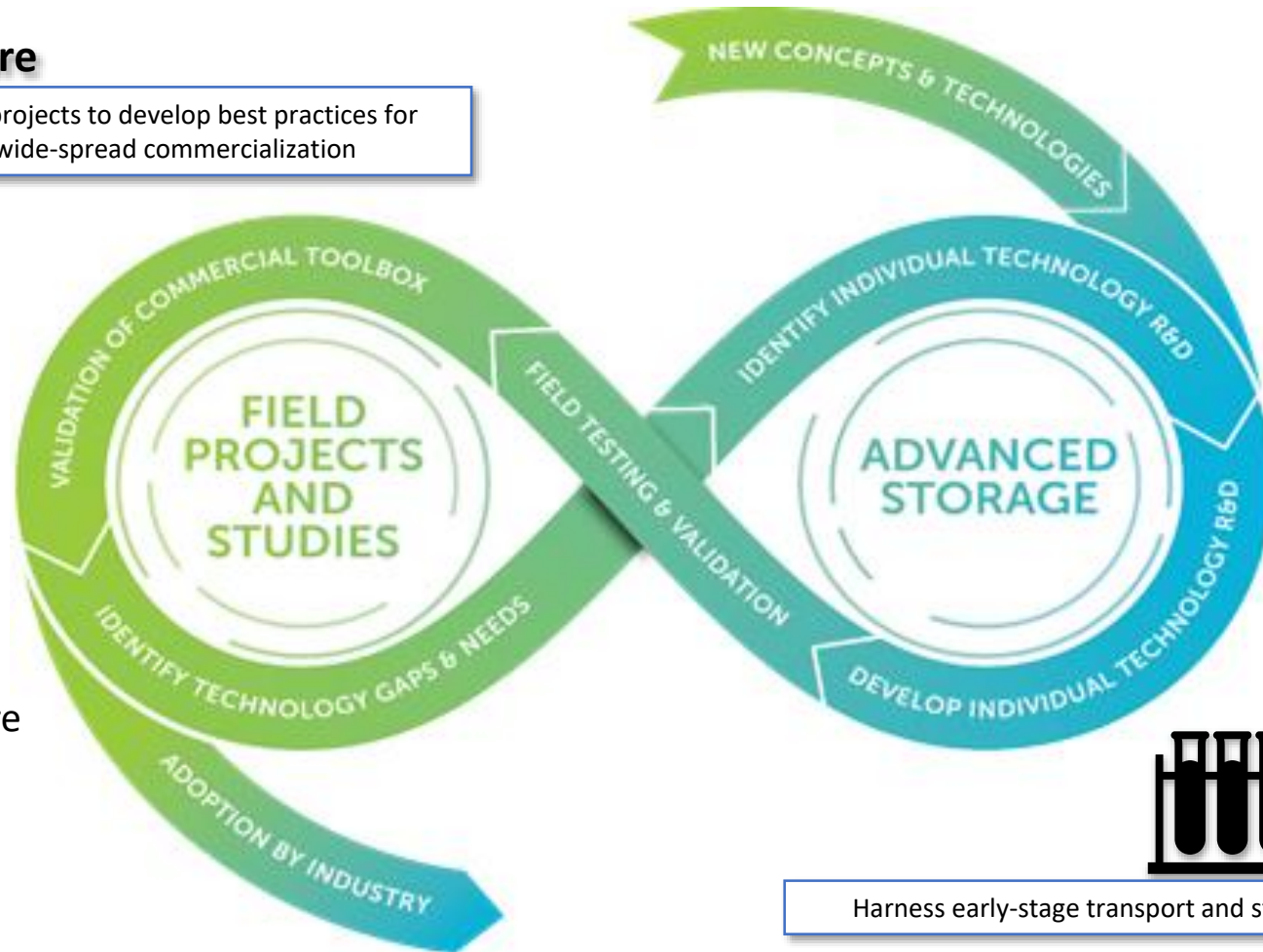


Infrastructure

Large-scale demonstration projects to develop best practices for industry and facilitate wide-spread commercialization

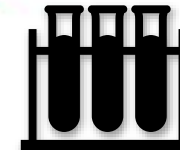
Infrastructure Focus

- Carbon Management Hubs and Basins
- Multimodal/Offshore CCUS Interest
- Technical Considerations and Qualifications Required to Repurpose O&G Infrastructure



Advanced R&D Focus

- Lab-based and pilot scale testing and demonstration
- Material Integrity and Discovery
- Monitoring, verification, and accounting of CO₂ across value chain



Advanced R&D

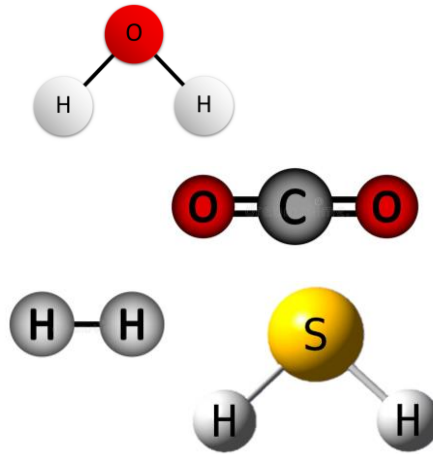
Harness early-stage transport and storage concepts to technology demonstration

Technology R&D for New and Repurposed CO₂ Pipelines

Developing cost-effective technologies and materials

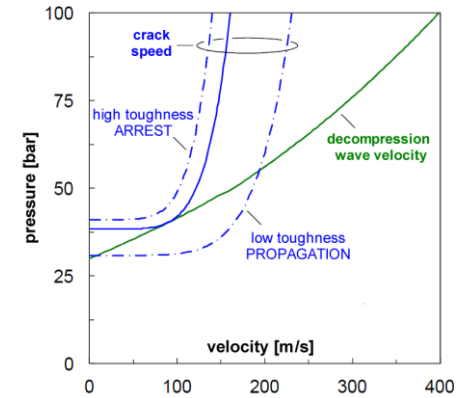
IMPURITIES

- Understand the effect of impurities: H₂, H₂S, H₂O, Particulate Matter, N₂, NO_x, SO_x, O₂.
- Create a testing protocol to complement ongoing work and coordinate experimental and modeling efforts.
- Conduct longer-term testing to evaluate the impact of impurities at pilot scale



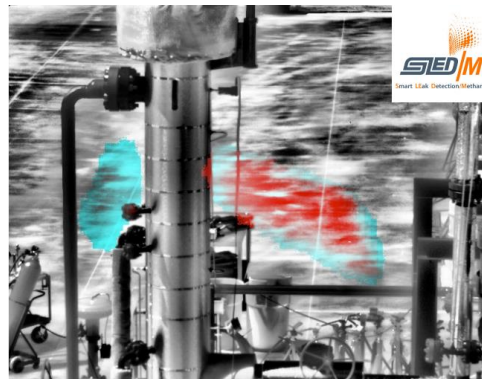
FRACTURE PROPAGATION

- Develop model correction factors for CO₂ performance across various CO₂ source specifications
- Battelle two-curve model
- Perform large-scale field test to validate models



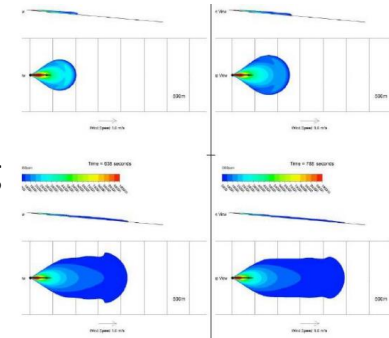
LEAK DETECTION & EMERGENCY RESPONSE PROTOCOLS

- Understand factors contributing to pipeline leaks to inform materials design standards
- Advance the capabilities of monitoring and metering technologies
- Develop proactive emergency response protocols using organizational models



DISPERSION MODEL

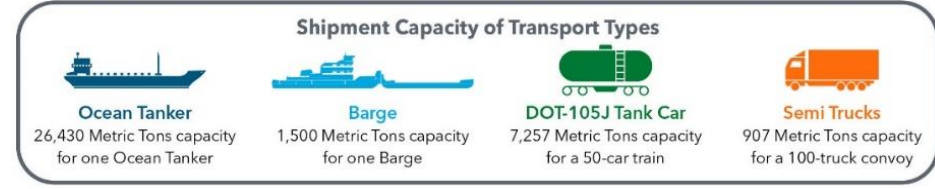
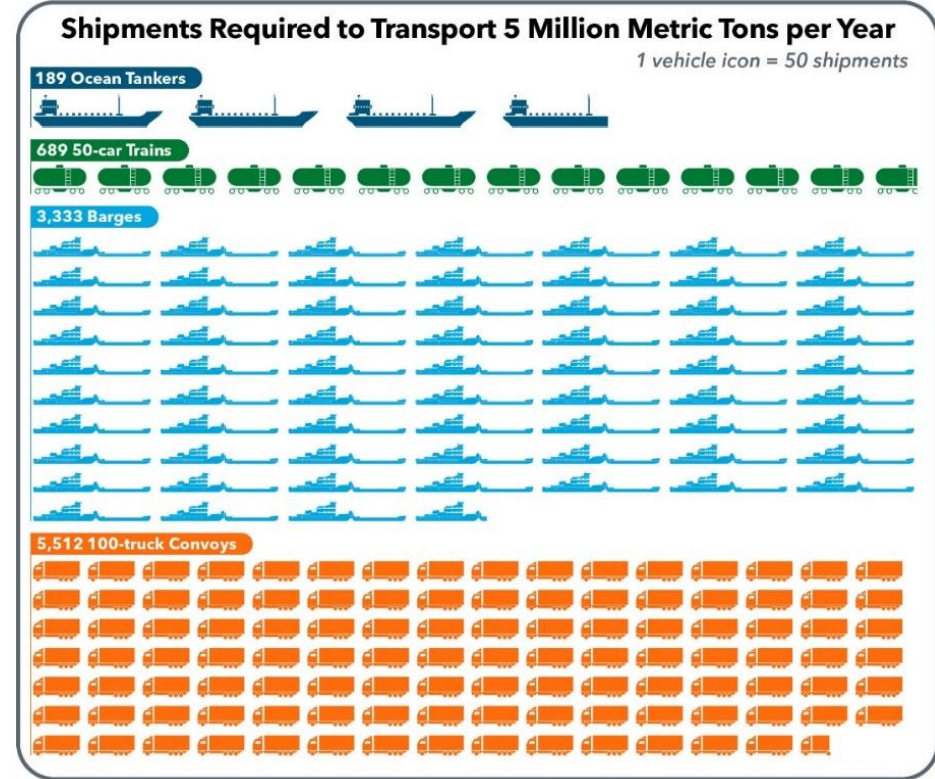
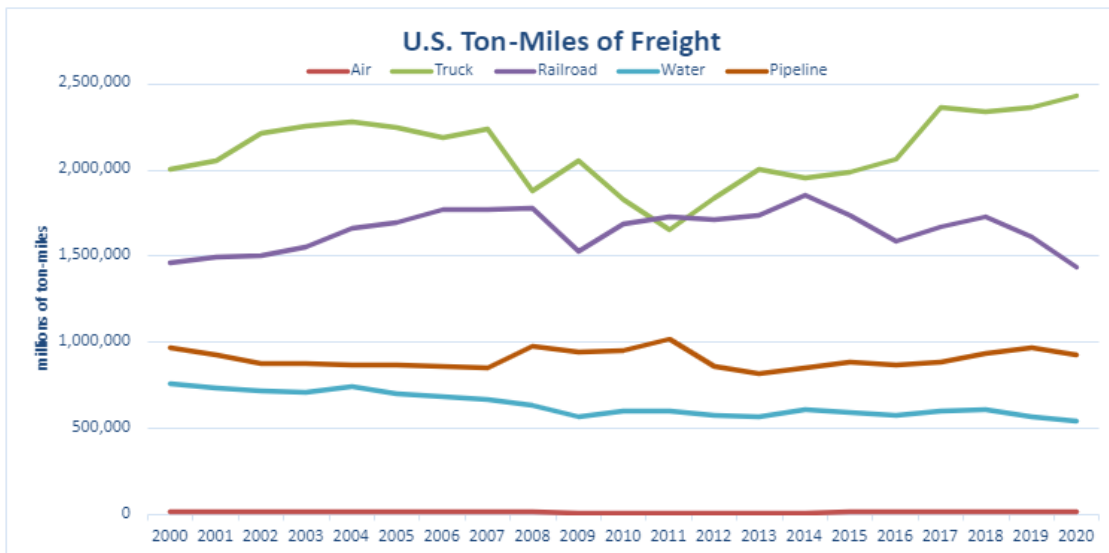
- Generate recommendations for varying areas of concern and emergency response in case of a CO₂ release
- Integrate new data with ongoing modeling efforts
- PHMSA Dispersion Model development



Alternative Modes of CO₂ Transport and Multimodal Hubs

- Alternative modes of transportation include rail, trucks, and marine
- Factors include transportation mode, distance, point of origin and destination, and physical state of the CO₂, and transported phase

USDOT BTS data on ton-miles of freight by mode



Visual comparison between freight modes to transport 5 million metric tons of CO₂. This annual volume is approximately equal to total CO₂ emitted from one 680 MW power-generation station.