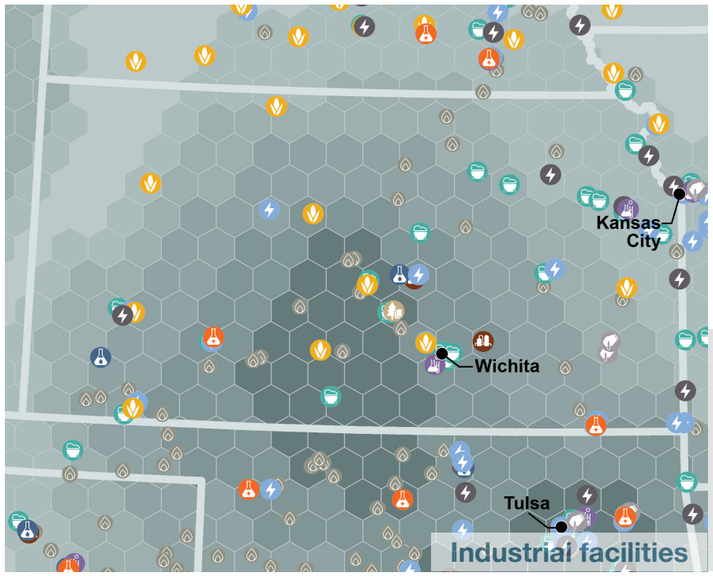
Kansas Hub

The existing landscape of industrial production, commodity transport infrastructure, and geologic carbon storage capacity give Kansas unique advantages in jumpstarting investment in carbon capture and low-carbon hydrogen deployment. The geographic extent of the Kansas hub is based on the CCUS hub proposed by Kansas Geological Survey and DOE's Carbon Utilization and Storage Partnership.

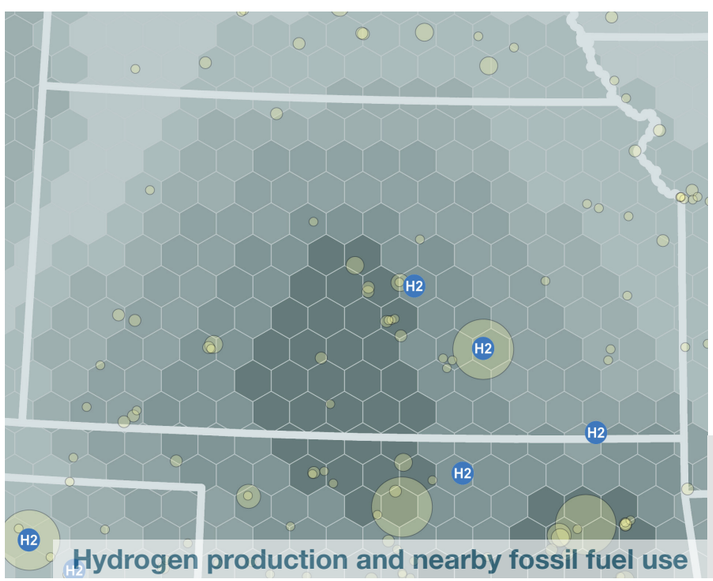
Industrial Emissions and Fossil Fuel Use



Industrial facilities

Kansas is home to industries including ethanol production, natural gas processing, and pulp and paper manufacturing. Facilities in the Kansas hub emit 2.7 million metric tons (Mt) of CO_2e annually, including 2.1 Mt from stationary combustion and 600,000 from process emissions. Several natural gas liquids fractionation plants and gas processing facilities in this regional hub are the focus of a hub proposed by Kansas Geological Survey (KGS) and DOE's Carbon Utilization and Storage Partnership.

- Ammonia
- Cement & lime
- Chemicals
- Coal power
- Ethanol
- Gas power
- Gas processing
- Metals, minerals, & other
- Petrochemicals
- Pulp & paper
- Refineries
- Steel



Hydrogen production and nearby fossil fuel use

There are **three hydrogen-producing facilities** located in close proximity to the Kansas hub. A recent concept paper also discussed plans to install additional hydrogen generation facilities in this regional hub in the near future. Industrial facilities in the Kansas hub use a total of 25 million MMBtu of fossil fuels per year.

Hydrogen can be used as a low- or zero-carbon alternative to fossil fuels at industrial facilities. Clusters of hydrogen production and fossil fuel demand can facilitate technology deployment and jumpstart the transition to hydrogen.

- H2 Existing hydrogen production
- Fossil fuel use at industrial facility

Industrial facility emissions

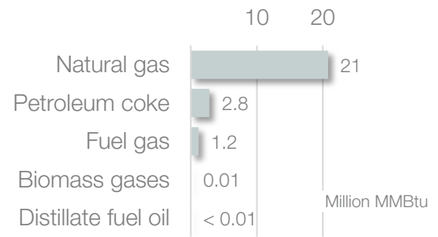
Sector	Total # of Facilities	Total Emissions	Stationary Combustion Emissions	Process Emissions
Ethanol	2	0.6	0.1	0.4
Gas processing	18	2.0	1.7	0.2
Metals, minerals & other	4	0.2	0.2	-
Pulp & paper	1	< 0.1	< 0.1	-
Total	**25**	**2.7**	**2.1**	**0.6**

All emissions are in million metric tons CO_2e.

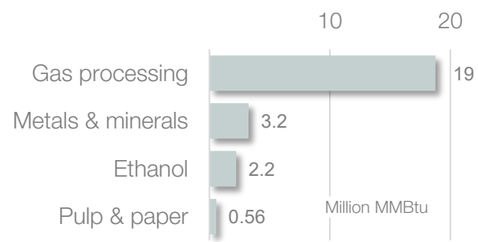
The top industrial fuels consumed in the Kansas hub include natural gas at 21 million MMBtu per year and petroleum coke at 2.8 million MMBtu per year. Gas processing plants are the largest consumers of fossil fuels in this regional hub, consuming 19 million MMBtu of fossil fuels per year.

Using hydrogen as a medium- and high-intensity energy source to displace conventional fossil fuels can reduce combustion emissions alongside other solutions like electrification and renewable energy. Process emissions from product manufacture are another major source of GHGs at industrial facilities. These production processes may not involve fuel combustion and would require other solutions such as carbon capture to fully decarbonize.

Top industrial fuels consumed



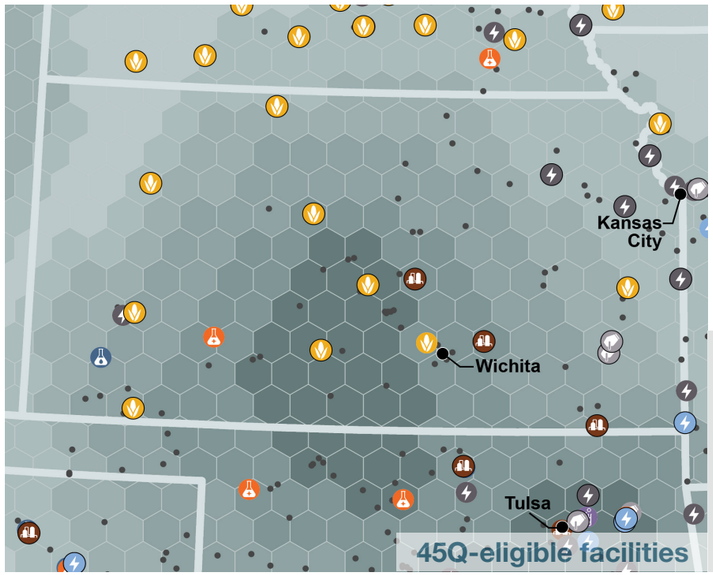
Largest fuel-consuming industries



Kansas Hub

Carbon capture and storage is an essential tool for achieving midcentury climate goals, maintaining the competitiveness of US industry, and protecting and creating high-wage jobs. Carbon capture is crucial in decarbonizing key carbon-intensive industries where CO_2 emissions are inherent to the chemistry of production processes and cannot be eliminated solely by switching to low-carbon electricity. The US has capacity to safely and permanently store thousands of years of carbon emissions in geologic saline formations.

Carbon Capture and Storage

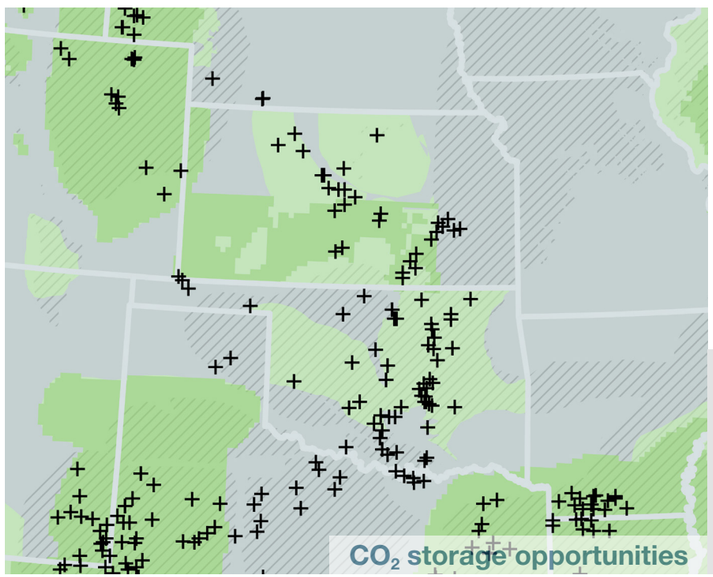


45Q-eligible facilities

The Section 45Q tax credit lowers cost barriers to carbon capture and storage. There are two industrial facilities in the Kansas hub that meet emissions thresholds for Section 45Q eligibility. Both facilities have been identified as near- to medium-term candidates for capture retrofit over the next 10 to 15 years.

45Q-eligible facilities by industry

- Ethanol
- Near- to medium-term
- Additional emitting facility



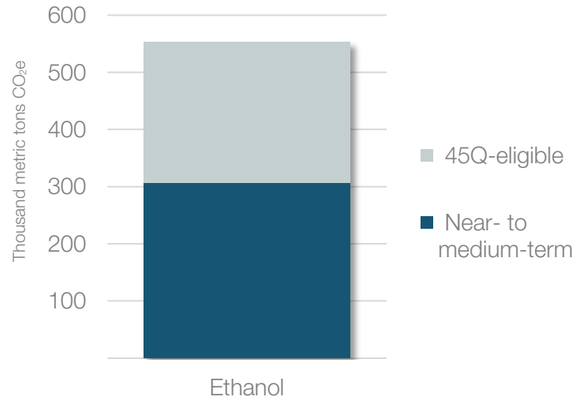
CO_2 storage opportunities

Kansas has potential to act as a major carbon storage destination for capture facilities and carbon removal. The state of Kansas has potential to store 37 billion metric tons of CO_2 in secure geologic saline formations, and also has extensive capacity for carbon storage in geologic fossil basins such as oil and gas fields. The Kansas hub is the focus of a KGS and DOE study aiming to identify potential CO_2 resevoirs for long-term geologic storage.

Geologic storage opportunity

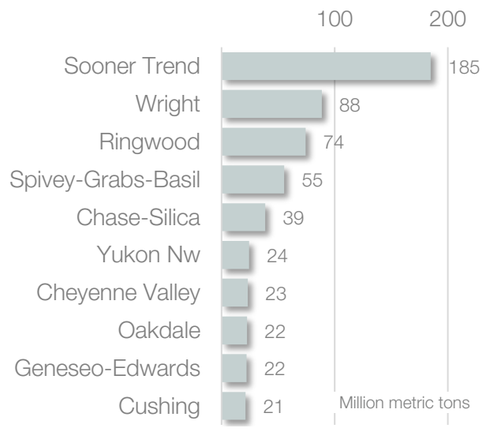
- Assessed low-cost saline storage
- Saline CO_2 storage formation
- Fossil CO_2 storage formation
- Existing petroleum production site

Carbon capture opportunities

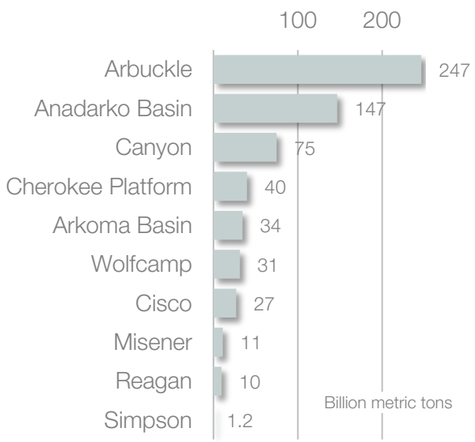


- Industrial and power facilities emit **2.7 Mt CO_2e per year**
- **45Q-eligible** facilities emit **600,000 mt CO_2e per year**
- **300,000 mt CO_2 per year** are **capturable** in the **near- to medium-term**

Fossil storage formations
by CO_2 storage capacity



Saline storage formations
by CO_2 storage capacity

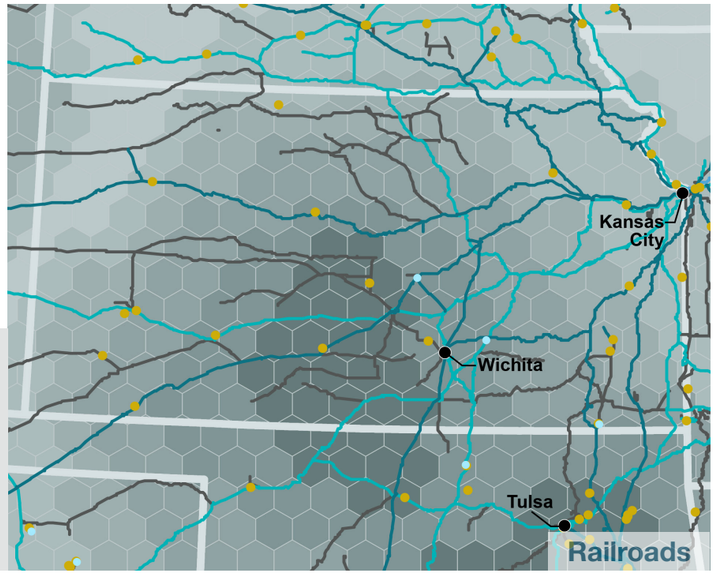


Kansas Hub

Industrial hubs can offer existing transportation infrastructure, delivery routes, and distribution networks needed for the efficient supply of feedstocks and delivery of products. Hydrogen may be blended into existing natural gas pipelines for co-firing, and both carbon and hydrogen could be transported by rail, freight trucking, or barge. Existing pipeline rights-of-way may be crucial for efficient and equitable routing of new CO_2 pipelines for utilization and permanent storage.

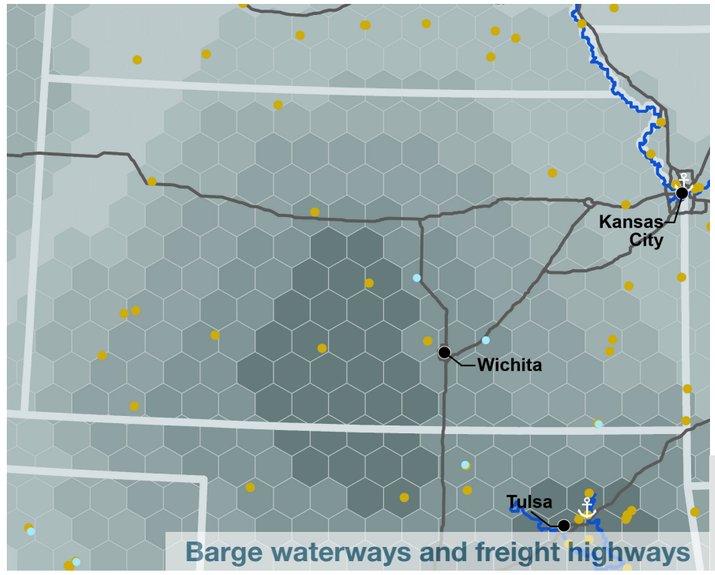
Transport Infrastructure

Many industrial facilities are located along rail lines and often use rail transport to import and export goods. Railroads can also play a role in transporting captured carbon and hydrogen. Many of the facilities in the Kansas hub are located along major rail lines, facilitating connection to markets across the US.



Railroad networks

- Union Pacific Railroad
- BNSF Railway
- CSX Transportation
- Norfolk Southern Railway
- All others



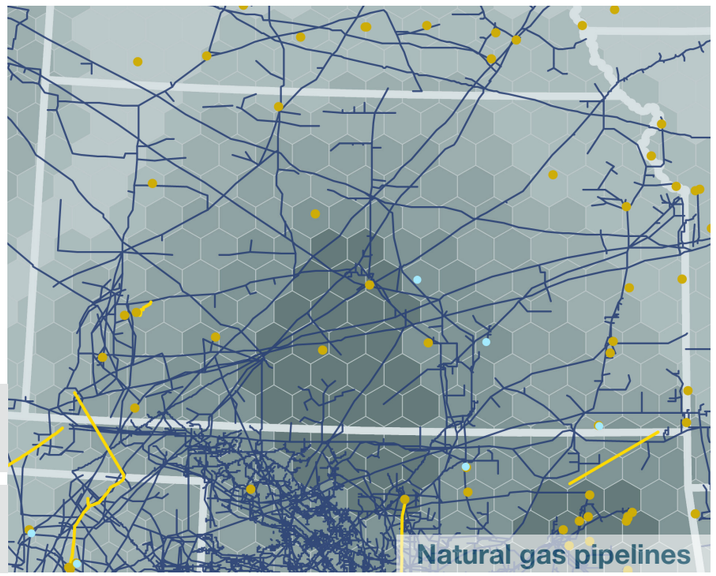
Freight trucks and barges can each play a role in the development of carbon and hydrogen transport networks. Both transport options are flexible, enabling routes to evolve over time and the frequency of transport to adapt in line with the volume of material being transported. Major ports along rivers in the Midcontinent region can connect Kansas with broader markets for carbon and hydrogen.

- Interstate highway
- Navigable waterway
- Major port

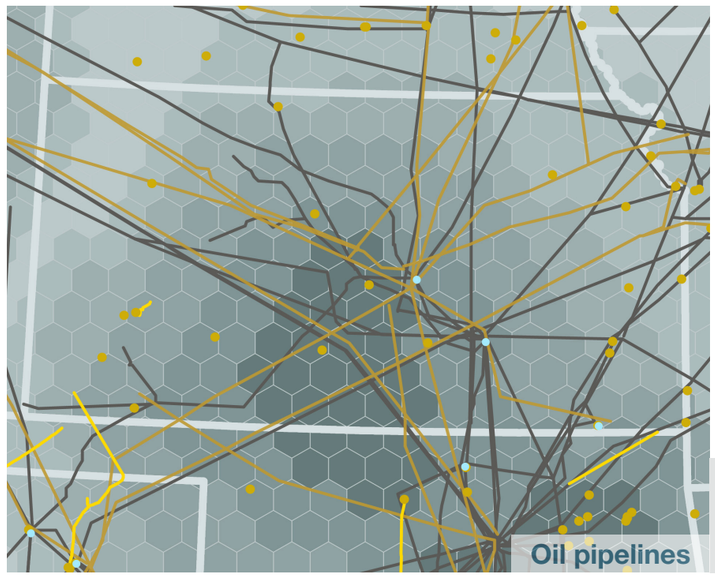
Logistical challenges to carbon and hydrogen pipeline deployment can be reduced by following existing right-of-way of natural gas and oil lines. The Kansas hub currently has 6,178 miles of natural gas pipelines and 3,421 miles of oil pipelines.

Infrastructure	Miles
Natural gas pipelines	6,178
Oil pipelines	3,421

- 45Q-eligible facility
- Existing hydrogen production



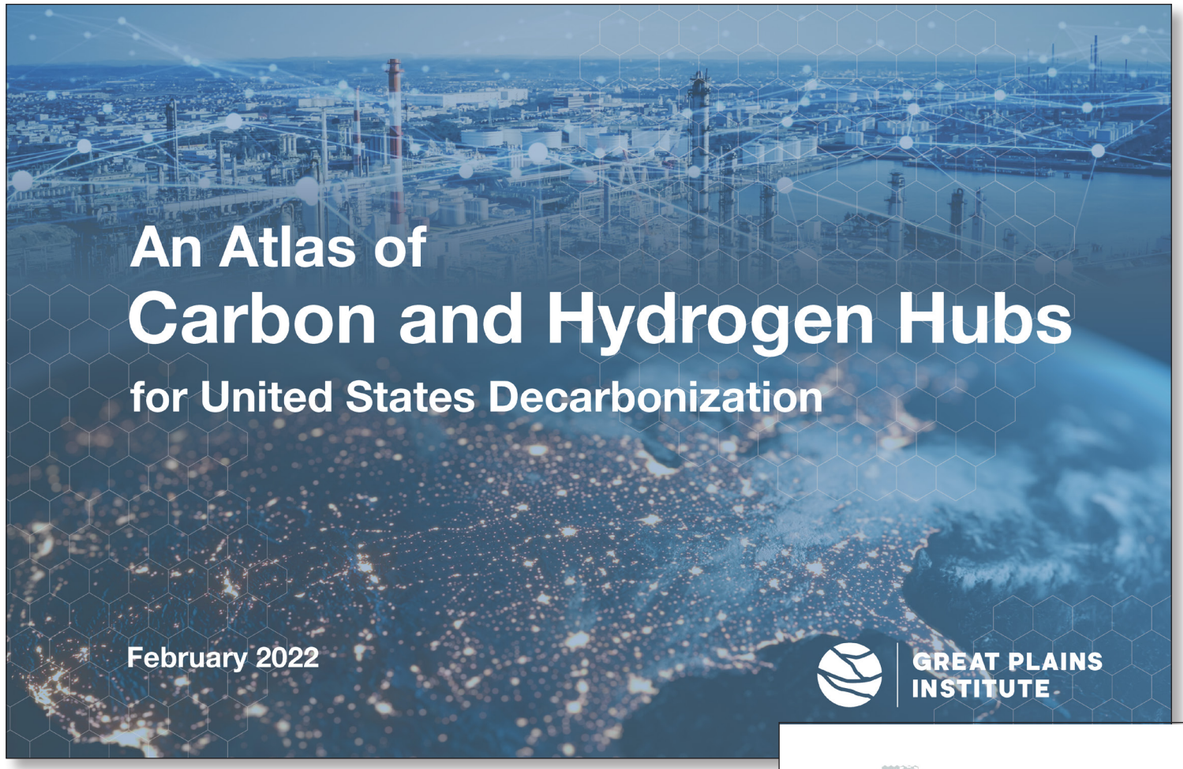
- Existing CO_2 pipelines
- Natural gas pipelines



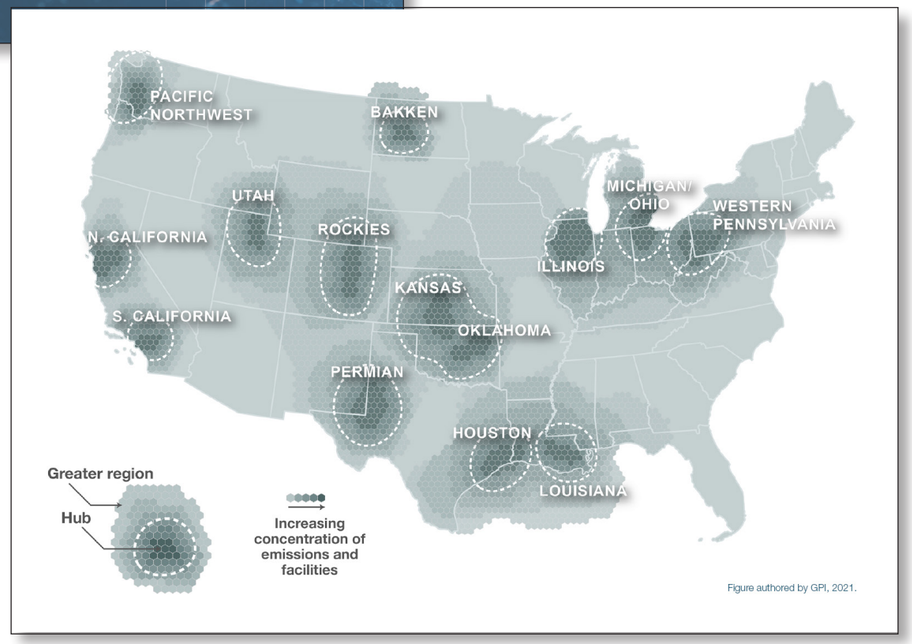
Kansas is centrally located between areas of rich geologic storage resource and existing CO_2 utilization. This offers potential for the state to become a nexus of long-distance CO_2 transport corridors under future scenarios where major CO_2 capture, transport, and storage occurs in accordance with US decarbonization goals. The state of Kansas has 14 miles of existing CO_2 pipeline, and unlike most other states, is adjacent to a major concentration of the nation's existing CO_2 pipelines.

- Existing CO_2 pipelines
- Hydrocarbon gas liquids pipelines
- Petroleum pipelines

GPI's Atlas of Carbon and Hydrogen Hubs



Download the report at carboncaptureready.org



About the Great Plains Institute

A nonpartisan, nonprofit organization, the Great Plains Institute (GPI) is transforming the energy system to benefit the economy and environment. Working across the US, we combine a unique consensus-building approach, expert knowledge, research and analysis, and local action to find and implement lasting solutions. Our work strengthens communities and provides greater economic opportunity through creation of higher paying jobs, expansion of the nation's industrial base, and greater domestic energy independence while eliminating carbon emissions.

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