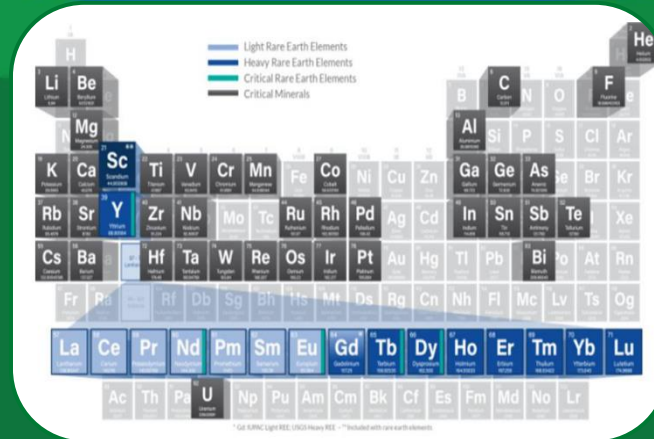


## FECM REGIONAL NARRATIVES

*FECM equities in support of regional efforts to build clean energy and industrial economies*

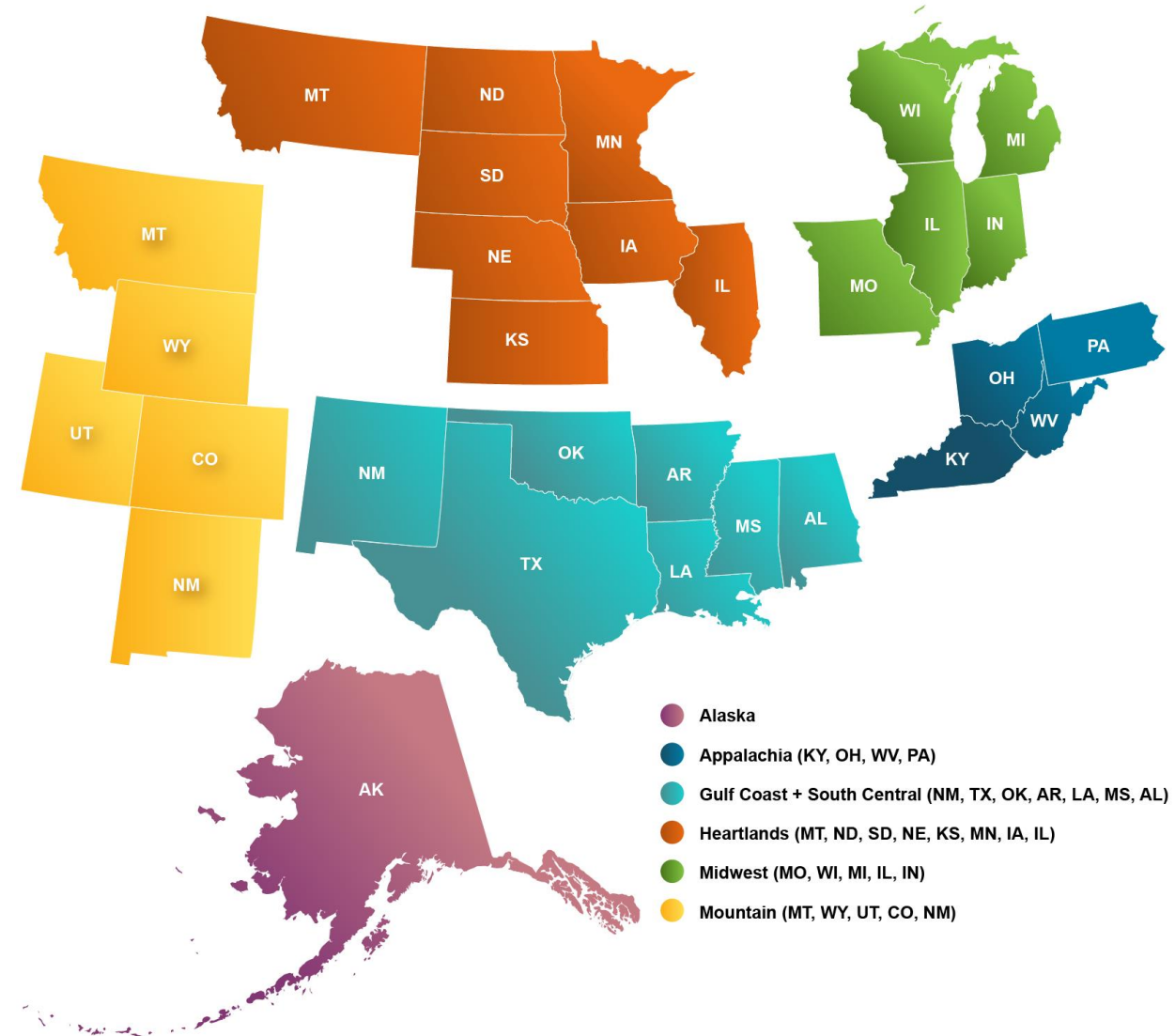
November 2024



## REGIONAL NARRATIVES

## CURATING FECM+ EQUITIES TO BEST SUPPORT REGIONS

- Unique context (energy mix, industry mix, infrastructure, resources) of each region
- How FECM+ technology portfolio supports current energy plans and targets
- Focus on energy producing and industrial regions
- Maps to visualize infrastructure sharing and ecosystem opportunities
- Regional Dialogues and improved stakeholder engagement



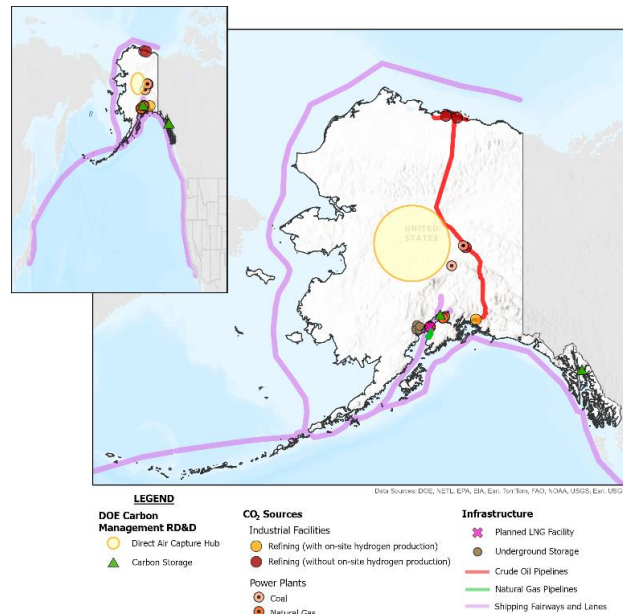


# REGIONAL NARRATIVES

## REGIONS HAVE DIFFERENT INDUSTRIES AND OPPORTUNITIES

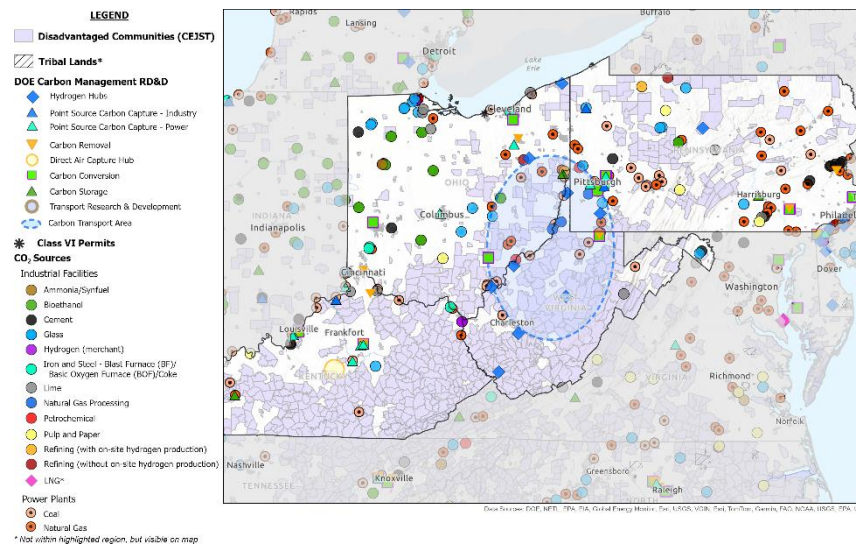
### Alaska and International Trade in CO<sub>2</sub>

Strategically located and resource rich in oil, natural gas, coal, and critical minerals, with high potential for geological storage. Net exporter of oil, with one quarter of the state's employment in the oil industry.



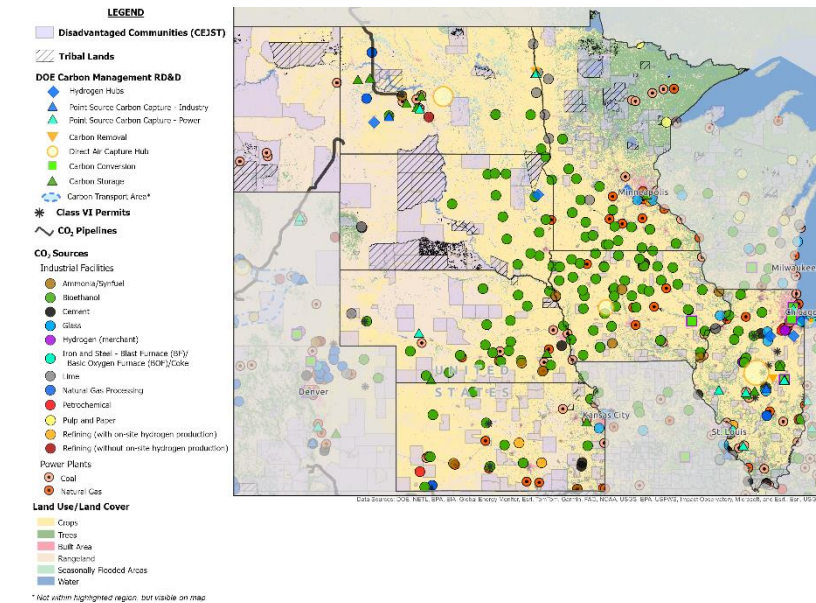
### Redeveloping Appalachia

37% of energy consumption is in clustered, industrial high temperature industries incl. BF/BOF steel, lime, glass, chemicals. Second largest natural gas producer, and 70% of U.S. coal mines are in Appalachia. Large number of disadvantaged communities.



### Diversifying Rural Heartlands Agriculture economy

Agriculture economy large bioethanol industry producing 73% of U.S. bioethanol, and expanding fertilizer sector (17 awardees of USDA fertilizer expansion program)



## REGIONAL NARRATIVES

# SIX REGIONAL NARRATIVES IN DEVELOPMENT

### Appalachia (WV, OH, PA, KY)

<b>92%</b> 2022 Energy Mix is Fossil Energy	<b>37%</b> 2022 Sector Energy Consumption is Industrial
<b>34%</b> 2022 U.S. Gas Production	<b>70%</b> 2022 U.S. Coal Mines

\*23% 2023 electricity mix nuclear and renewables

### Heartlands (MT, ND, SD, NE, KS, MN, IA, IL)

<b>80%</b> of 2022 Energy Mix is Fossil Energy*	<b>38%</b> of 2022 Sector Energy Consumption is Industrial
<b>48%</b> 2022 U.S. estimated recoverable coal reserves	<b>73%</b> 2023 U.S. fuel ethanol capacity

\*60% of 2023 electricity mix nuclear and renewables

### Midwest (IL, IN, MI, WI, MO)

<b>83%</b> of 2022 Energy Mix Fossil Energy	<b>30%</b> of 2022 Sector Energy Consumption Industrial
<b>70%</b> U.S. pig iron producing capacity	<b>1.1 tcf</b> of underground storage

\*40% of 2023 electricity mix nuclear and renewables

## Scope of 6 Regional Narratives (27 states)

### U.S. 2022 Fossil Energy Production

- 98% of coal production
- 99% of natural gas production
- 97% of crude oil production

### U.S. Industrial Facilities

- 95% of bioethanol plants
- 99% of petrochemical plants
- 86% of ammonia plants
- 78% of refineries
- 100% of BF-BOF steel plants
- 100% of soda and ash plants
- 82% of lime
- 64% of cement plants
- 61% of glass plants
- 46% of pulp and paper

### Most Critical Materials Regions in U.S.

### Alaska

<b>98%</b> 2022 Energy Mix is Fossil Energy	<b>59%</b> 2022 Sector Energy Consumption is Industrial
<b>#1</b> CO <sub>2</sub> storage potential west coast U.S.	<b>49/50</b> Critical Minerals

\*23% 2023 electricity mix renewables

### Mountain (MT, UT, WY, CO, NM)

<b>102%</b> of 2022 Energy Mix Fossil Energy*	<b>32%</b> 2022 Sector Energy Consumption Industrial
<b>52%</b> 2022 U.S. coal production	<b>21%</b> of 2022 U.S. crude production

\*34% electricity mix renewables

### Gulf Coast + South Central (NM, TX, LA, AR, OK, MS, AL)

<b>91%</b> 2022 Energy Mix is Fossil Energy*	<b>52%</b> 2022 Sector Energy Consumption is Industrial
<b>75%</b> 2022 U.S. crude production	<b>54%</b> of 2022 U.S. natural gas production

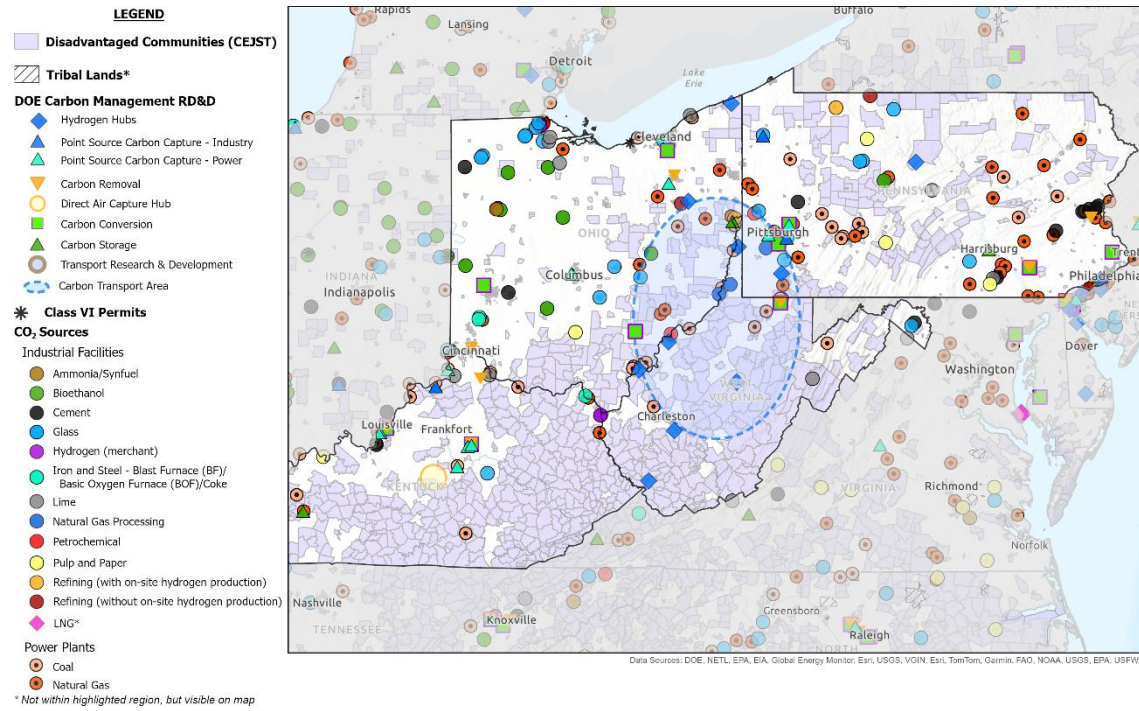
\*34% of 2023 electricity mix nuclear and renewables



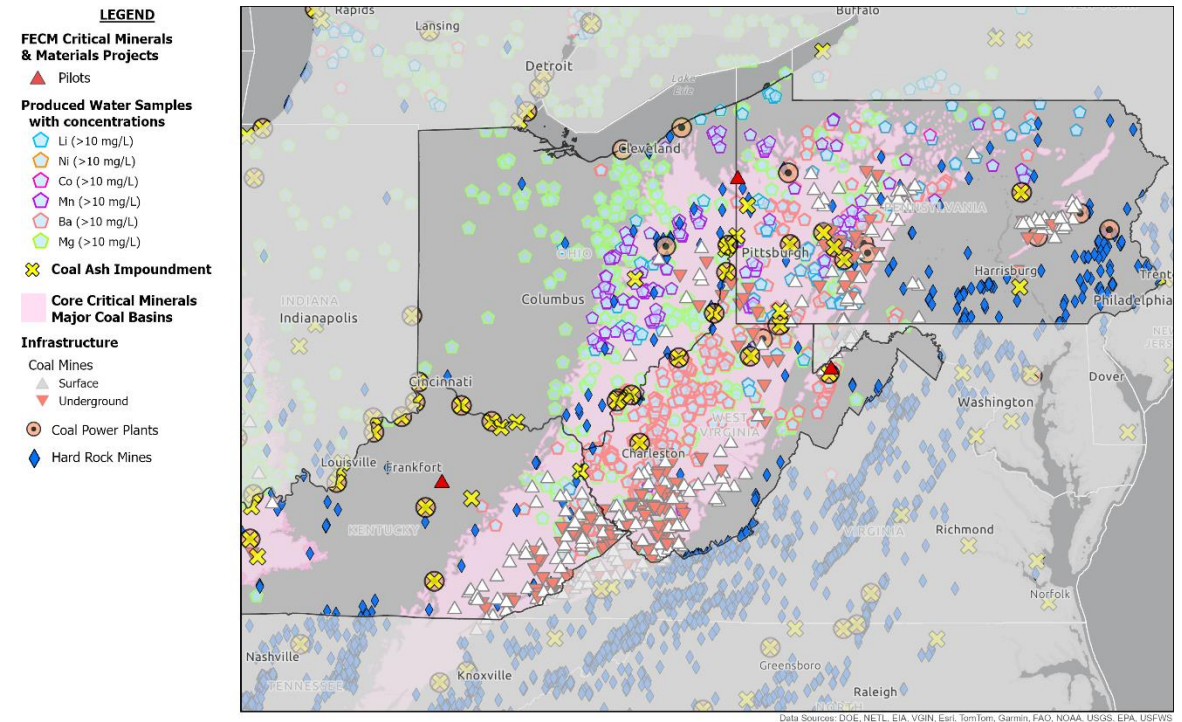


# APPALACHIA (KY, OH, PA, WV) - RETOOLING AN INDUSTRIAL REGION POWERED BY FOSSIL ENERGY FOR A NET-ZERO ECONOMY

*Clustered facilities spanning multiple industries, close to disadvantaged communities, that could share carbon management infrastructure creating the opportunity for competitive lower carbon products and supporting high-wage jobs, communities, and regional supply chains.*



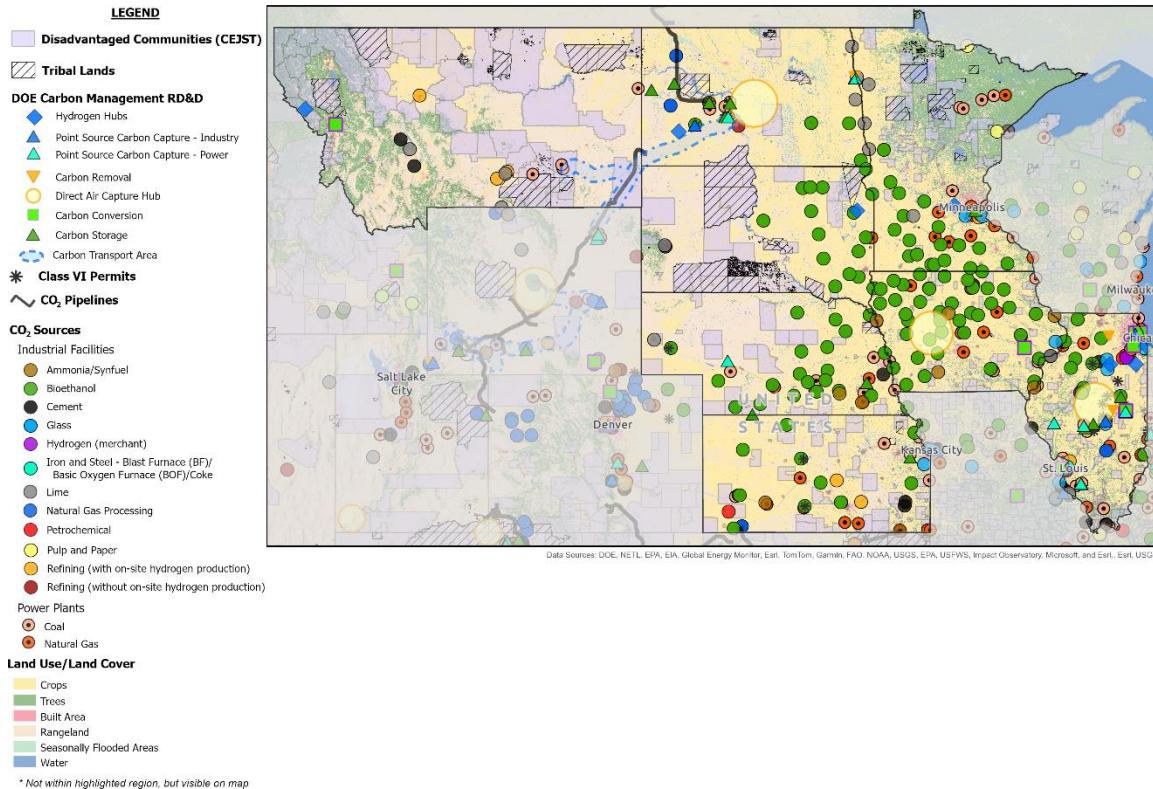
*With 70% of U.S. coal mines and as the second largest onshore gas producer, Appalachia is well positioned to produce critical minerals and materials from coal and energy and mining waste streams (e.g., coal ash, acid mine drainage, and produced water) while remediating land and water.*



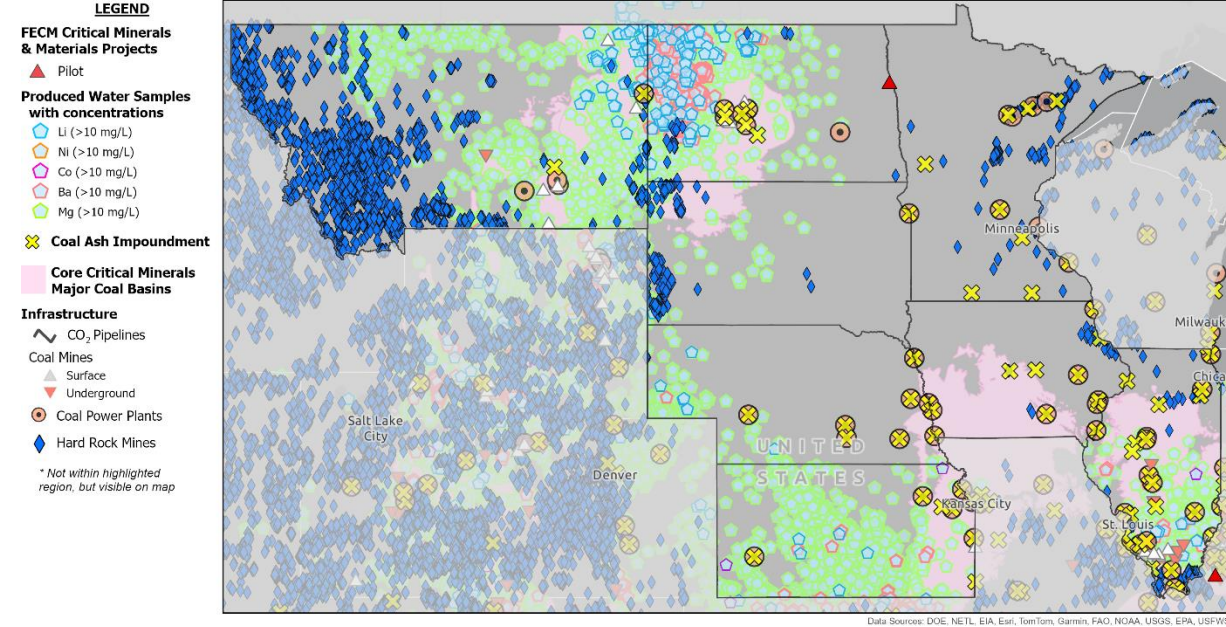


# HEARTLANDS (MT, ND, SD, NE, KS, MN, IA, IL) - DIVERSIFYING A RURAL AGRICULTURE ECONOMY

***With 73% of the U.S. bioethanol capacity, there is the opportunity for the development of shared carbon management infrastructure to reduce bioethanol emissions and support new areas, e.g., SAF, use of waste and perennial, cover, and purpose-grown crops for low carbon fuels and chemicals***



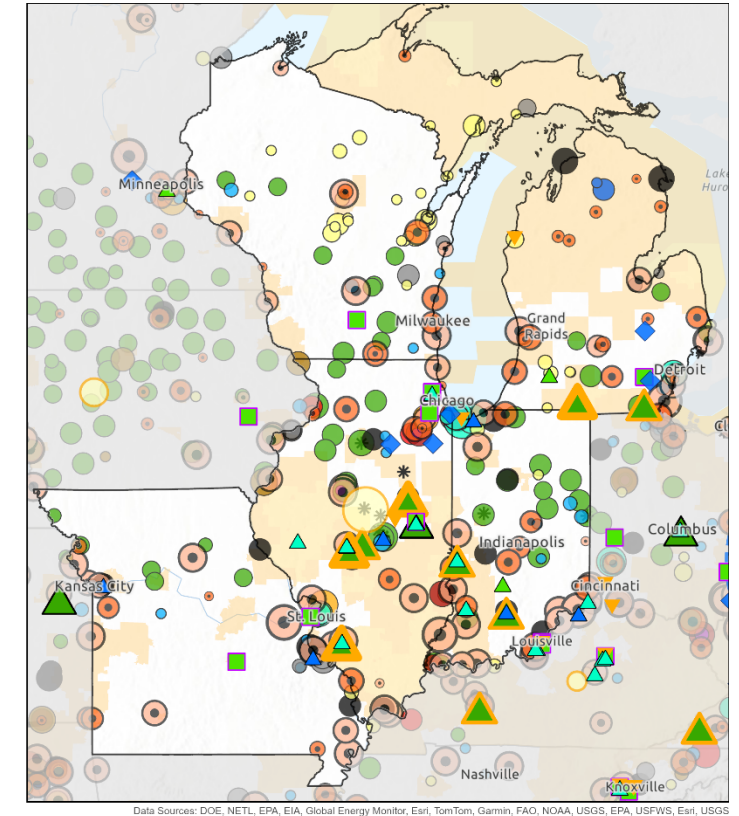
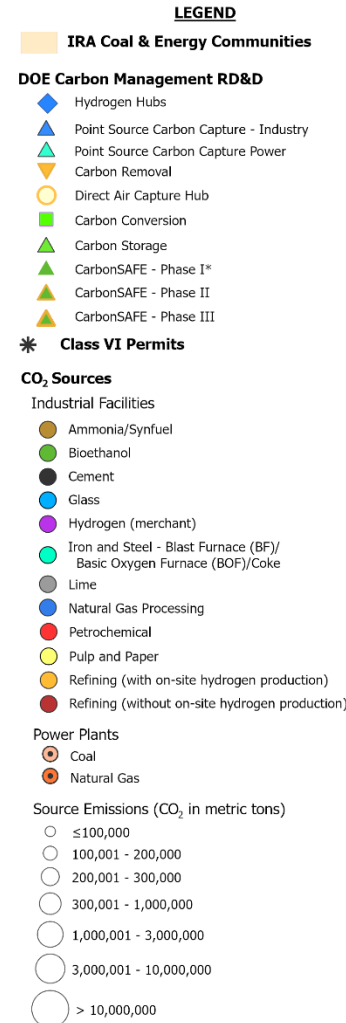
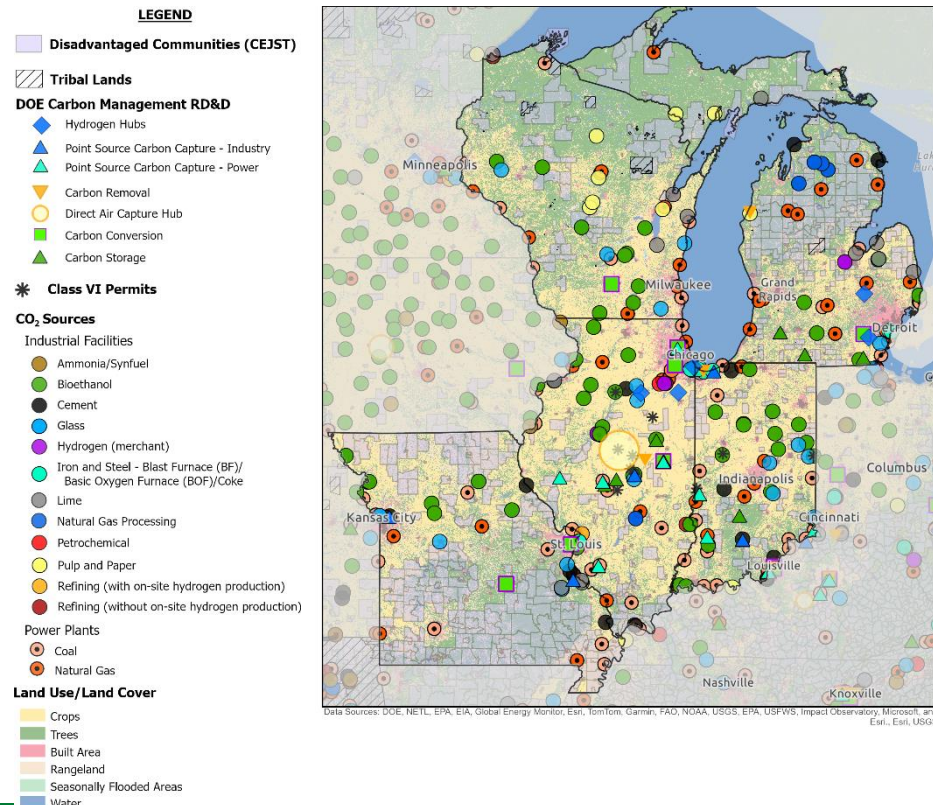
***With 48% of the U.S. recoverable coal reserves and the 3<sup>rd</sup> largest crude producer, the Heartland Region has the opportunity to produce rare earth elements and critical minerals from coal, coal ash, produced water, acid mine drainage, and other energy and mining waste streams.***





# MIDWEST (IL, IN, WI, MI, MO) – THE EVOLUTION OF AN INDUSTRIAL MANUFACTURING AND TRANSPORT CENTER

***A significant concentration of industrial facilities (e.g., 70% of U.S. pig iron capacity) creates the potential for shared carbon management infrastructure and the opportunity to produce low carbon fuels and chemicals as this region transitions its manufacturing to thrive in a low carbon economy.***



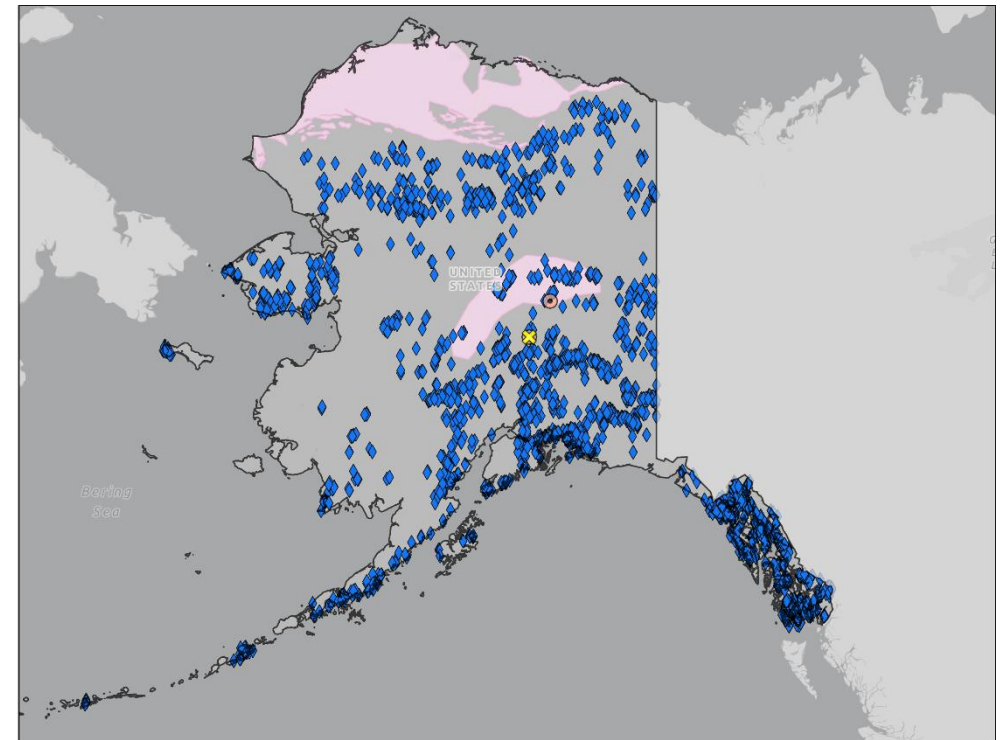
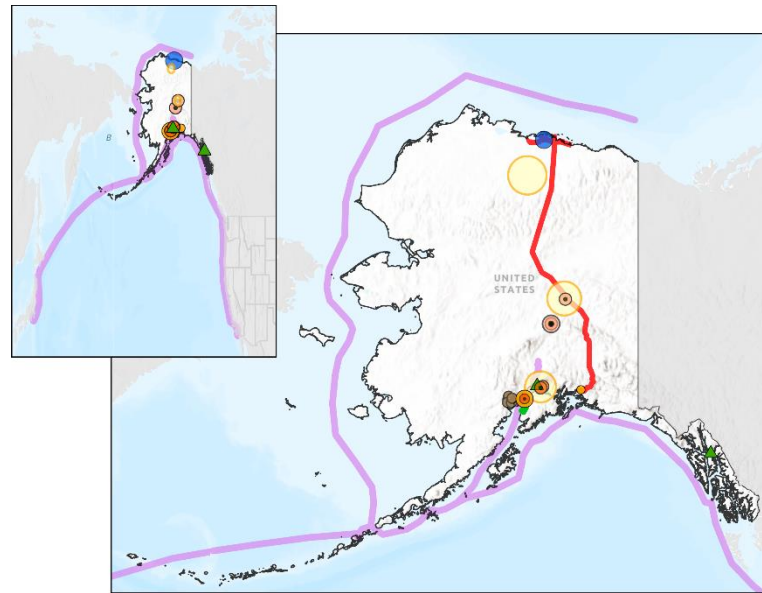
***Abundant CO<sub>2</sub> storage resources close to industry and power emitters, a skilled industrial workforce, and financial incentives, make this an attractive region for storing CO<sub>2</sub> emissions from industry***



# ALASKA – STRATEGICALLY LOCATED ENERGY PRODUCING AND EXPORTING STATE WITH A WEALTH OF NATURAL RESOURCES

*Alaska's significant CO<sub>2</sub> storage potential, established energy trade, and proximity to Asia could be leveraged to import CO<sub>2</sub> and provide storage services to other markets. As the fourth largest producer of natural gas in the U.S. (but only 10% marketed), international trade is also an opportunity for the stranded natural gas in the North Slope*

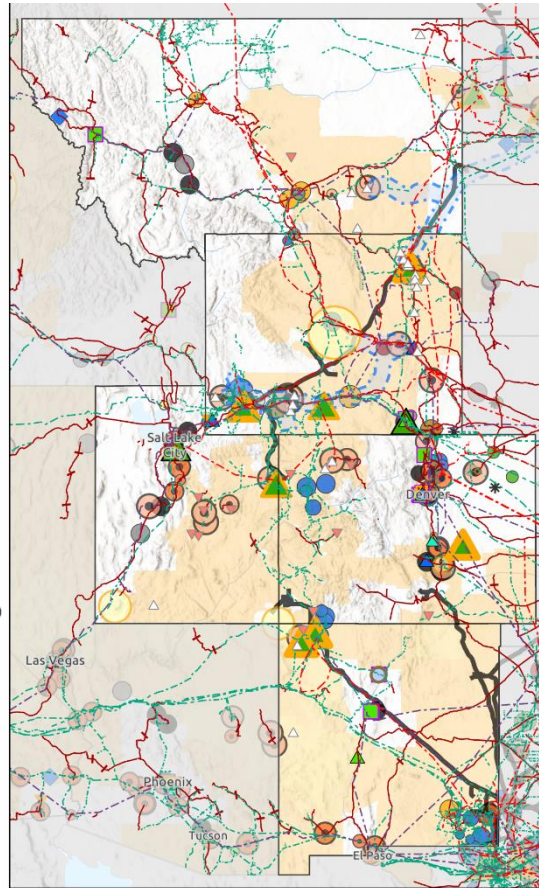
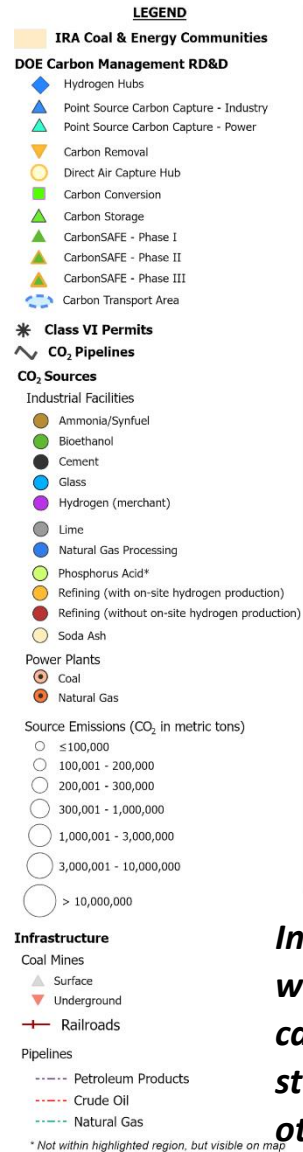
*With Alaska home to 49 of the 50 critical minerals, Alaska has the opportunity to play a key role in establishing a domestic critical minerals supply chain from its rock mines, mining waste, and coal resources*





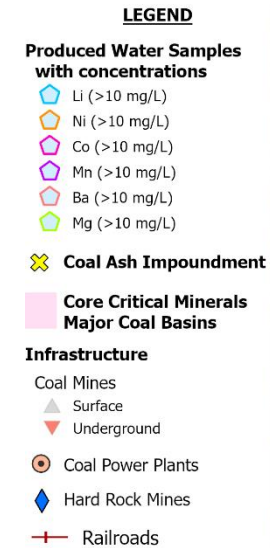
# MOUNTAIN (MT, WY, UT, CO, NM) –

STRATEGICALLY  
LOCATED AND  
NET EXPORTER  
OF OIL, GAS,  
COAL, AND  
ELECTRICITY

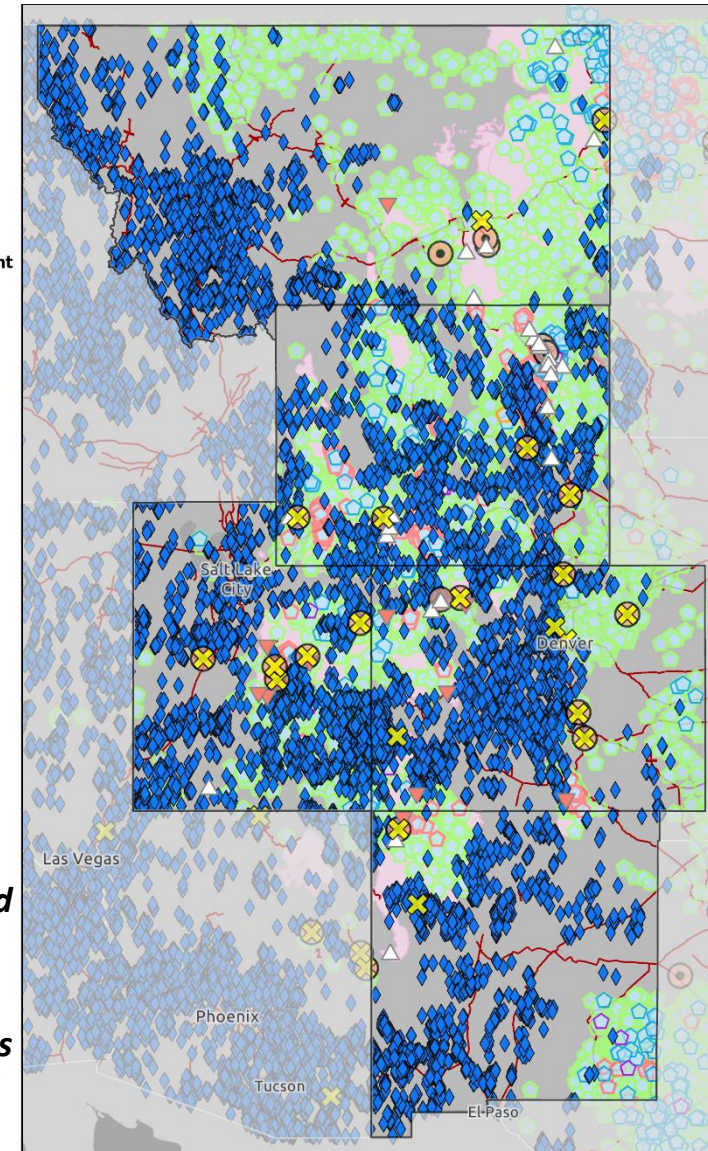


Data Sources: DOE, NETL, EIA, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS, Esri, USGS

**Industrial facilities and mining sites well-connected, existing energy export capabilities, and significant geologic storage potential to store CO<sub>2</sub> from other regions, make this a competitive region for shared infrastructure and CO<sub>2</sub> storage hubs.**



**With 52% of U.S. coal production and hundreds of hard rock mines, the Mountain region is well positioned to produce rare earth elements and critical minerals from coal, hard rock mines, and their waste streams while remediating land and water.**



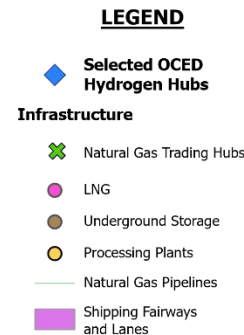
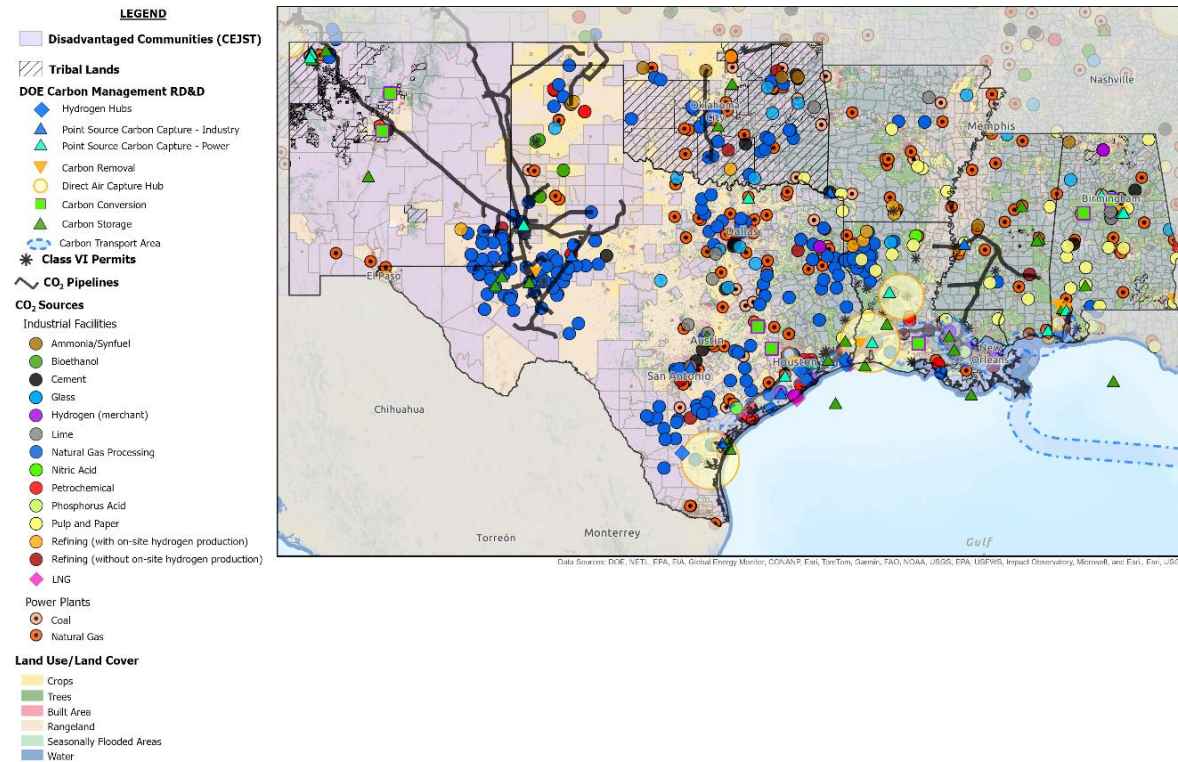
Data Sources: DOE, NETL, EIA, Esri, TomTom, Garmin, FAO, NOAA, USGS, EPA, USFWS



# GULF COAST AND SOUTH CENTRAL (NM, TX, LA, OK, AR, MS, AL)– LEVERAGE GLOBAL ENERGY TRADE AND CAPABILITY CENTER

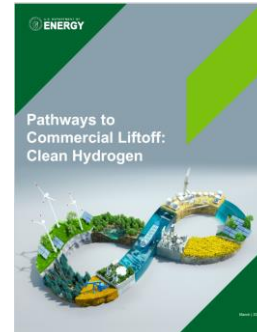
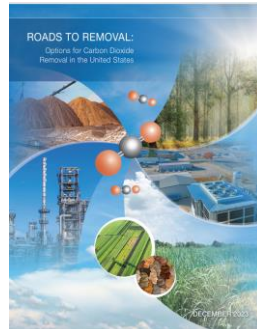
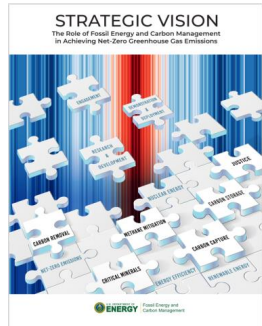
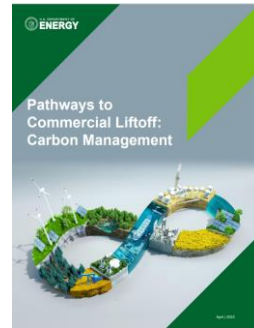
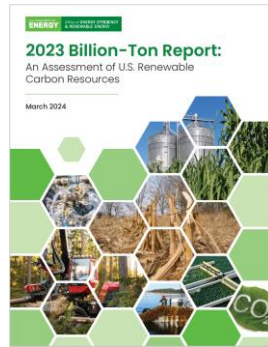
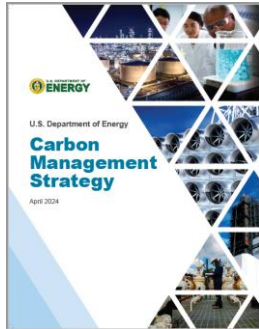
**Abundant CO<sub>2</sub> storage resources and existing energy infrastructure close to emitting industries (incl. 88% of chemical facilities and 46% of refineries in the U.S.), and extensive skilled energy workforce can be leveraged to make this one of the most competitive regions (\$/ton of CO<sub>2</sub>) for storing CO<sub>2</sub>.**

**Reducing methane emissions of the natural gas supply chain is critical to LNG trade and low carbon hydrogen/ammonia production in the Gulf Coast. The existing LNG export and international trade infrastructure will enable the global trade of low carbon hydrogen/ammonia.**



# REGIONAL NARRATIVES INDUSTRIAL DECARBONIZATION AND CARBON MANAGEMENT CROSS-CUTS

## Department of Energy Research and Publications



**+ future  
reports**



### Hydrogen Shot™

Accelerate innovation and spur demand of clean hydrogen by reducing the cost by 80%, to \$1 per 1 kilogram of clean hydrogen within 1 decade.



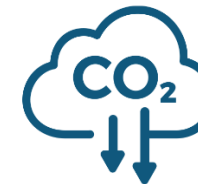
### Clean Fuels & Products Shot™

Decarbonize the fuel and chemical industry through alternative sources of carbon to advance cost-effective technologies.



### Industrial Heat Shot™

Develop cost-competitive industrial heat decarbonization technologies with at least 85% lower greenhouse gas emissions by 2035.



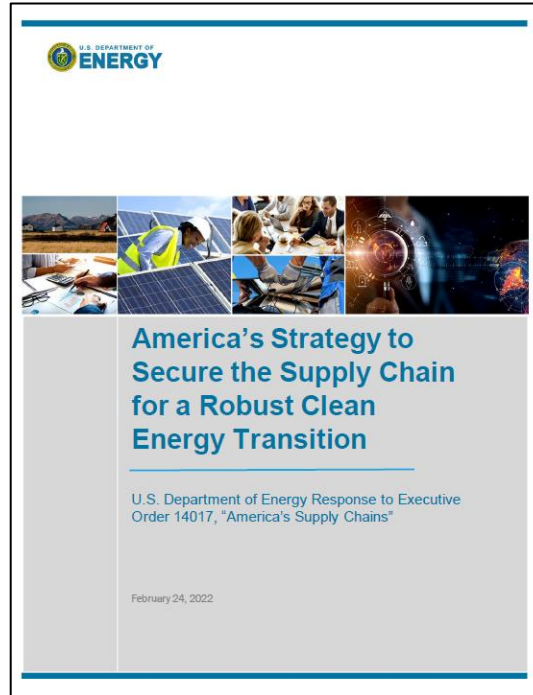
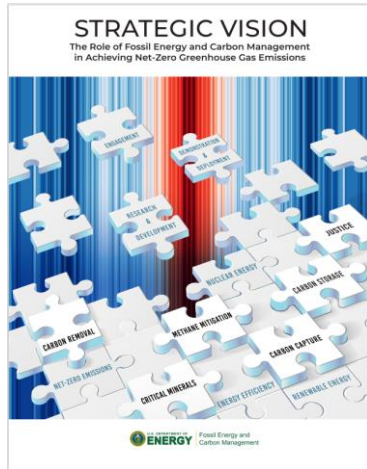
### Carbon Negative Shot™

Remove CO2 from the atmosphere and durably store it at meaningful scales for less than \$100/net metric ton of CO<sub>2</sub>-equivalent within a decade.



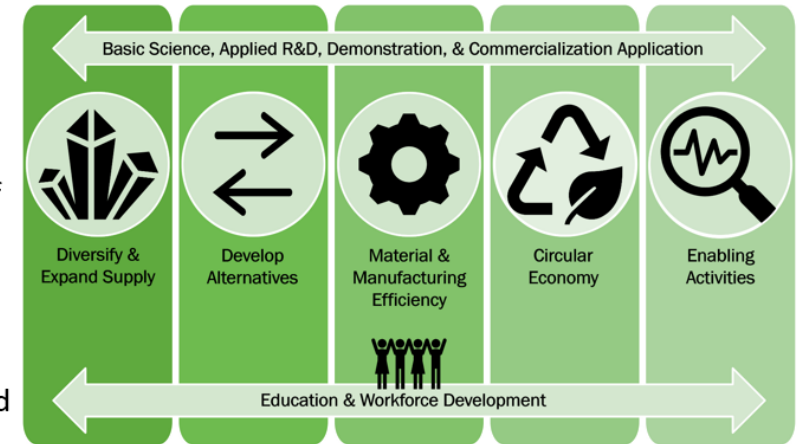
# REGIONAL NARRATIVES

## CRITICAL MINERALS CROSS-CUTS



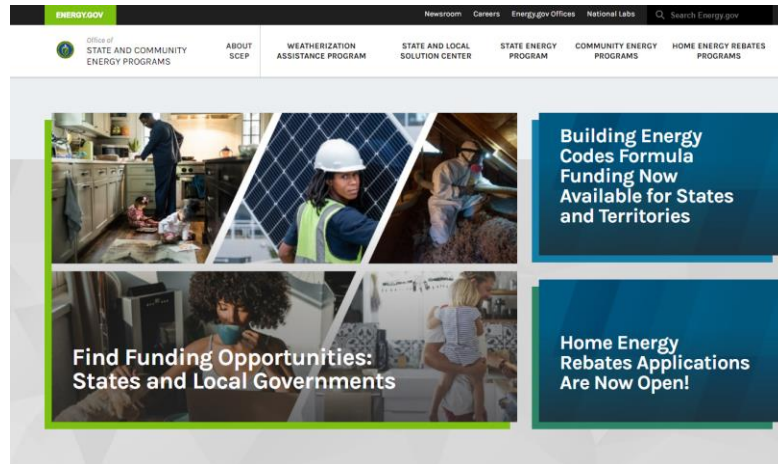
### DOE Critical Minerals/Materials (CMM) Vision & Strategy

- Reliable, resilient, affordable, diverse, sustainable, and secure **domestic critical mineral and materials supply chains**.
- Support the clean energy transition and decarbonization of the energy, manufacturing, and transportation economies.
- Promote safe, sustainable, economic, and environmentally just solutions to meet current and future needs.



# REGIONAL NARRATIVES REGIONAL CROSS-CUTS

## SCEP and REDI



## White House Environmental Justice Advisory Council



## Regional and Hub Initiatives



## Carbon Management Regional Initiative





## REGIONAL NARRATIVES

# ROLL-OUT APPROACH – DEPLOY DIALOGUES AND IN COLLABORATION WITH OFFICES WITH EQUITIES IN THE REGIONS

## Alaska USEA Regional Workshop

May 7-8, Industrial  
Decarbonization

May 9<sup>th</sup> Critical Minerals

## Appalachia Deploy Dialogues

July 17<sup>th</sup> Critical Minerals

Aug 6<sup>th</sup> Industrial Decarb.

Aug 7<sup>th</sup> Networked Infrastructure

*... future  
dialogues  
+ mapping  
tools*

## Target Audience

- Industry (facility owners, service providers) who will invest and deploy the technologies in the region
- Regional workforce (including labor) who work in the industries in scope and in energy and mining
- Regional and local government who can establish enabling policies
- Representation from the communities in the region

## DOE Announces Demonstrate Deploy Decarbonize 2024

MARCH 19, 2024

Loan Programs Office » DOE Announces Demonstrate Deploy Decarbonize 2024





U.S. DEPARTMENT OF  
**ENERGY**

# Thank you

Regional Reports: Building a Clean Energy and Industrial Economy and the Supporting Role of DOE's Office of Fossil Energy and Carbon Management | Department of Energy

## Regional Reports: Building a Clean Energy and Industrial Economy and the Supporting Role of DOE's Office of Fossil Energy and Carbon Management

JULY 8, 2024

Office of Fossil Energy and Carbon Management

Regional Reports: Building a Clean Energy and Industrial Economy and the Supporting Role of DOE's Office of Fossil Energy and Carbon Management

### Overview

The U.S. Department of Energy's Office of Fossil Energy and Carbon Management (FECM) is developing a series of regional reports to highlight carbon management and resource sustainability decarbonization solutions in fossil energy—coal, oil, and gas—producing and industrial regions. Each report references the specific region's unique energy and industry mix, local energy resources, and current initiative and priorities, and aligns them with FECM's research, development, and demonstration portfolio to curate relevant solutions.

The six regions covering 27 states account for 98% of coal, 99% of natural gas, and 97% of U.S. oil production. They also host a significant share of hard-to-abate industries, including almost all petrochemical, blast furnace basic oxygen furnace steel, soda and ash, and ethanol facilities; over 80% of lime and ammonia; almost 80% of refineries, and over 60% of cement and glass facilities. Additionally, these regions hold most of the potential to produce critical minerals and materials from carbon ore or energy (e.g., coal and produced water) wastes.

The following map provides an overview of the regions identified in the various FECM Regional Reports. Additional information will be forthcoming as the reports are finalized.



DOWNLOAD THE REPORT(S) AND SUPPLEMENTAL FACT SHEETS