CO_2 Transportation on a National Scale Towards Net-Zero

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CESAM Kick-off Meeting

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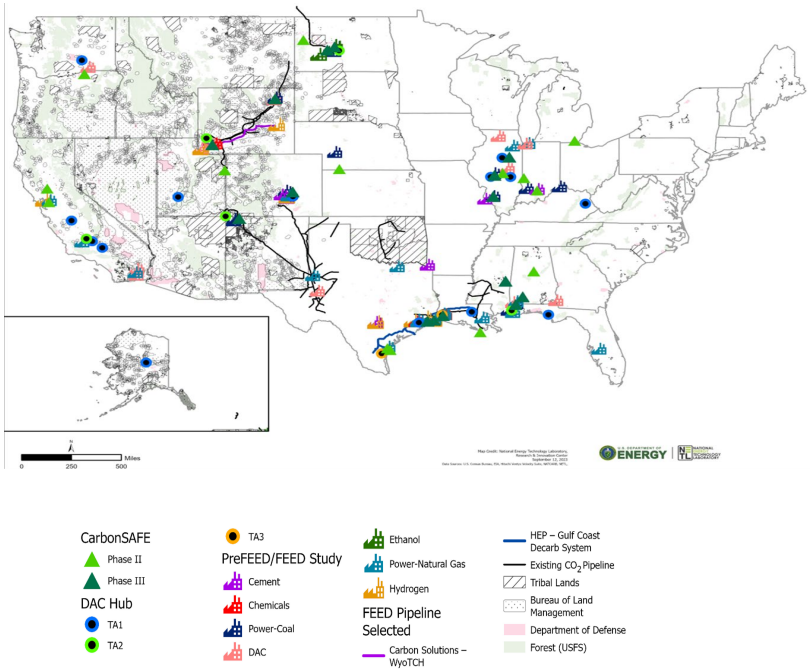
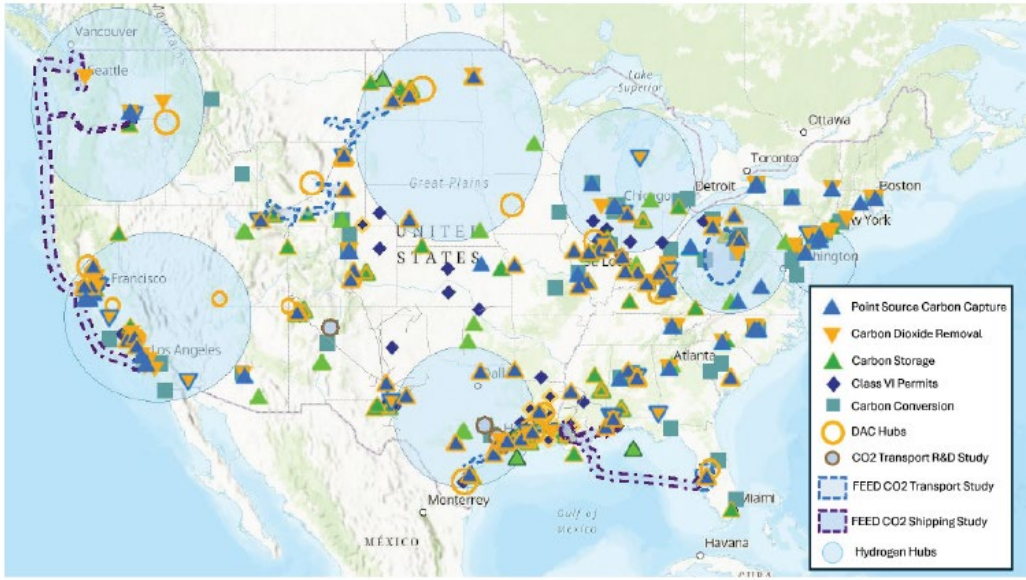
Socorro, NM

LA-UR-24-31736

Momentum of Carbon Management



Source: Sarah Forbes LANL Visit
September 2023



Source: DOE Carbon Management Strategy
DOE-funded carbon management projects as of
March 2024

How is CO_2 Transported?

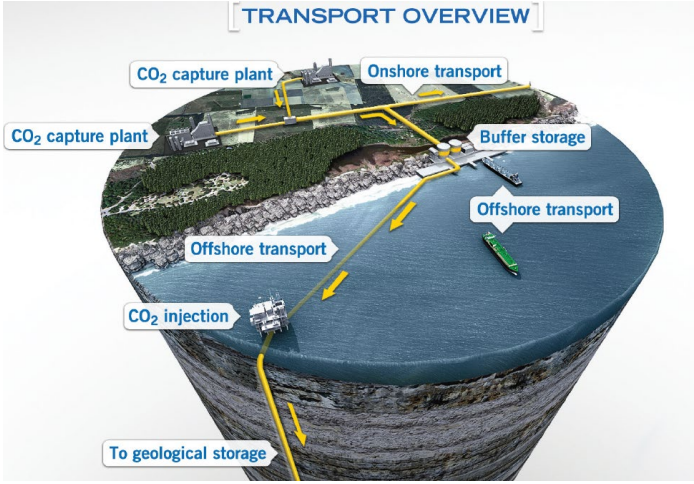
Safely and reliably transporting carbon dioxide (CO_2) from where it is captured to a storage site is an important stage in the carbon management

Pipelines are – and are likely to continue to be – the most common method of transporting the very large quantities of CO_2 involved in CCS.

Ship transportation can be an alternative option for many regions of the world. Shipment of CO_2 already takes place on a small scale in Europe and Asia.

Transport of CO_2 by truck and rail is possible for small quantities. Trucks are used at some project sites, moving the CO_2 from where it is captured to a nearby storage location.

- Northern Lights Project (Norway); Acorn CCS Project (UK); Quest CCS Project (Canada); various EOR projects



Source: Global CCS Institute

Existing CO_2 Pipelines in the U.S.

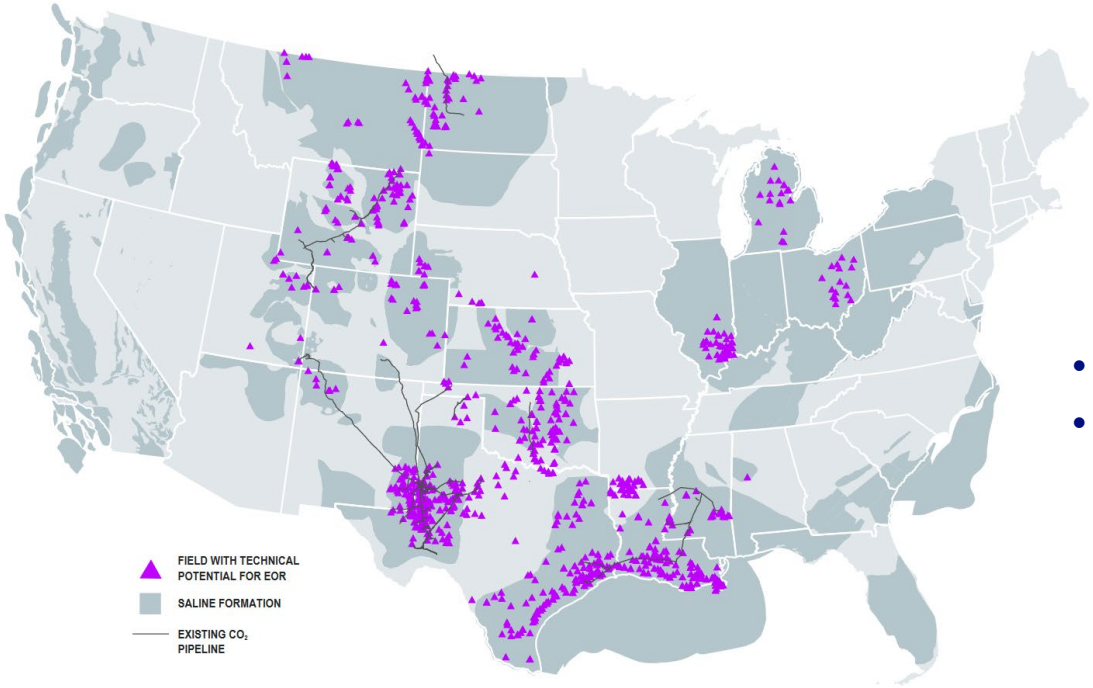
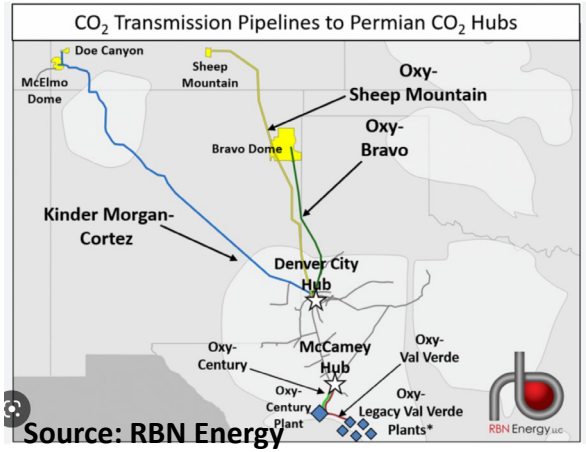
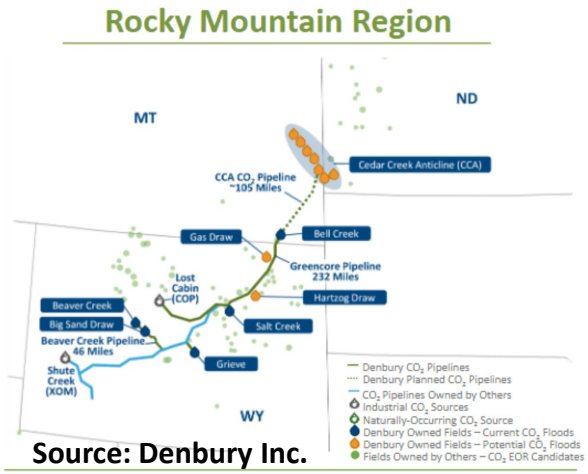


Figure authored by GPI based on data from ARI and NATCARB.

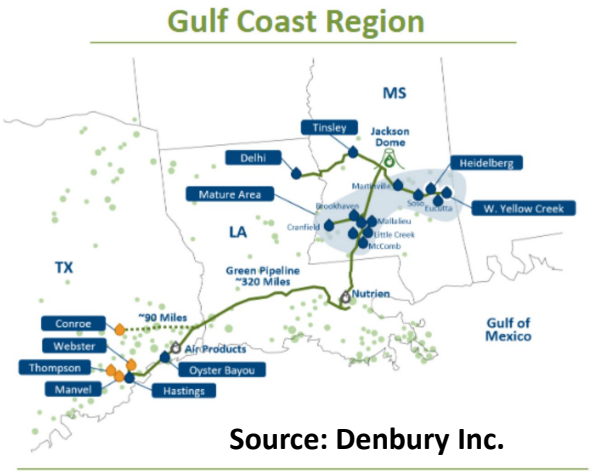
- Approximately 5,500 miles
- Primarily linking natural CO_2 sources to aging oil fields for EOR



Source: RBN Energy



Source: Denbury Inc.



Source: Denbury Inc.

How many miles of new pipeline will need to be built to achieve net-zero emissions by 2050?

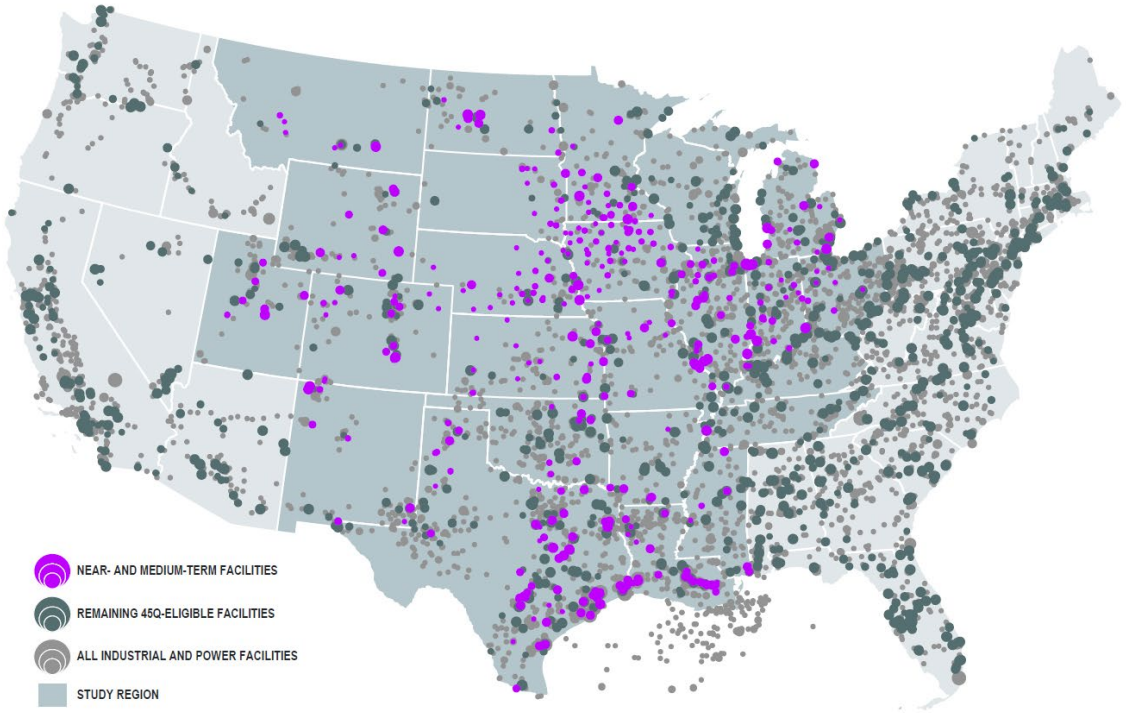


Figure authored by GPI based on data from EPA FLIGHT 2018.

Net-Zero America: Potential Pathways, Infrastructure, and Impacts - Larson et al., 2021

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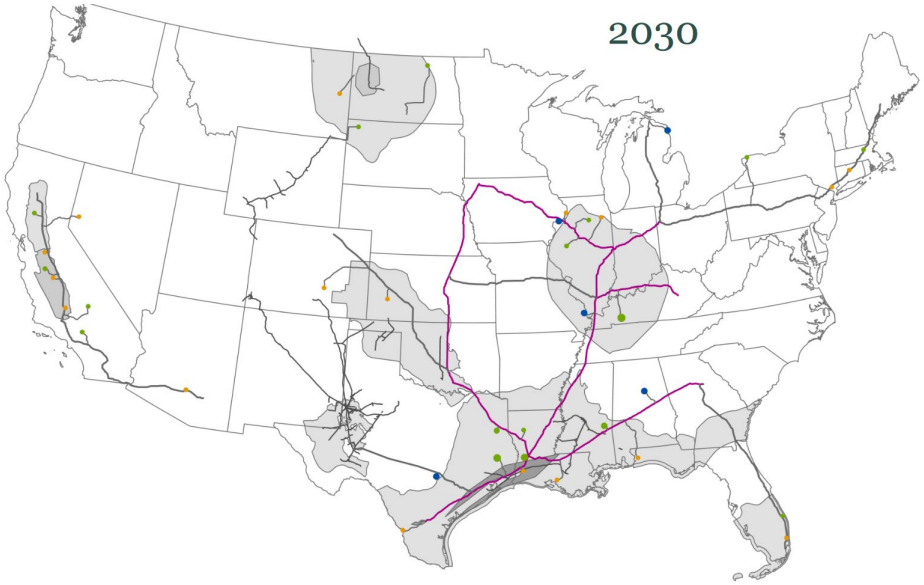
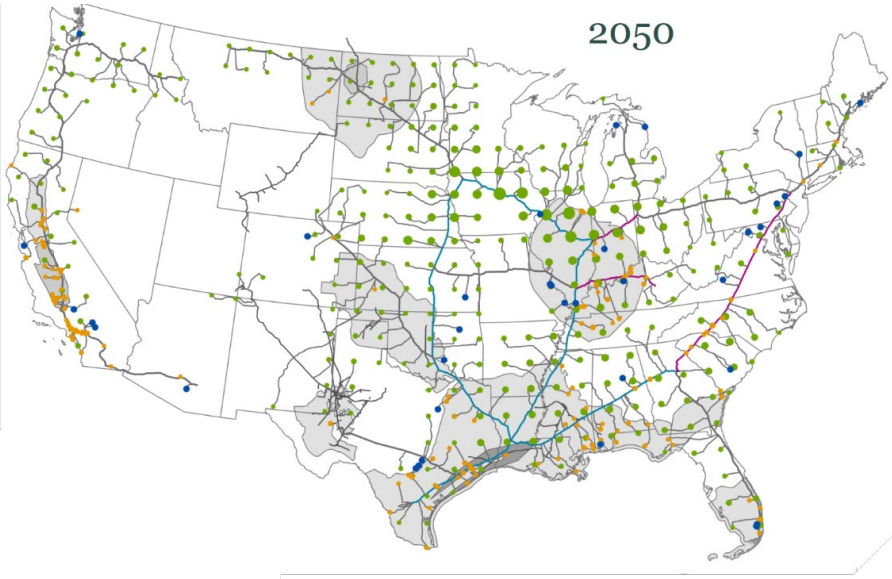




- 65 million tCO_2/year – 11,806 miles pipelines in total
- 929 million tCO_2/year – 65,865 miles pipelines in total
  - 13,049 miles trunk lines; 52,816 miles spur lines

Los Alamos NATIONAL LABORATORY

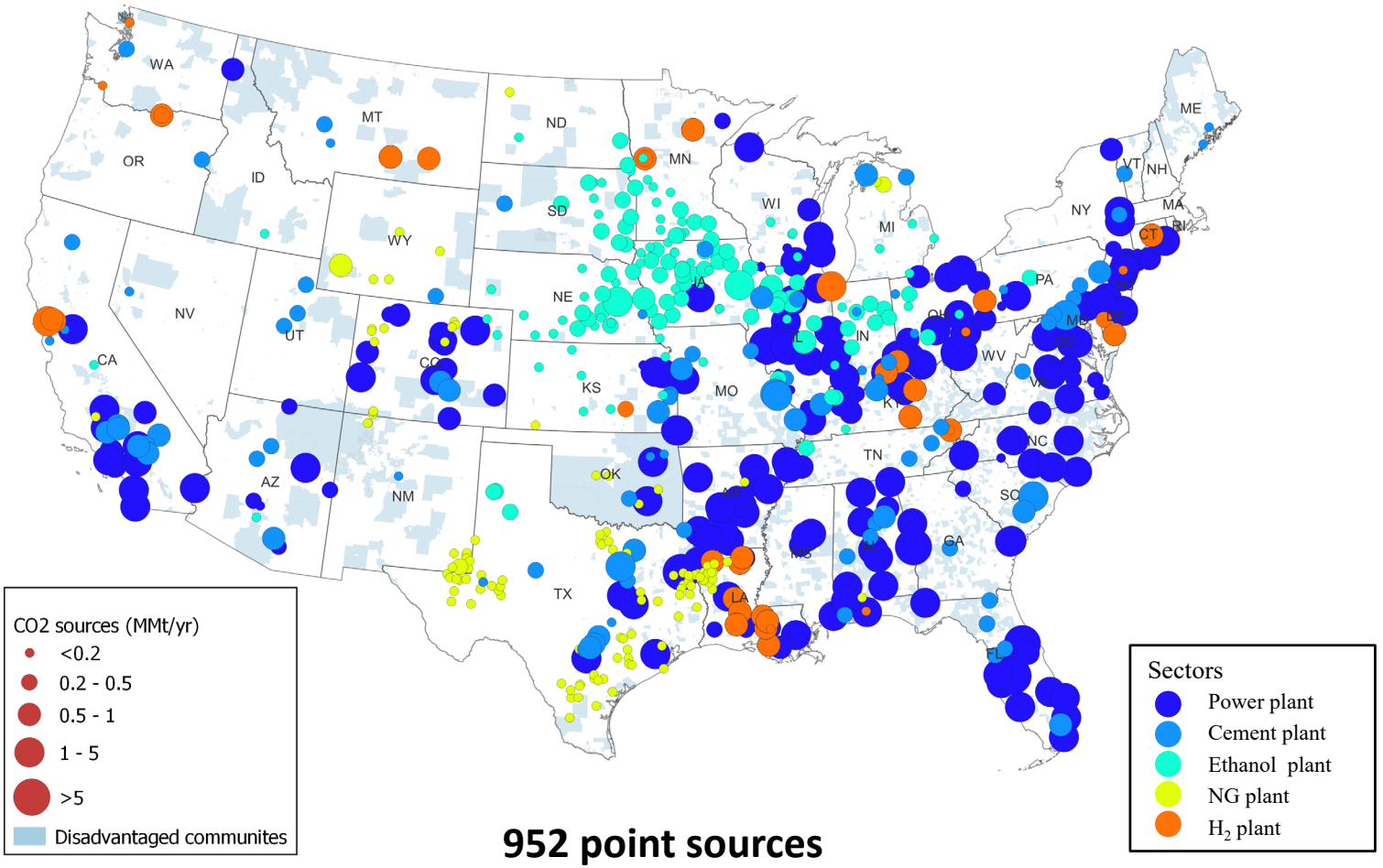
National Scale CCS Pipeline Network Modeling by LANL

- **Objective**: Use *SimCCS* platform to understand potential national scale CCS infrastructure deployment scenarios
- In coordination with DOE-FECM
- In collaboration with OnLocation Inc.

U.S. DEPARTMENT OF ENERGY
Fossil Energy and Carbon Management

OnLocation 40 YEARS
A KEYLOGIC COMPANY

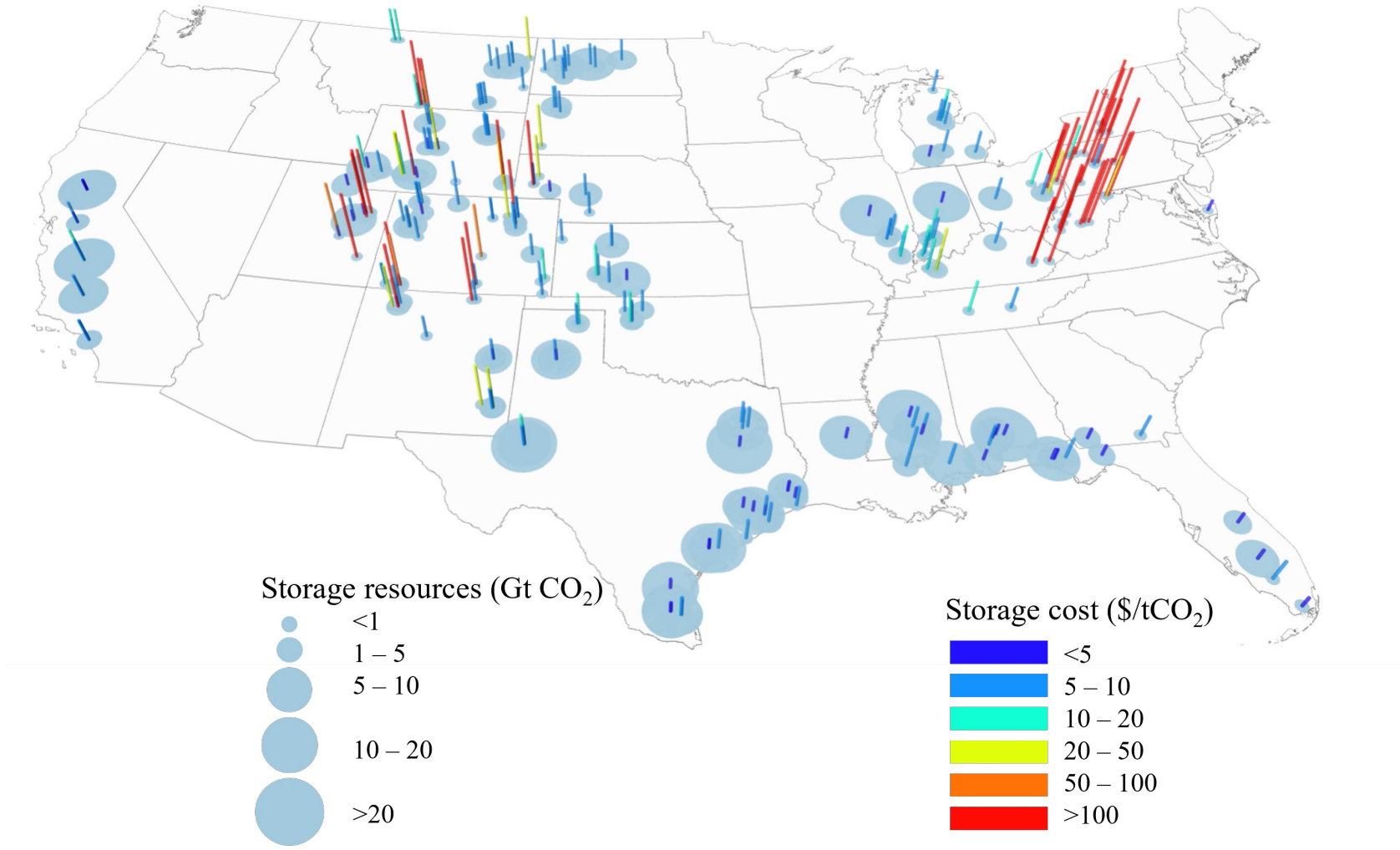
Net-zero IRA case (data from OnLocation)



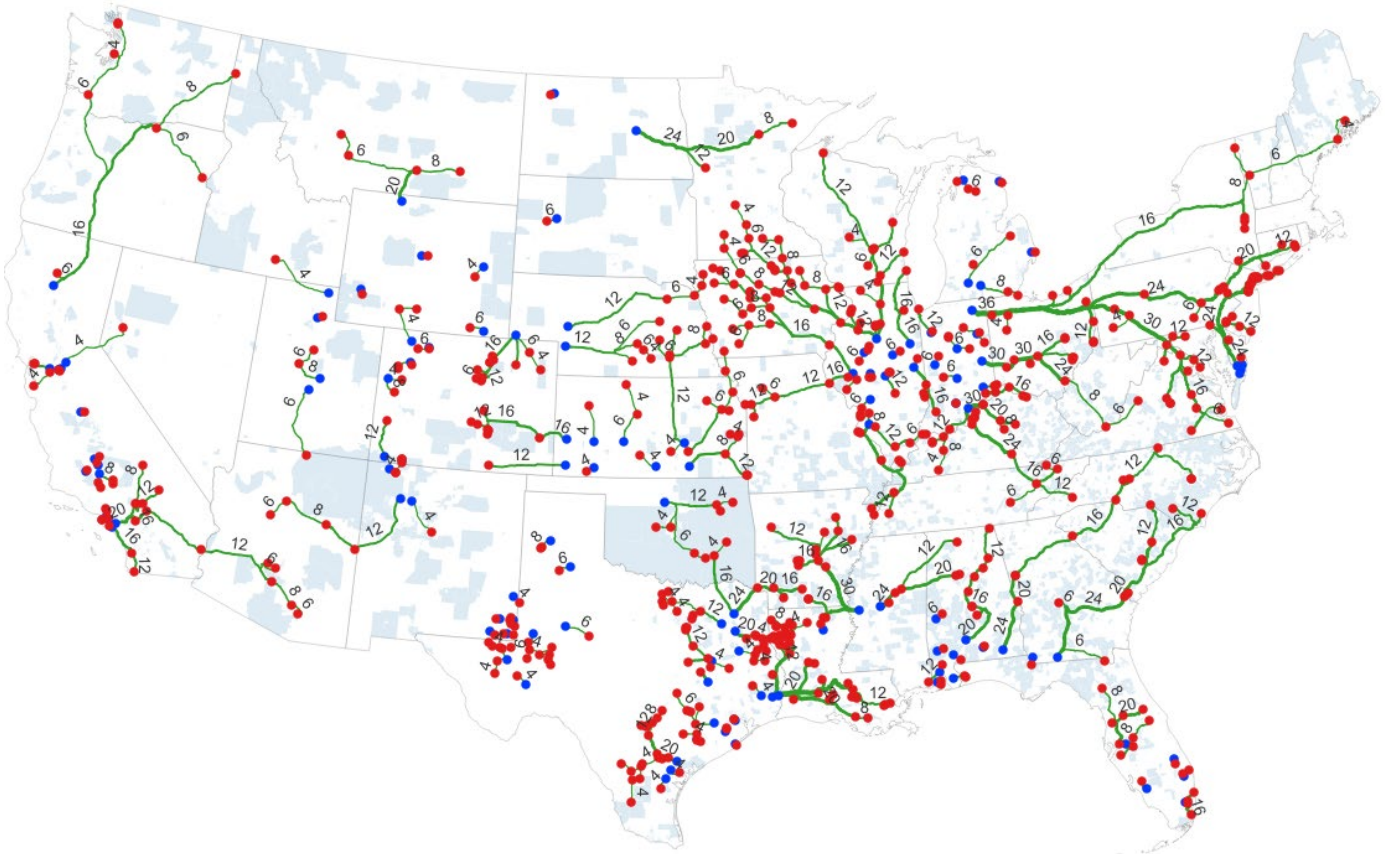
952 point sources

Direct Air Capture starting from 2034

Nationwide saline storage cost and resource



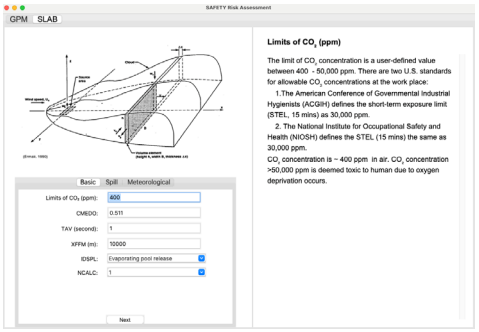
Outlook of CO_2 pipeline in 2050

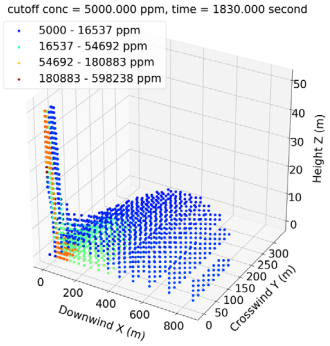


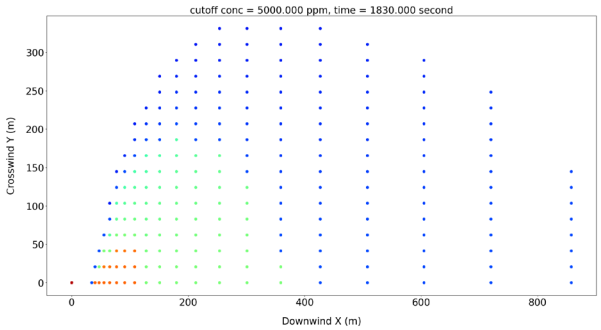
Total pipeline length: 27,438 miles

Summary

- ***SimCCS* demonstrates to be an effective toolset to support deployment of CCS transport infrastructure**
  - Phased-modeling
  - Multi-modal modeling: pipeline, truck, rail, and ship/barge
  - Re-use of existing pipeline and ROWs
  - Critical transport safety and risk assessment







- **National CCS infrastructure modeling results indicate:**
  - ~23,081-27,438 miles of new pipelines required to capture and store the CO_2 emissions
    - *Over 90% to be constructed by 2035*

Thank you!

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