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## **CAES Webinar**

# Carbon Capture and Storage (CCS) Landscape Overview

June 1, 2023

Flue Gas Duct

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Background photo: Petra Nova with CCS. Source: U.S. Energy Information Administration <a href="https://www.eia.gov/todayinenergy/detail.php?id=33552">https://www.eia.gov/todayinenergy/detail.php?id=33552</a>

## Outline

- What is CCS?
- What is a CCS hub?
- CCS funding in the U.S.
- CO<sub>2</sub> pipelines
- CO<sub>2</sub> storage
- Environmental justice
- Challenges, risks, impacts

## What is CCS?

 There is general global consensus that reducing greenhouse gas emissions from industry is key to preventing further harm from climate change

#### • Carbon Management (CM):

- An umbrella term used by government and industry to broadly describe strategic approaches to reduce carbon dioxide (CO<sub>2</sub>) emissions from power and industrial sectors and their legacy emissions
  - CDR: Remove CO<sub>2</sub> directly from atmosphere or sea
    - o Carbon Dioxide Removal
  - CCS/CCU/CCUS: Abate CO<sub>2</sub> at emission source
    - o Carbon Capture
    - Use/Utilization
    - Storage/Sequestration



Source:

https://blogs.edf.org/climate411/2022/03/31/getting-to-netzero-new-policy-insights-on-the-role-of-carbon-managementstrategies/

## What is a CCS hub?



Source: https://archive.ipcc.ch/publications\_and\_data/graphics/jpg/large/Figure%20TS-01.jpg

## CCS funding in the U.S.

- In November 2021, the **Infrastructure Investments and Jobs Act (IIJA)** (also known as the Bipartisan Infrastructure Law) was signed into law
  - The IIJA includes an allocation of **\$12.1 billion** toward CCS provisions
    - Nearly \$3.5 billion toward pilot and demonstration projects
    - \$3.5 billion for the US DOE to establish four regional Direct Air Capture (DAC) hubs
    - $\circ$  Over \$4.5 billion toward facilitating carbon transportation and sequestration
    - PLUS: \$8 billion for the US Department of Energy (DOE) to establish 6 to 10 hydrogen hubs
      - $\circ$   $\;$  Which could integrate CCS if fossil fuels are used as feedstock for hydrogen production

#### • In August 2022, the Inflation Reduction Act (IRA) was signed into law

- Two tax incentives that may have immense implications for CCS: 45Q and 45V
  - **45Q tax credit:** Carbon sequestration
    - $\circ$  Up to \$85 per ton of sequestered carbon dioxide
    - $\circ$   $\,$  Up to \$60 per ton of utilized carbon dioxide that is captured from a point source
    - Up to \$180 per ton of sequestered carbon dioxide that is captured from ambient air (direct air capture)
  - o 45V tax credit: Hydrogen production (which in some cases may include capturing carbon)

### How would captured CO<sub>2</sub> be transported?

#### Existing CO<sub>2</sub> pipeline network

- ~ 80 million tCO<sub>2</sub>/yr transported
- $\sim 8,500$  km of pipelines
- Servicing enhanced oil recovery operations
- Majority in Permian Basin (West Texas and southeast New Mexico)

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SEE SLIDE 228 IN PRINCETON UNIVERSITY, Net zero America: Potential pathways, infrastructure, and impacts, (2020), https://environmenthalfcentury.princeton.edu/sites/g/files/toruqf331/files/2020-12/Princeton NZA Interim Report 15 Dec 2020 FINAL.pdf.

### How would captured CO<sub>2</sub> be transported?



SEE PAGE V IN ELIZABETH ABRAMSON, DANE MCFARLANE & JEFF BROWN, *Transport infrastructure for carbon capture and storage: Whitepaper on regional infrastructure for midcentury decarbonization*, (2020), <u>https://betterenergy.org/blog/new-analysis-carbon-capture-and-storage-infrastructure-for-midcentury-decarbonization/</u>.

### Where would carbon storage occur?



- The gray blobs represent potential CO<sub>2</sub> storage capacity
- The **red circles** are proposed CO<sub>2</sub> storage sites

Source: Clean Air Task Force (CATF) https://www.catf.us/ccsmapus/ (screenshot dated 05/03/2023)

## **Environmental justice**

#### SEPA EJScreen EPA's Environmental Justice Screening and Mapping Tool (Version 2.11)

EJScreen Website | Mobile | Glossary | Help

Please note: Territory data (except Puerto Rico) is not available as comparable to the US. It is only comparable to the territory itself by using the 'Compare to State' functionality. Likewise, some of the indicators may not be available for territories.



- EPA EJScreen: EJ Index for Air Toxics Cancer Risk
- The dark gray, yellow, orange, and red represent higher risk of cancer due to air pollution relative to the rest of the country

Source: US EPA EJScreen https://www.epa.gov/ejscreen/ how-interpret-standard-reportejscreen

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#### Challenges, risks, and impacts

- New proposed CCS projects poses the need for frontline communities to understand the challenges, risks, and impacts of CCS infrastructure
  - CO<sub>2</sub> transport via pipeline
    Dr. Steven Jansto

CO<sub>2</sub> injection for storage/sequestration
 Dr. Dominic DiGiulio







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