Pore Space Primer

Who, What, When, Where, and How Much?

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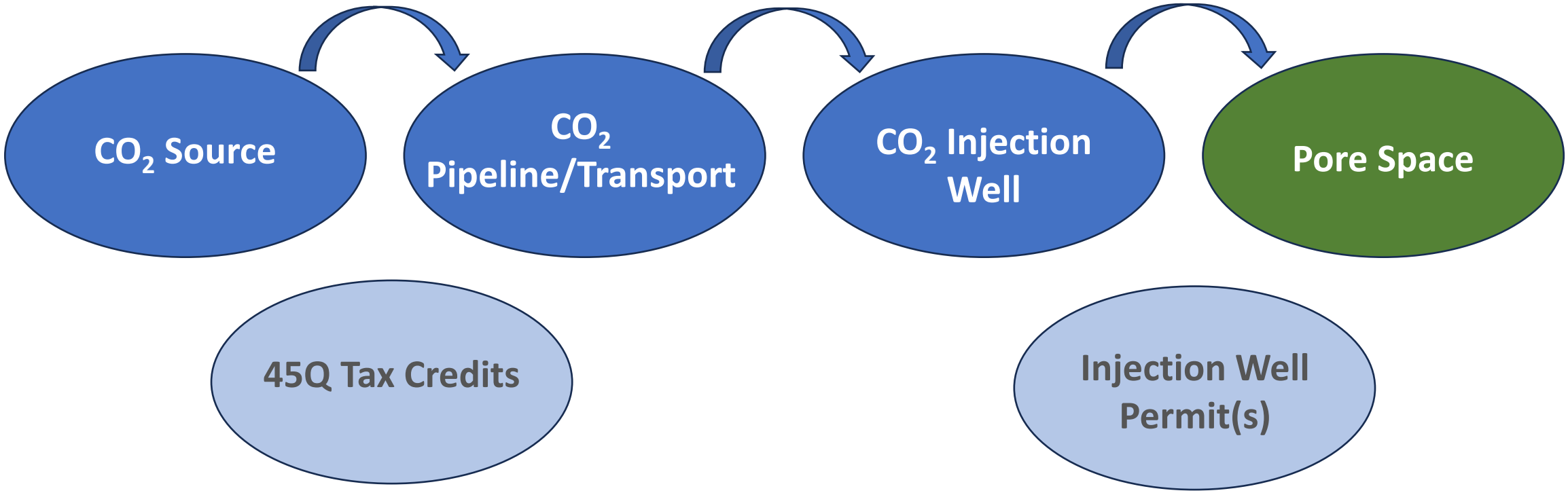
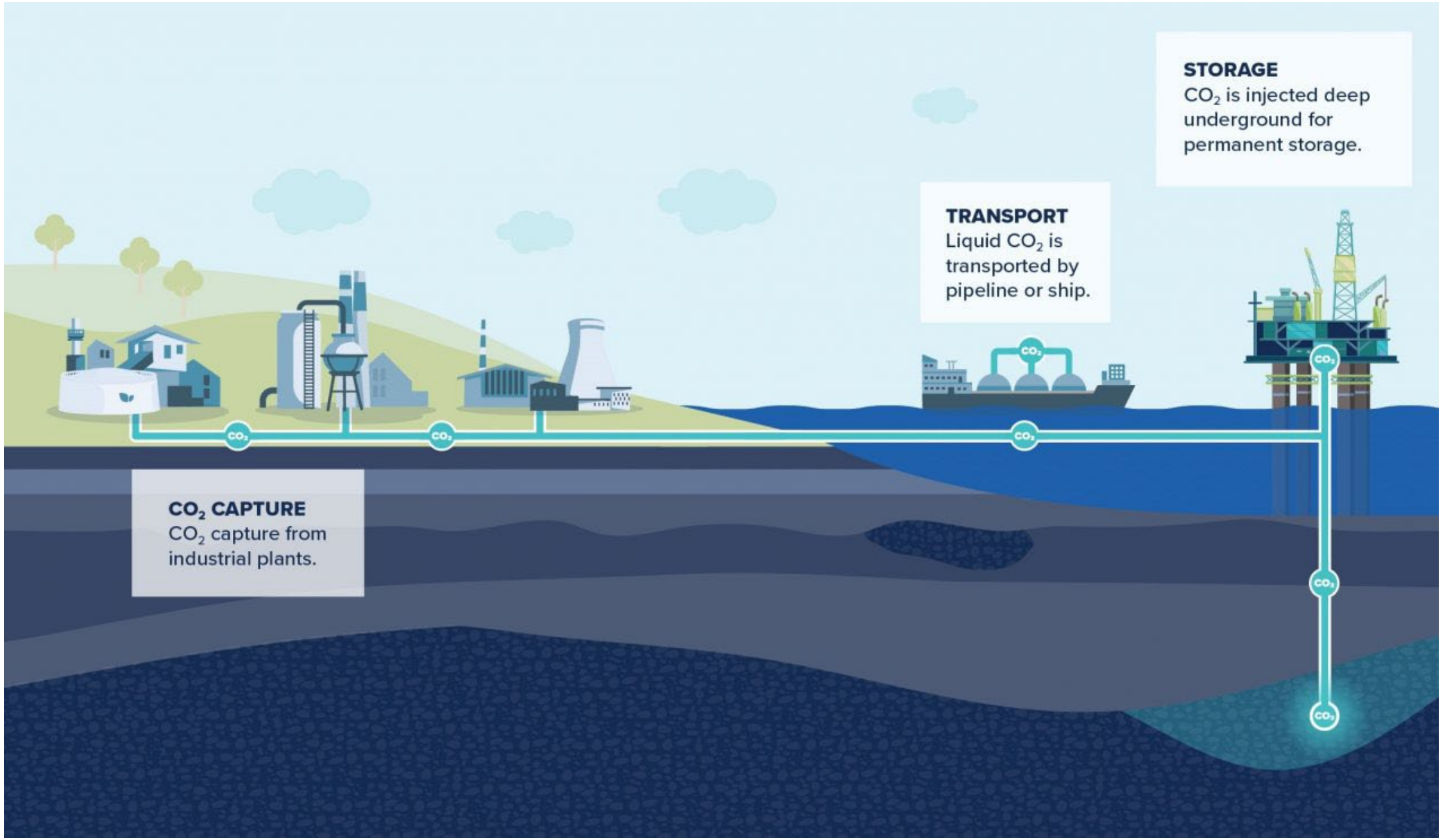
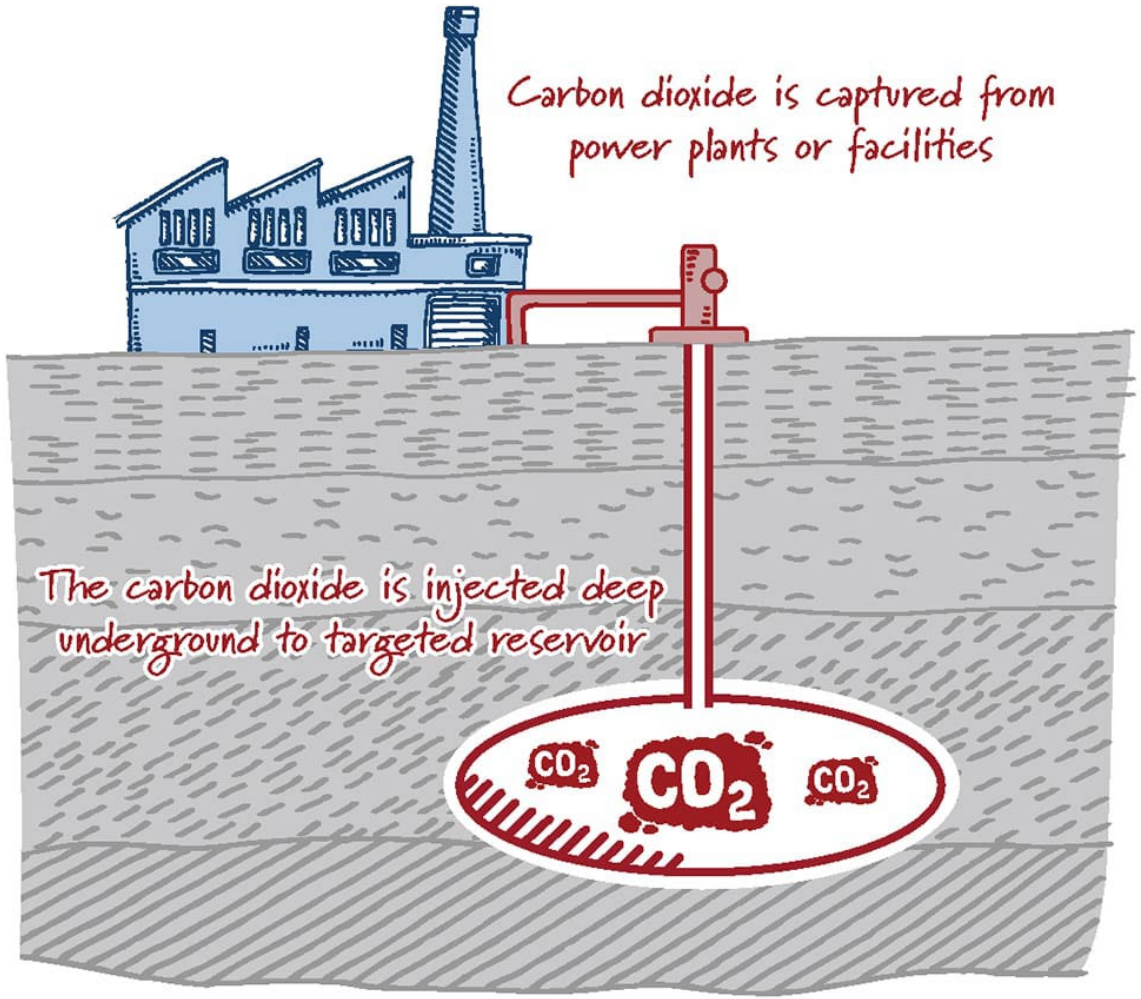
What is CCS?


CO_2 Source
CO_2 Pipeline/Transport
CO_2 Injection Well
Pore Space
45Q Tax Credits
Injection Well Permit(s)


STORAGE
CO_2 is injected deep underground for permanent storage.
TRANSPORT
Liquid CO_2 is transported by pipeline or ship.
CO_2 CAPTURE
CO_2 capture from industrial plants.

Source

What is pore space?



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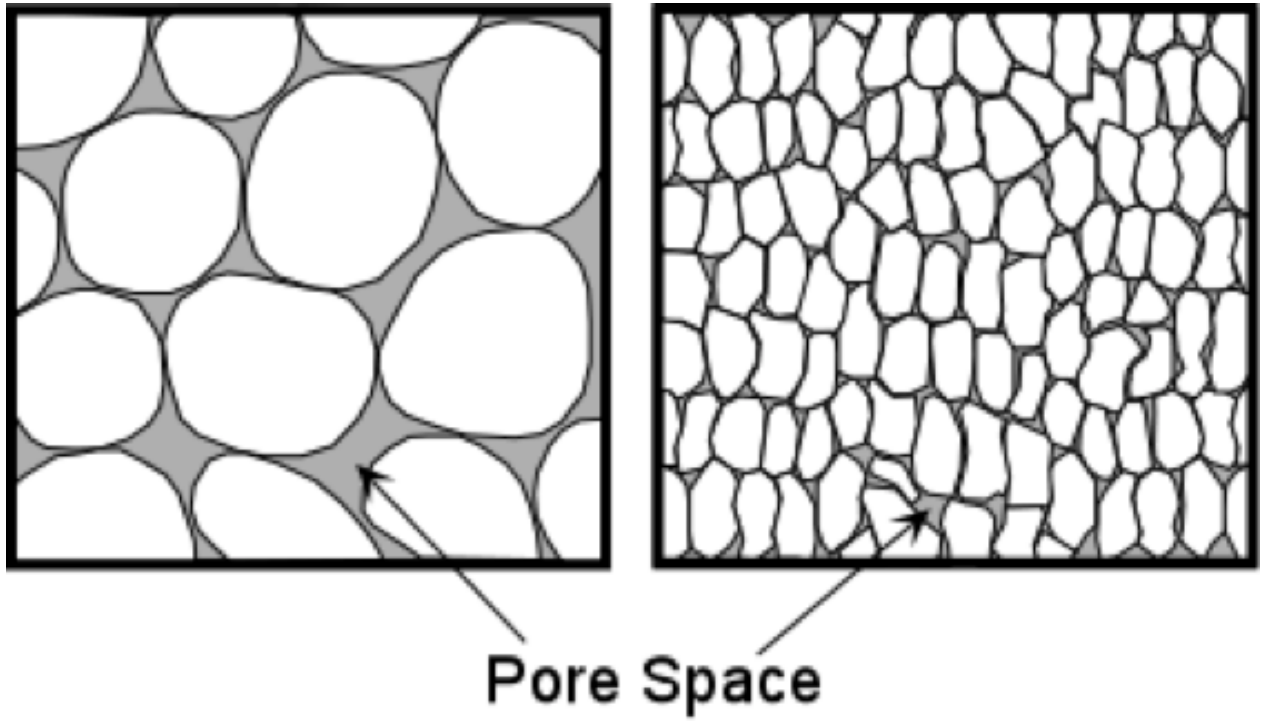


Source

Pore Space Primer

1. **Who** owns the pore space in Texas?
2. **What** kind of property interest could a CCS project proponent obtain in the pore space?
3. **When** should the pore space for a CCS project be acquired?
4. **Where** should the pore space property interest be located?
5. **How much** pore space is needed for a CCS project?

Who owns the pore space in Texas?

Two theories of pore space ownership: American Rule and English Rule

Texas has not addressed by statute

House Bill 4484/Senate Bill 2107 (2023)

Texas case law supports American Rule

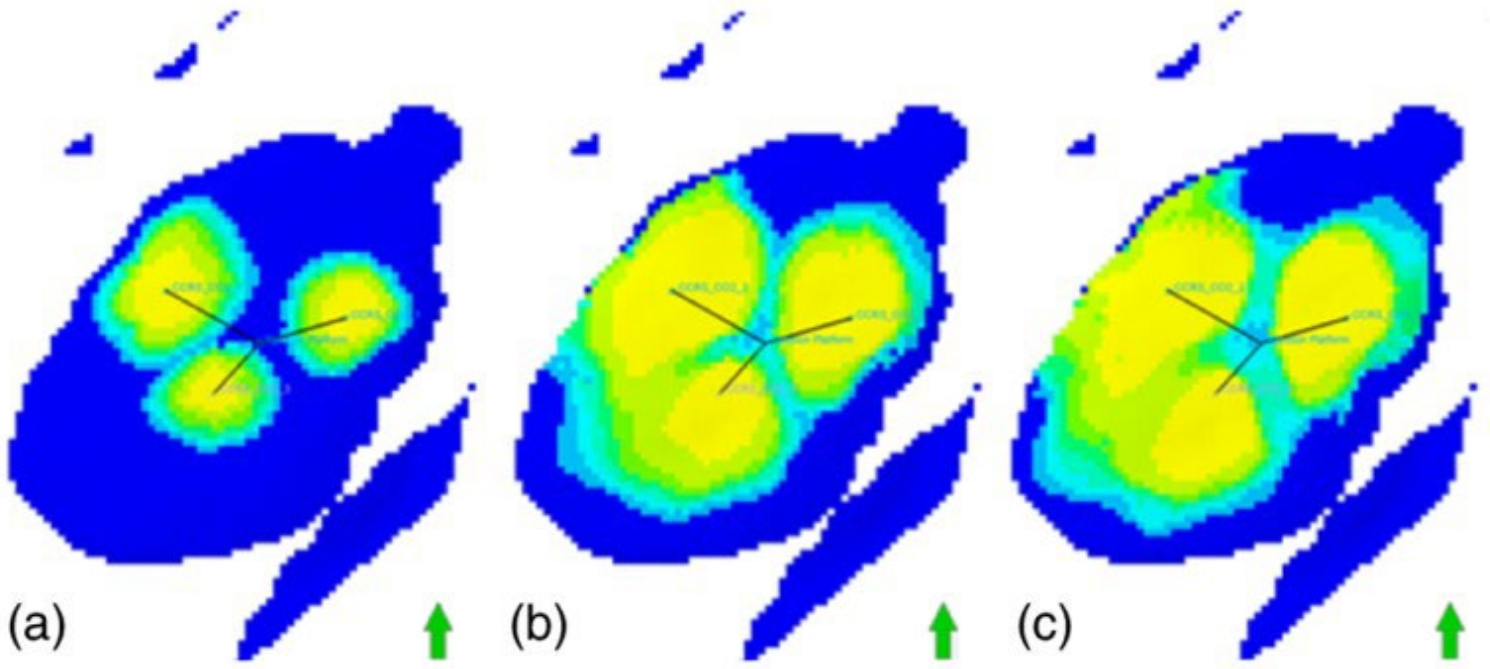
Potential exception: Myers-Woodward, LLC v. Underground Services Markham, LLC

What kind of property interest could a CCS project proponent obtain in the pore space?

- **Not mandated by regulation**
- Texas CCS permit applicant must submit "a signed statement that the applicant has a **good faith claim to the necessary and sufficient property rights** for construction and operation of the geologic storage facility for at least the first five years after initiation of injection." 16 TAC § 5.206(b)(10).
- **Potential approaches:** deed or (perpetual) easement or lease
- Mineral interest owner coordination and/or agreements

When should the pore space for a CCS project be acquired?

"The director may issue a permit under this subchapter if the applicant demonstrates and the director finds that: […] the applicant has provided a signed statement that the applicant has a good faith claim to the necessary and sufficient property rights for construction and operation of the geologic storage facility for at least the first five years after initiation of injection." 16 TAC § 5.206(b)(10).



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Where should the pore space property interest be located?

Largely based on geology and location of CO_2 source(s)

Additional Legal Considerations

Corrective Action	Pipeline Challenges	Contested Case Hearings	TCEQ-Permitted Injection Wells

Corrective Action

Applicants for both Texas and EPA permits must identify **all** artificial penetrations within the CO_2 plume area and perform corrective action as necessary

Key Considerations

- Cost of corrective action
- Access to wells to perform corrective action

Potential Mitigation

- Site project to minimize inclusion of artificial penetrations requiring corrective action within CO_2 plume area

Pipeline Challenges

Key Considerations

- Opposition to CO_2 pipelines
- County ordinances
- Examples: Navigator CO_2 Ventures pipeline, Wolf Carbon Solutions pipeline, and Summit Carbon Solutions pipeline, each in the Midwest

Potential Mitigation

- Eminent domain
- Public engagement

Contested Case Hearings

Key Considerations

- "Affected persons" may protest a Texas state CCS permit
  - Affected person: "A person who, as a result of activity sought to be permitted has suffered or may suffer actual injury or economic damage other than as a member of the general public."

Potential Mitigation

- Site project to avoid damage to others
- Public engagement

TCEQ-Permitted Injection Wells

Key Considerations

- Must submit a copy of the Texas CCS permit application to the TCEQ
- Must obtain a letter of determination from the TCEQ concluding that the CCS project will not impact or interfere with any previous or existing TCEQ-permitted injection wells or their associated waste plumes

Potential Mitigation

- Site project to avoid impacts to TCEQ-permitted injection wells

How much pore space is needed for the CCS project?

CO_2 plume: the underground extent, **in three dimensions**, of the injected CO_2 stream

Additional Legal Considerations

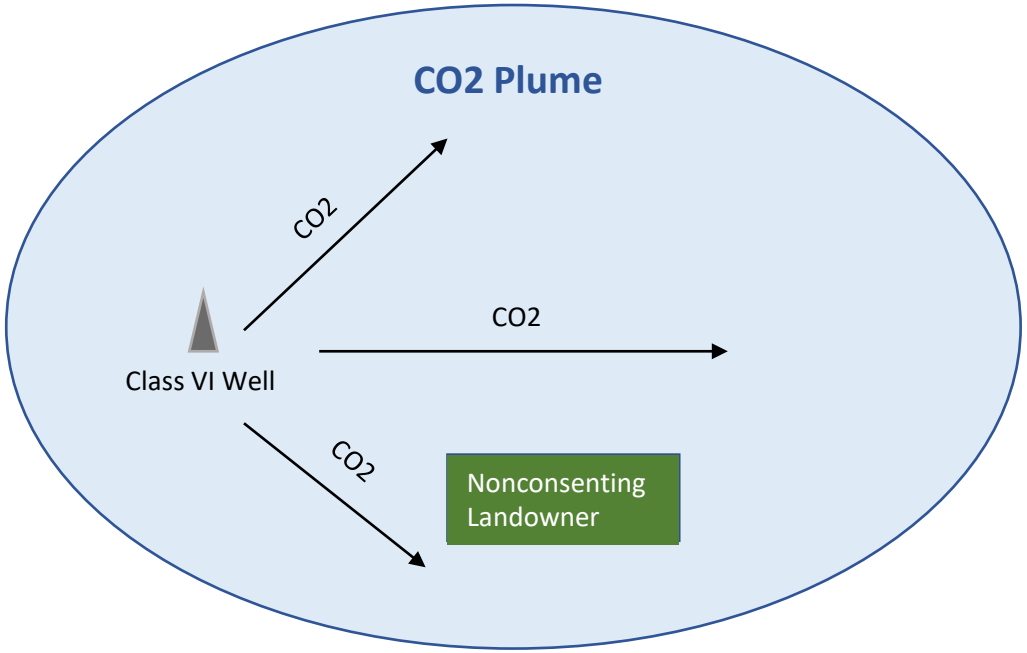
Consequences for failure to obtain sufficient pore space	Pore space owner holdouts to pore space acquisition

Trespass and Nuisance Claims

- **Trespass in Texas:** an unauthorized entry upon the land of another
  - Deep subsurface trespass is unsettled in Texas:
  - Dicta: "the ancient common law maxim that land ownership extends to the sky above and the earth's center below …has no place in the modern world. Wheeling an airplane across the surface of one's property without permission is a trespass; flying the plane through the airspace two miles above the property is not. Lord Coke, who pronounced the maxim, did not consider the possibility of airplanes. But neither did he imagine oil wells. The law of trespass need no more be the same two miles below the surface than two miles above." *Coastal Oil & Gas Corp. v. Garza Energy Tr.*, 268 S.W.3d 1, 11 (Tex. 2008).
- **Nuisance in Texas:** a condition that substantially interferes with the use and enjoyment of land by causing unreasonable discomfort or annoyance to persons of ordinary sensibilities
- **Potential Mitigation:**
  - Ensure sufficient pore space is acquired to accommodate the CO_2 plume
  - Carefully monitor the CO_2 plume movement for any unexpected migration

Pore Space Owner Holdouts

Amalgamation (also known as integration, pooling, unitization, aggregation): the combining of the pore space of each of the separate lands overlying a CO_2 storage reservoir into one CCS storage facility, or storage unit, into which CO_2 may be injected from any of the amalgamated properties



Pore Space Owner Holdouts

Forced Amalgamation

- Generally, requires good faith effort to obtain pore space rights + already having obtained pore space rights or consent from the owners of the pore space underlying some minimum percentage of the surface area above the proposed storage facility

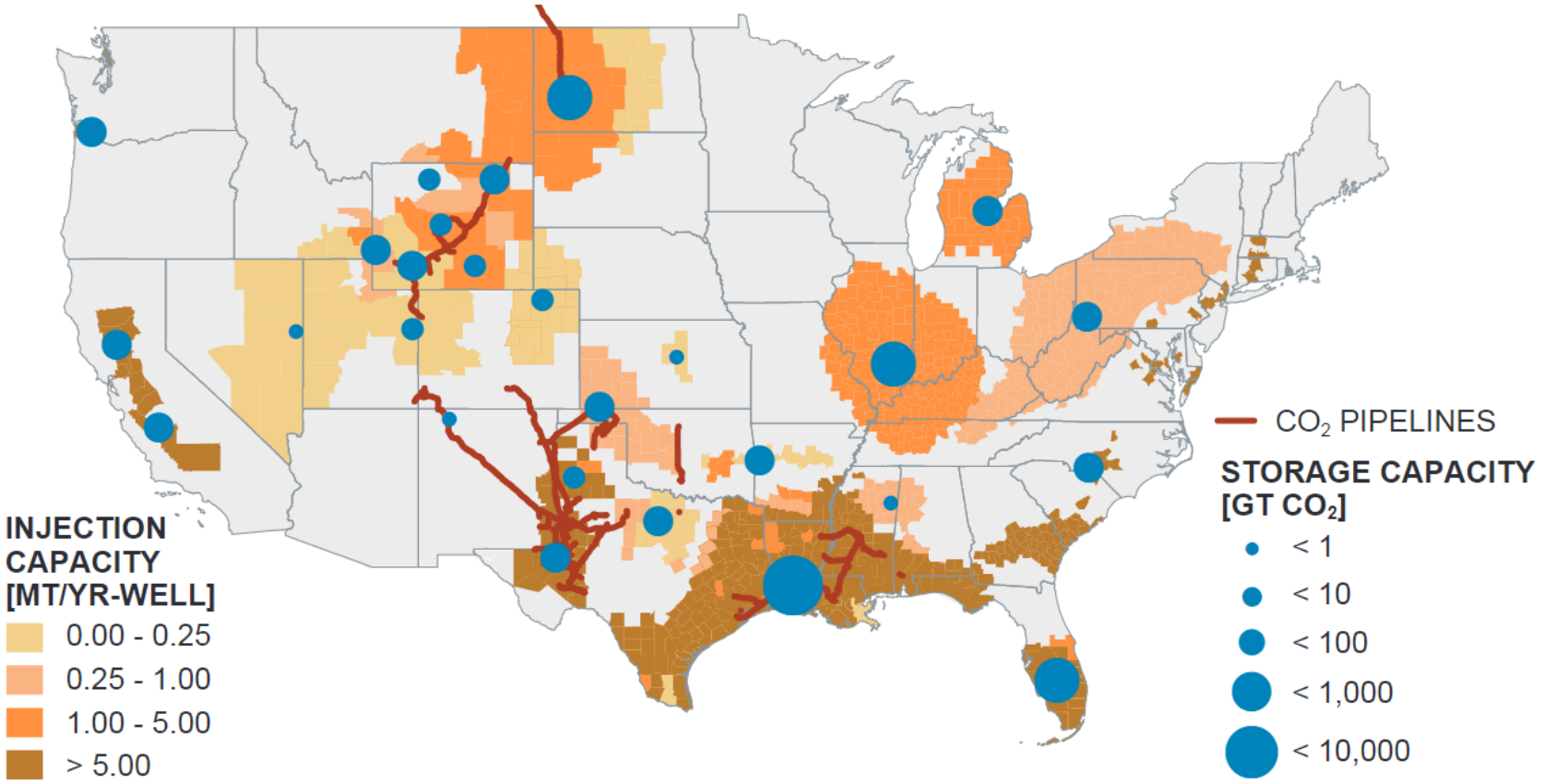
Texas **does not** currently provide a similar mechanism for acquiring pore space without the owner's consent

- House Bill 4484/Senate Bill 2107 (2023)

Potential Mitigation

- Early outreach to pore space owners
- Siting project in areas where a larger percentage of the pore space is owned by a smaller number of people

Questions?



Source: Baik, E., et al. (2018). "Geospatial analysis of near-term potential for carbon-negative bioenergy in the United States." Proceedings of the National Academy of Sciences, 115(13), 3290-3295.

Source

Figure 7-5. *CO_2 Injectivity per Well and Storage Capacity in the United States*