Carbon Capture Coalition: Update on Activities and CO_2 Transport Infrastructure

17th Annual EOR Carbon Management Workshop
Midland, Texas
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We have an Urgent, Time-Limited Window of Opportunity to Achieve Economywide Deployment of Carbon Capture by Midcentury

- Deployment of carbon capture to meet emissions reduction goals requires a critical mass of capture projects across industry sectors and associated pipeline infrastructure by 2030 in order to scale economywide by 2050.
- Yet, the federal 45Q tax credit expires at the end of 2023, by which time projects must begin construction.
- We are pursuing a three-part strategy in response to this challenge:
  1. Enact a broader federal policy portfolio to leverage 45Q in financing and de-risking projects, while extending the credit beyond 2023;
  2. Engage state officials and key industry, labor and NGO stakeholders to make states “carbon capture ready” by adopting policies to complement 45Q and maximize near-term deployment; and
  3. Catalyze development and expansion of new and existing regional carbon capture, transport, use and storage hubs.

CARBON CAPTURE COALITION

STATE CARBON CAPTURE WORK GROUP

REGIONAL CARBON CAPTURE DEPLOYMENT INITIATIVE

"All hands on deck" to achieve economywide deployment of carbon capture in the U.S.

CARBON CAPTURE COALITION

Unprecedented National Coalition in U.S. Energy & Climate Policy

- ~75 energy, industrial and technology companies, unions and environmental and clean energy NGOs.
- Supports innovation and deployment across all energy resources and industry sectors.
- **Goal**: achieve economywide deployment of carbon capture from industrial facilities, power plants and ambient air to reduce carbon emissions, support domestic energy and industrial production, and create high-wage jobs.

Participants

- Accelergy
- AFL-CIO
- Air Liquide
- Air Products
- AK Steel
- American Carbon Registry
- ArcelorMittal
- Arch Coal
- Archer Daniels Midland Co.
- Baker Hughes, a GE Company
- Bipartisan Policy Center
- Carbon180
- Carbon Wrangler LLC
- Center for Climate and Energy Solutions
- Citizens for Responsible Energy Solutions Forum
- Clean Air Task Force
- ClearPath Foundation
- Cloud Peak Energy
- Conestoga Energy Partners
- Core Energy LLC
- EBR Development LLC
- EnergyBlue Project
- Energy Innovation Reform Project
- Glenrock Petroleum
- Great River Energy
- Greene Street Capital
- Impact Natural Resources LLC
- ION Engineering LLC
- International Brotherhood of Boilermakers
- International Brotherhood of Electrical Workers
- Jackson Hole Center for Global Affairs
- Jupiter Oxygen Corporation
- Lake Charles Methanol
- LanzaTech
- Linde LLC
- Mitsubishi Heavy Industries America, Inc.
- National Audubon Society
- National Farmers Union
- National Wildlife Federation
- NET Power
- New Steel International, Inc.
- NRG Energy
- Occidental Petroleum Corporation
- Pacific Ethanol
- Peabody
- Prairie State Generating Company
- Praxair, Inc.
- Renewable Fuels Association
- Shell
- SMART Transportation Division (of the Sheet Metal, Air, Rail and Transportation Workers)
- Summit Power Group
- Tenaska Energy
- The Nature Conservancy
- Third Way
- Thunderbolt Clean Energy LLC
- United Mine Workers of America
- United Steel Workers
- Utility Workers Union of America
- White Energy
- Wyoming Outdoor Council

Observers

- Algae Biomass Organization
- Biomass Power Association
- Carbon Engineering
- Carbon Utilization Research Council
- Cornerpost CO2 LLC
- Enhanced Oil Recovery Institute, University of Wyoming
- Environmental Defense Fund
- Growth Energy
- Institute of Clean Air Companies
- Melzer Consulting
- Tellus Operating Group
- World Resources Institute

To learn more and view our complete membership list, visit www.carboncapturecoalition.org.

Carbon Capture Coalition and Partners Marshaled Unparalleled Bipartisan Support for Reform of the 45Q Tax Credit

Key Reforms to 45Q Tax Credit

Increases credit values to US$ 35 and 50 per metric ton.

Expands eligibility to include other beneficial uses of captured carbon (in addition to EOR), projects that capture CO and direct air capture projects.

Creates **greater financial certainty** by lifting the credit cap and providing clear timing for eligibility

Expands eligibility to more industries by lowering the annual carbon capture threshold and expanding definitions for qualified facilities and qualified carbon.

Enables the owner of the capture equipment to transfer the credit to another party that stores the CO_2 or puts CO_2 or CO to beneficial use.

45Q Tax Credit Amount: Depends on Project Type

There is a 10-year ramp up to the following dollar per ton amounts, with the value depending on project type as shown below.

$35/ton

for CO_2 stored geologically through EOR.

$35/ton

for other beneficial uses of CO_2 or CO such as converting carbon emissions into fuels, chemicals, or useful products like concrete.

$50/ton

for CO_2 stored in other geologic formations and not used in EOR.

Shaping U.S. Treasury's 45Q Tax Credit Guidance

February 2018 — Reformed 45Q included in Bipartisan Budget Act

November 2018 — Coalition submits model guidance to Treasury Department

January 2019 — Coalition urges Treasury Department to act swiftly to implement 45Q

June 2019 — Coalition submits additional comments to Treasury Department in response to RFI

December 2019 — Treasury Department expected to release draft rule for 45Q implementation

Key Recommendations

- **Ensure flexible contractual assurance and transferability** of the tax credit.
- **Limit investor risk of credit recapture** by establishing a safe harbor.
- **Define commence construction and continuous construction** for projects to qualify.
- **Provide an equivalent ISO-based monitoring and reporting program** (in addition to the Subpart RR Greenhous Gas Reporting Program) for demonstrating secure geologic storage through CO_2-enhanced oil recovery.

Coalition’s Federal Policy Agenda Going Forward

- **Ensure effective implementation of 45Q by the U.S. Treasury** to provide investment certainty and business model flexibility;
- **Enact a broader portfolio of federal carbon capture policies** to complement 45Q;
- **Incorporate CO_2 pipeline infrastructure into national infrastructure policy**; and
- **Expand and diversify federal R&D, demonstration and deployment funding** for carbon capture, utilization, removal and geologic storage.
- **Ensure inclusion of industrial sectors in federal policy** and eligibility of both CO_2 and CO emissions, where applicable.

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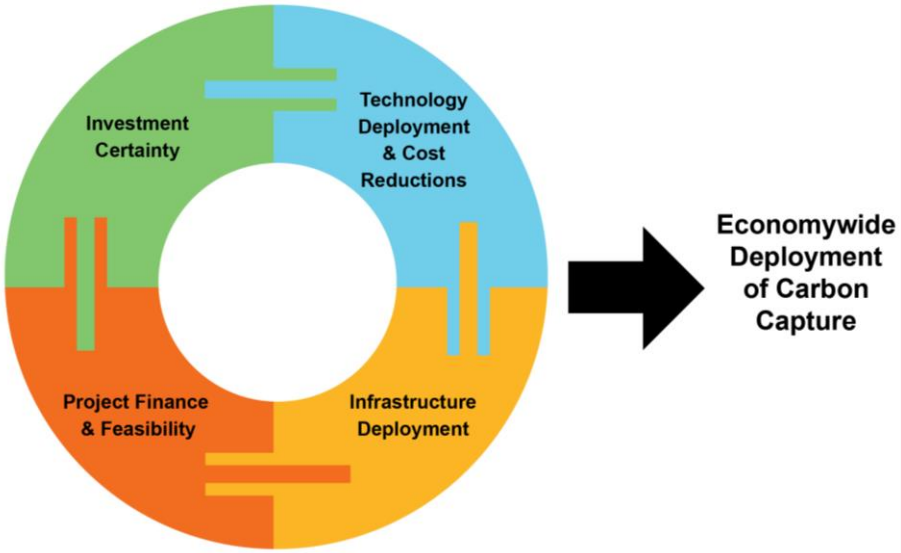
Carbon Capture Coalition's Federal Policy Blueprint

- ✓ Agenda for economywide deployment.
- ✓ Recommends full policy portfolio, similar to current support for wind, solar and other low and zero-carbon technologies.
- ✓ Consensus of Coalition's 70+ companies, unions, and NGOs.



Current Legislation to Enhance and Expand on 45Q Enjoys Broad Political Support in Congress

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Improvements to 45Q and other incentives

- **Extension of 45Q commence construction window (introduced):**
  - House Carbon Capture and Sequestration Extension Act would extend 45Q by one year through 2024.
  - Five majority cosponsors and included in House Ways and Means majority energy tax discussion draft. Coalition requesting parity with 5-year extensions proposed for wind, solar and other technologies. Exploring Senate companion.
- **Direct pay or enhanced transferability to increase monetization of 45Q:**
  - House Ways and Means majority discussion draft proposes direct pay provision for renewable electricity tax credits. Coalition requesting same treatment for 45Q.
  - Senate legislation anticipated to provide enhanced transferability for 45Q.
- **Carbon Capture Modernization Act (introduced):**
  - Corrects design flaws in Section 48A tax credit to enable carbon capture retrofits of existing coal power plants.

Current Legislative Priorities Cont.

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Additional incentives to complement 45Q:

- **Carbon Capture Improvement Act (introduced)**
  - Authorizes use of tax-exempt private activity bonds in financing carbon capture and utilization projects.
- **Financing Our Energy Future Act (introduced)**
  - Makes carbon capture and utilization projects eligible for master limited partnerships (tax advantage of partnerships, with ability to raise equity in public markets).
  - Included in House Ways and Means majority energy tax discussion draft.

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Current Legislative Priorities cont.

Expanding and retooling federal R&D:

- **USE IT Act (passed U.S. Senate)**
  - Supports demonstration of direct air capture and R&D for CO_2 and CO utilization; and
  - Facilitates planning, siting and permitting of CO_2 transport infrastructure.
- **Senate EFFECT & LEADING Acts/House Fossil Energy R&D Act (reported out of House/Senate committees)**
  - Expands and retools U.S. DOE research, development, demonstration and deployment (RDD&D) objectives and programs for carbon capture, utilization, removal and storage.

Clean Industrial Technology Act (reported out of House/Senate committees)

- Establishes Industrial Emissions Reduction Technology Development Program for innovative technologies, including carbon capture.

INVEST CO_2 Act: First-Ever Federal CO_2 Transport Infrastructure Financing Bill Introduced in October

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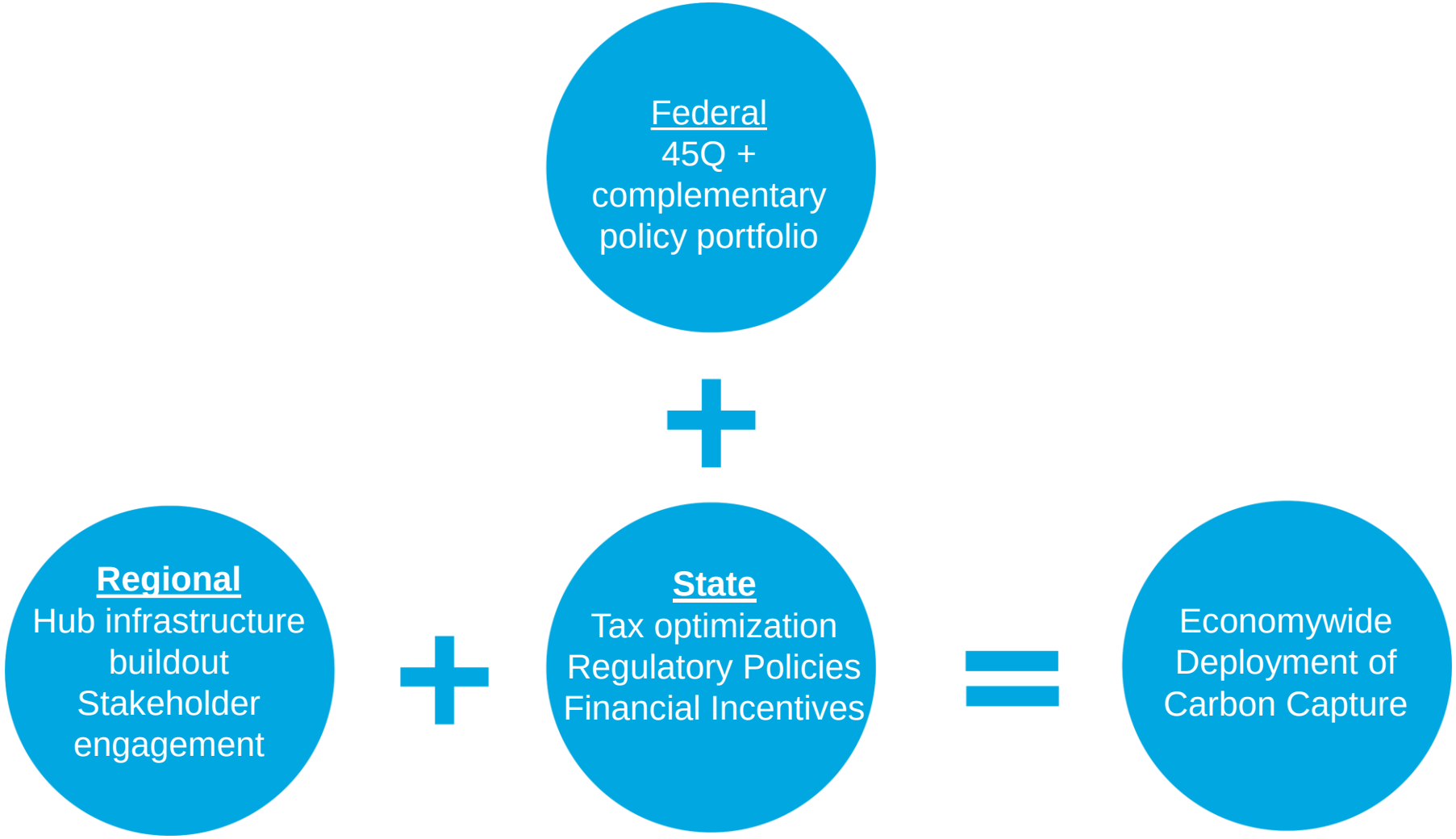
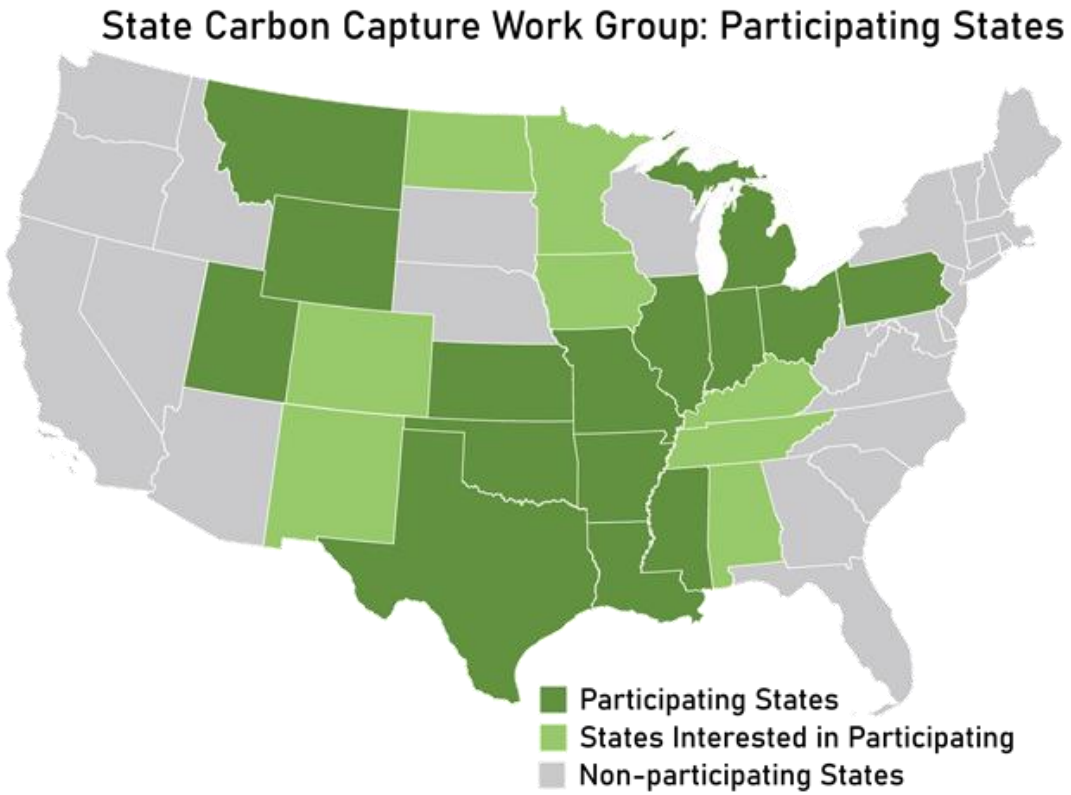
- Rep. Cheri Bustos (D-IL) introduced the **Investing in Energy Systems for the Transport of CO_2 Act of 2019 (INVEST CO_2 Act).**
- Advances key recommendations of the Carbon Capture Coalition's Federal Policy Blueprint:
  - Low-interest federal loans to finance extra pipeline capacity and realize economies of scale;
  - Federally-supported large-volume, long-distance CO_2 trunk lines to support development of key regional hubs; and
  - Encourages state and local governments to designate anthropogenic CO_2 pipelines as "pollution control devices" to enable tax abatement.
- Legislation aims to help enable state/regional efforts to advance specific infrastructure projects.

Integrated Federal-State Policy & Regional Hub Development are Key to Success

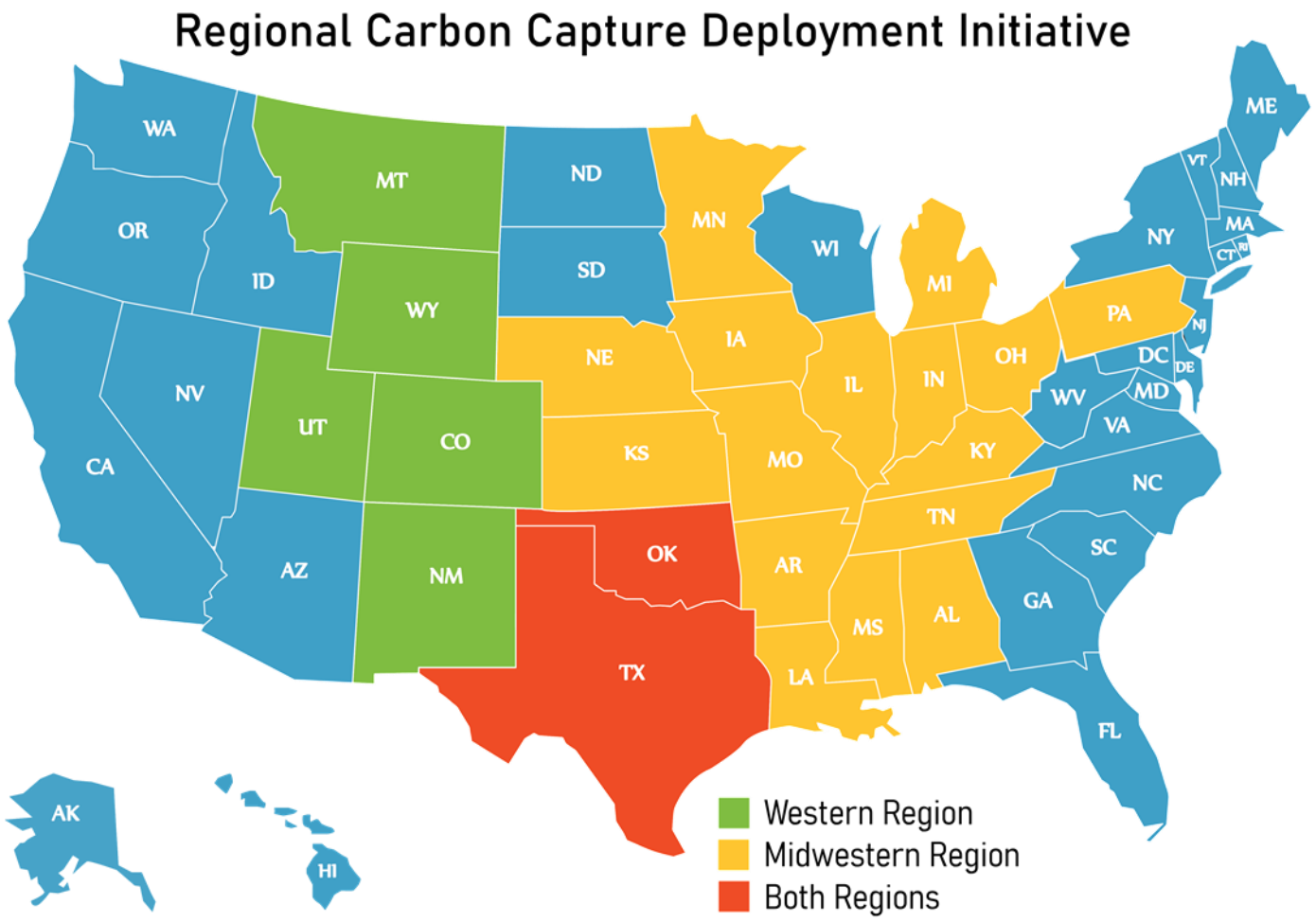


STATE CARBON CAPTURE WORK GROUP



- Formed in 2015 by then Governor Mead (R-WY) and Governor Bullock (D-MT).
- 15 states participating; actively recruiting additional states.
- Work Group launched Midwestern and Western Regional Deployment Initiatives in early 2018.
- **Goal**: Help states become "carbon capture ready" to leverage 45Q through state policy development and planning to support carbon capture and CO_2 project deployment.

Regional Deployment Initiatives: Western & Midwest Regions



REGIONAL CARBON CAPTURE DEPLOYMENT INITIATIVE

Regional Deployment Initiatives: Where We are in the Process

Phase I

Preliminary Analysis (Jan-Sep 2018)

Mapping industrial facilities, power plants and CO_2 storage opportunities, initial cost analysis, and preliminary pipeline modeling.

Phase II

Convening State Officials and Stakeholders (October 2018)

Launched Initiatives in Columbus, OH and Salt Lake City, UT.

Phase III

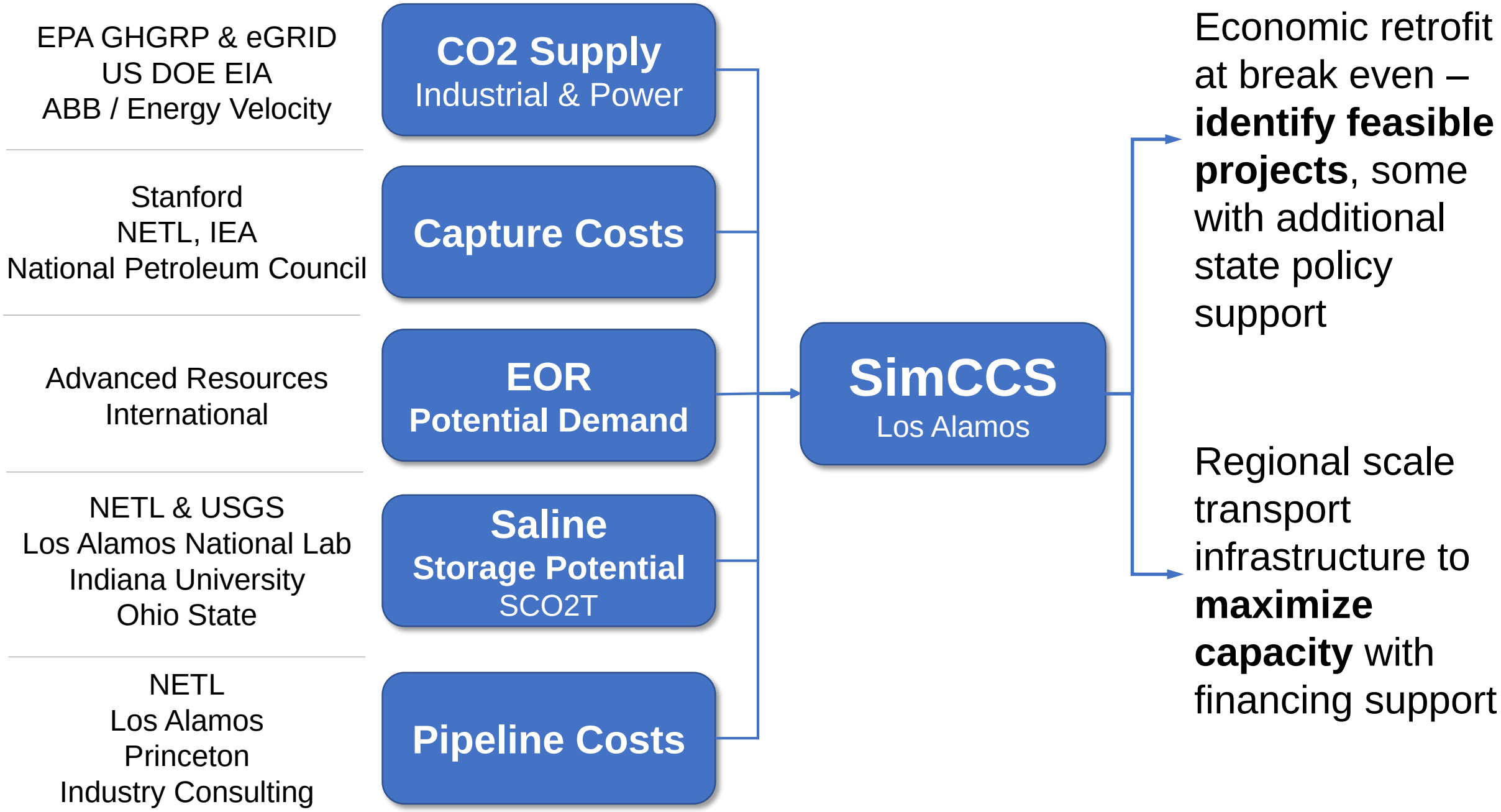
Supporting State Policy Development and Projects (Underway)

Identify candidate projects and state policies to complement 45Q credit.

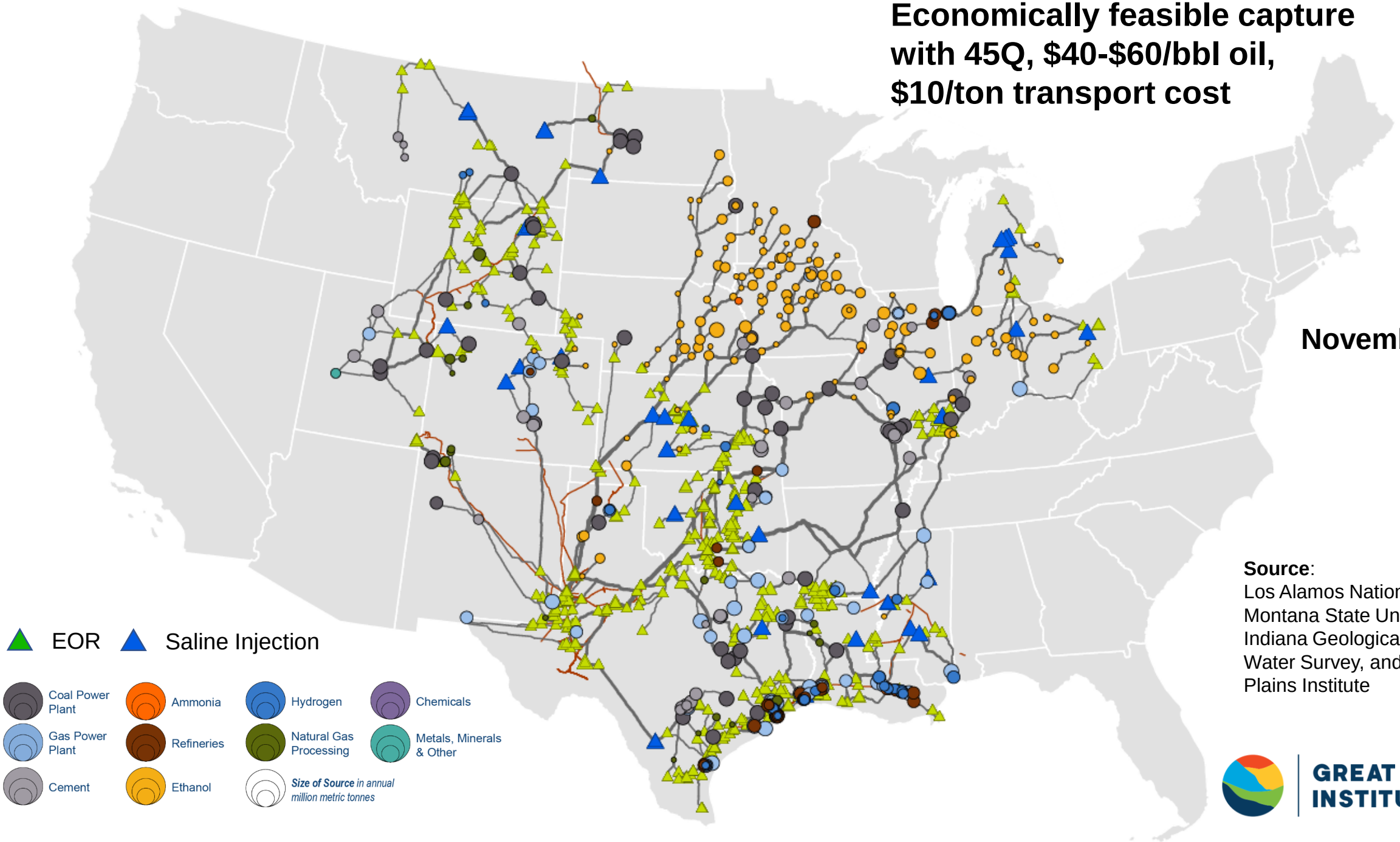
Prepare for 2020 state legislative sessions.

Cooperate regionally on CO_2 transport infrastructure and hub development.

REGIONAL CARBON CAPTURE DEPLOYMENT INITIATIVE


EPA GHGRP & eGRID
US DOE EIA
ABB / Energy Velocity
CO2 Supply
Industrial & Power
Stanford
NETL, IEA
National Petroleum Council
Capture Costs
Advanced Resources
International
EOR
Potential Demand
NETL & USGS
Los Alamos National Lab
Indiana University
Ohio State
Saline
Storage Potential
SCO2T
NETL
Los Alamos
Princeton
Industry Consulting
Pipeline Costs
SimCCS
Los Alamos
Economic retrofit at break even – identify feasible projects, some with additional state policy support
Regional scale transport infrastructure to maximize capacity with financing support

Economically feasible capture with 45Q, $40-$60/bbl oil, $10/ton transport cost



November 2019

Source:
Los Alamos National Lab, Montana State University, Indiana Geological and Water Survey, and Great Plains Institute

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Regional Analysis
White Paper Report: Modeling Results

Spring 2020

- Data sources
- Methodology
- Screening Criteria
- Scenario Development
- Economic and policy drivers
- Results
  - CO2 captured and stored
  - Industry emissions impact
  - Infrastructure investment

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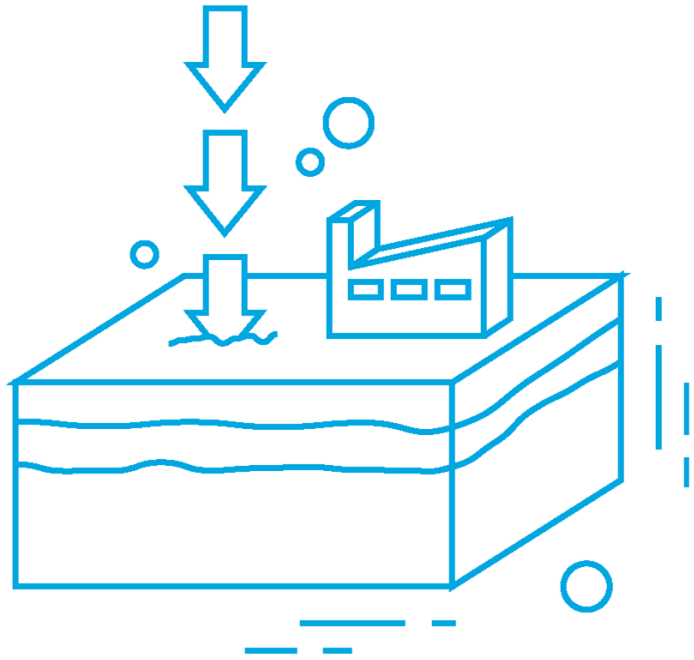
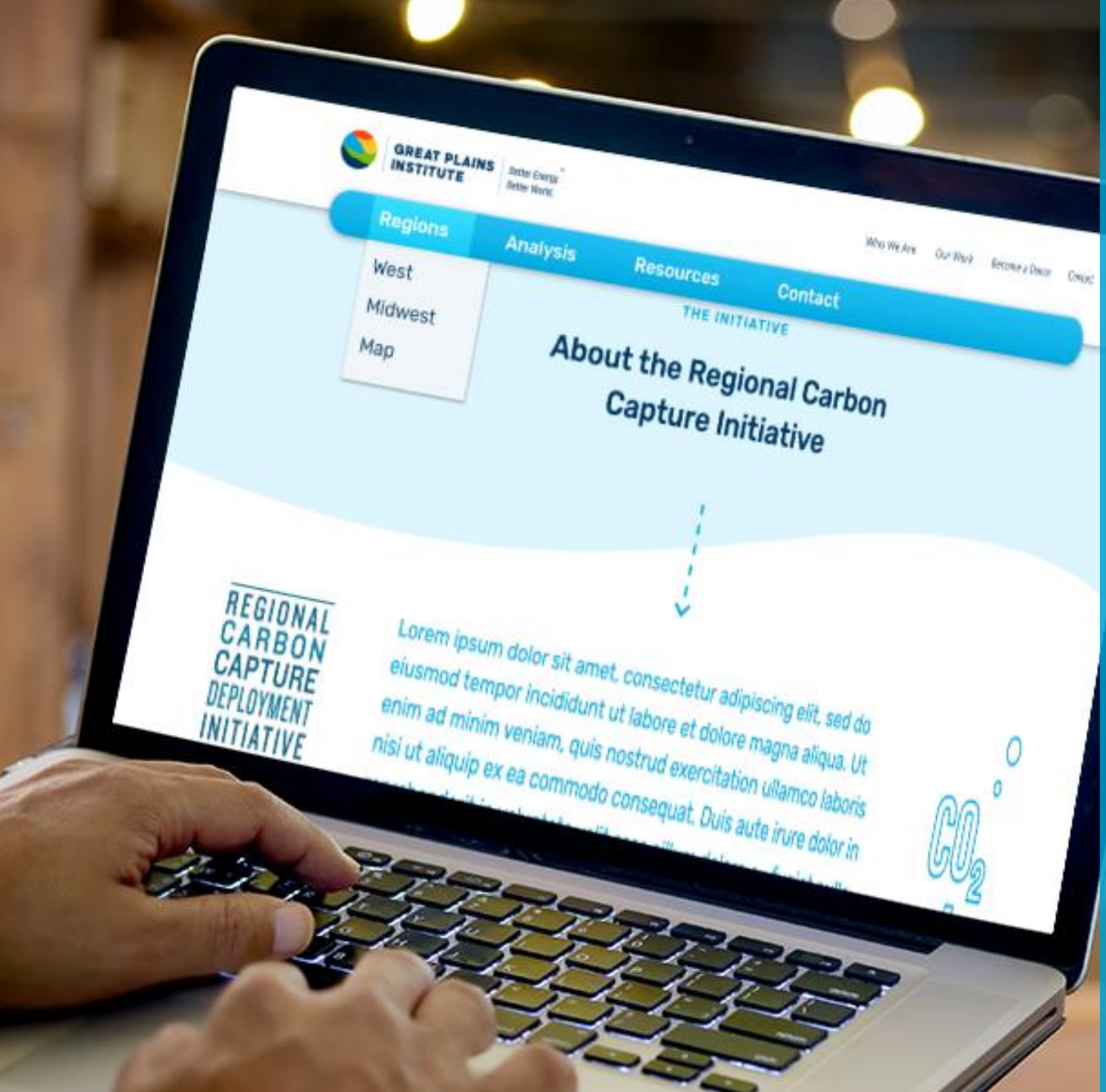
Legislative Readiness: State Policy Development to Leverage 45Q Credit Before End of 2023 Deadline

- Developing print and online policy checklist for states and updated state-by-state inventory of existing policies:
  - ✓ Delegation of EPA authority for permitting saline storage projects (federal UIC Class VI) to states
  - ✓ Rules for long-term CO_2 storage
  - ✓ Rules for CO_2 transport and storage space
  - ✓ Rules for clarifying the purpose of CO_2 injection
  - ✓ Financial incentives for carbon capture
  - ✓ Optimization of state taxes to incentivize capture, transport, use and storage
- Establishing state policy teams to develop legislative and other policies, based on modeling and analysis.
- **Next step: 2020 state legislative sessions. Please join us!**



Carbon Capture Ready

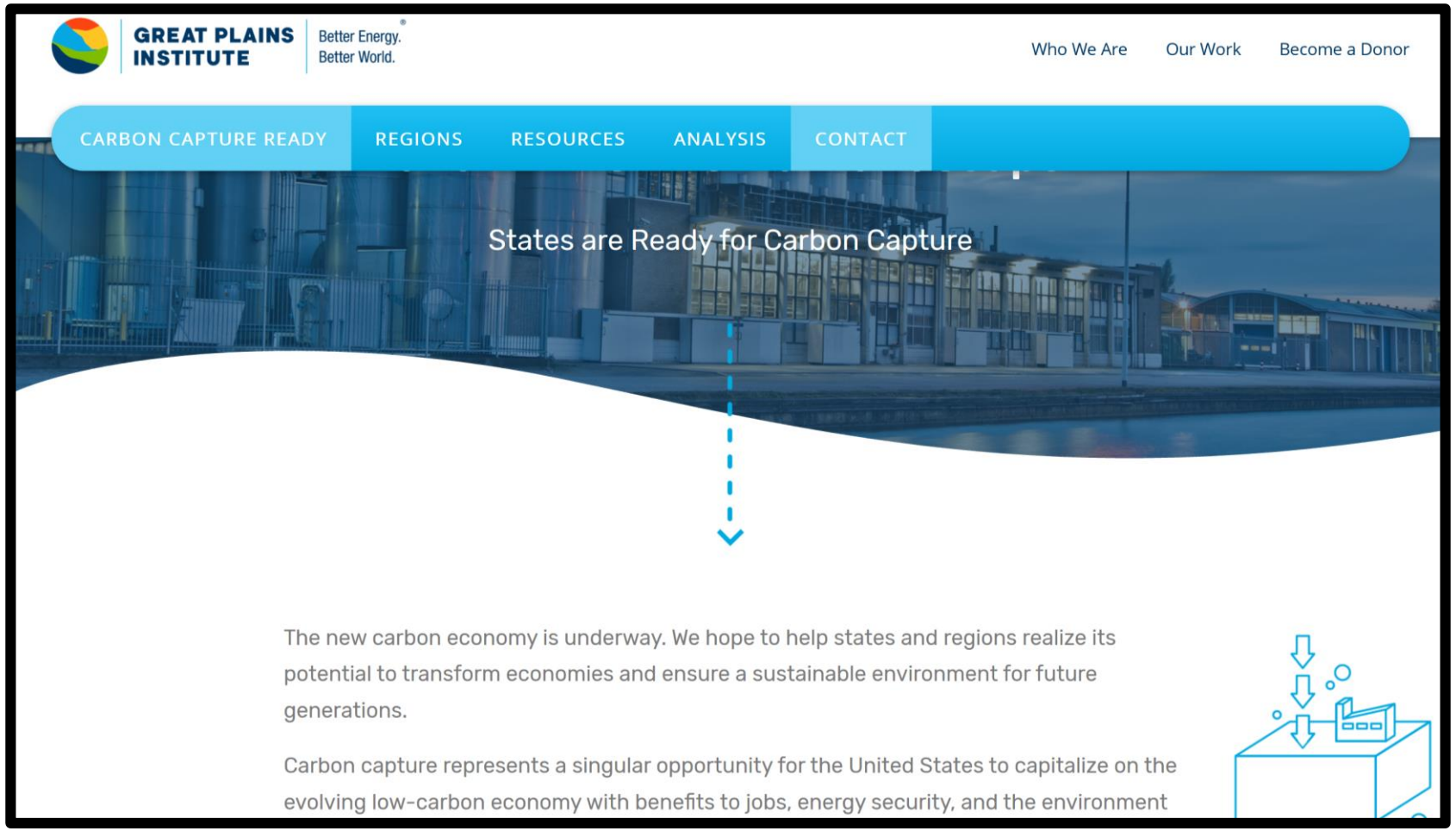


Building Out Web Presence and Tools for States and Policymakers

- Analysis and modeling results for states Midwest and Western regions.
- State-level fact sheets detailing carbon capture opportunities.
- Best practices for states to ensure they are “carbon capture ready”.
- Detailed information on policies already implemented in states.
- Additional resources, including one-page primers on carbon capture, 45Q and the federal policy landscape.
- Timeline for launch: December 2019.

- **Carboncaptureready.org**

https://carboncaptureready.betterenergy.org/



CO2 Deployment Fact Sheets: Tailored to Each State

REGIONAL CARBON CAPTURE DEPLOYMENT INITIATIVE

Indiana

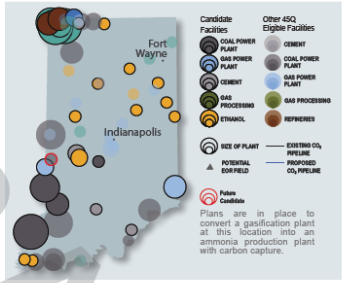
IMPLEMENTING CARBON CAPTURE AND STORAGE TECHNOLOGY

Carbon capture can play a vital role in the future of Indiana's energy system as support grows within the state for this technology. Indiana has fifty-six facilities qualifying for the expanded 45Q federal tax credit, twenty-eight of which are also identified as potentially economically feasible candidates for carbon capture. With large storage potential in the Illinois Basin and a diverse set of clean energy legislation, Indiana is strategically positioned to adopt this economically valuable technology enabling the state to meet its growing environmental and energy needs.

Figure 1 (Right) : Indiana has many facilities large enough to qualify for the 45Q carbon capture tax credit, including coal and gas power plants, gas processing facilities and petroleum refineries. Facilities identified by the Regional Carbon Capture Deployment Initiative as potential early candidates for capture retrofit based on emissions, equipment, and estimated capture cost, are shown with outlines and darker colors. Details on these facilities are listed below.

Source: GPI 2019; EPA 2018

SOURCES BY INDUSTRY & VOLUME

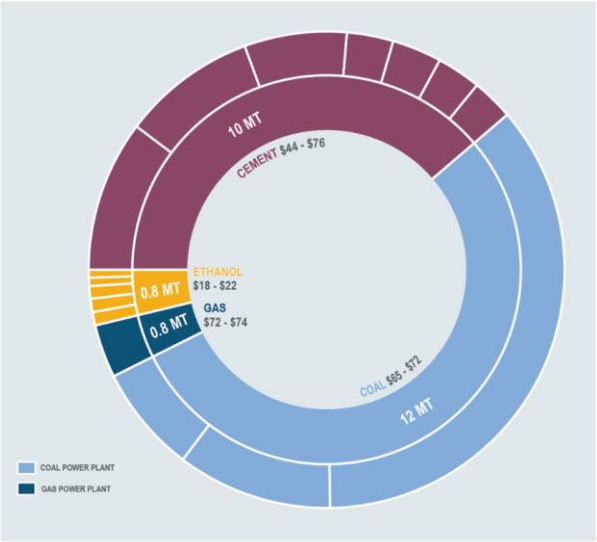


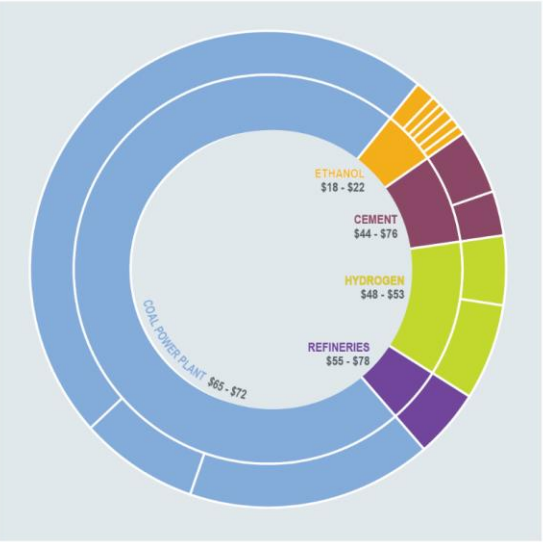
POTENTIAL CANDIDATE FACILITIES FOR CAPTURE WITH ANNUAL EMISSIONS

Facility Name	Location	Industry	Total Facility CO2 Emissions thousand tons	CO2 Captured Target thousand tons	Theoretical Capture Cost $/ton (Draft - Do Not Cite)
Gibson	Owensville	Coal Power Plant	16,332	6,400	$53
Mittal Steel USA	East Chicago	Metals & Minerals	6,971	4,373	$57
Merom	Sullivan	Coal Power Plant	4,834	3,200	$56
Edwardsport	Edwardsport	Coal Power Plant	3,430	3,043	$56
Arcelormittal Burns Harbor	Burns Harbor	Metals & Minerals	10,131	2,885	$58
11 Ethanol Plants	Multiple	Ethanol	3,133	2,787	$18 (Average)
US Steel Corp	Gary	Metals & Minerals	9,215	2,621	$59
Lawrenceburg Energy	Lawrenceburg	Gas Power Plant	2,857	2,574	$55
Arcelormittal Indiana Harbor	East Chicago	Metals & Minerals	4,684	2,571	$59
BP Business Unit 1	Whiting	Refineries	4,694	1,042	$47
BP Business Unit 2	Whiting	Refineries	4,694	955	$48
Lone Star Industries	Greencastle	Cement	1,056	952	$49
Praxair - Whiting	East Chicago	Hydrogen	1,610	900	$36
IPL Eagle Valley	Martinsville	Coal Power Plant	1,107	800	$61
Sugar Creek	West Terre Haute	Gas Power Plant	1,397	800	$61
Lehigh Cement	Speed	Cement	531	478	$57
Carmeuse Lime Buffington	Gary	Cement	873	462	$58
Lehigh Cement	Mitchell	Cement	626	318	$64

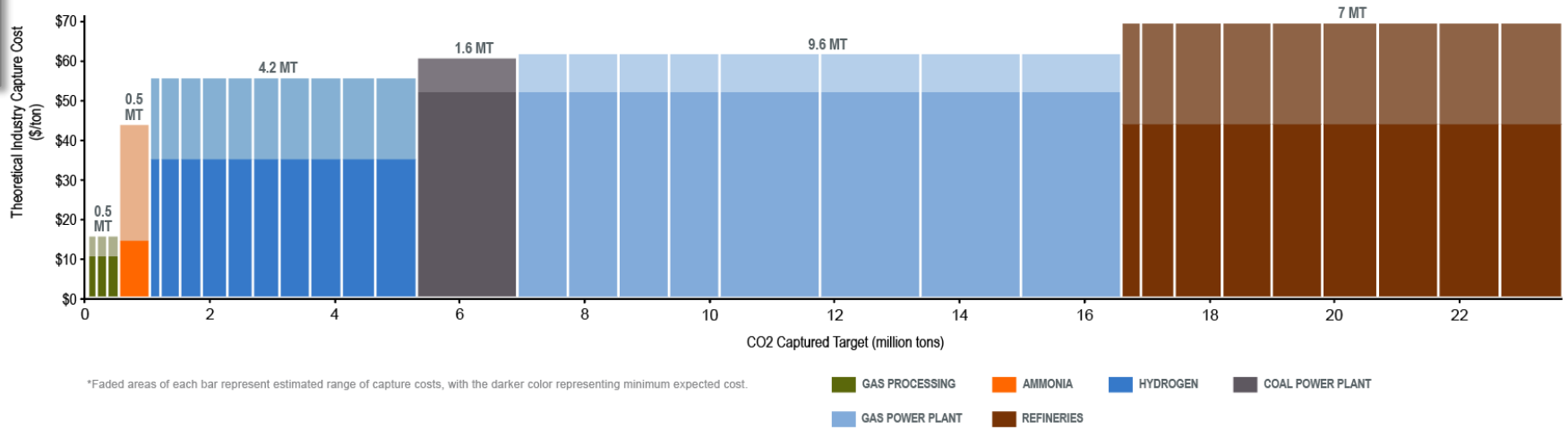
Table 1: The Regional Carbon Capture Deployment Initiative estimated theoretical facility capture costs based on published capture equipment costs, facility-specific operational patterns, existing equipment, and level of emissions. Most states have a large number of facilities eligible for 45Q. Of those facilities, the above table lists likely economically feasible candidates based on estimated capture cost. This list is not meant to be definitive. Commercial decisions by participating companies, and policy and regulatory decisions by state governments, will ultimately determine if a project is feasible for carbon capture. Captured Emissions refers to the amount of carbon dioxide that can be expected to be captured at a facility considering relevant technological and economic constraints. Source: GPI 2019; EPA 2018.

POTENTIAL CANDIDATE FACILITIES FOR CAPTURE, BY CO2 EMISSIONS AND COST RANGE





POTENTIAL CANDIDATE FACILITIES FOR CAPTURE, BY CAPTURE TARGET AND COST RANGE



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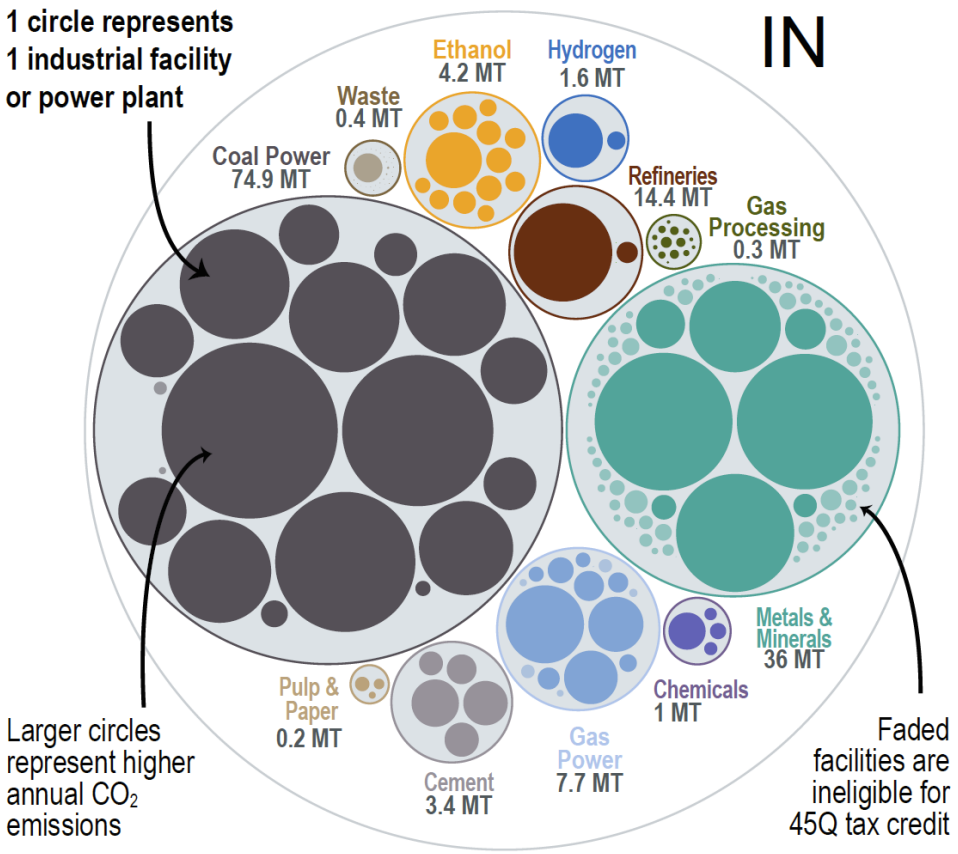
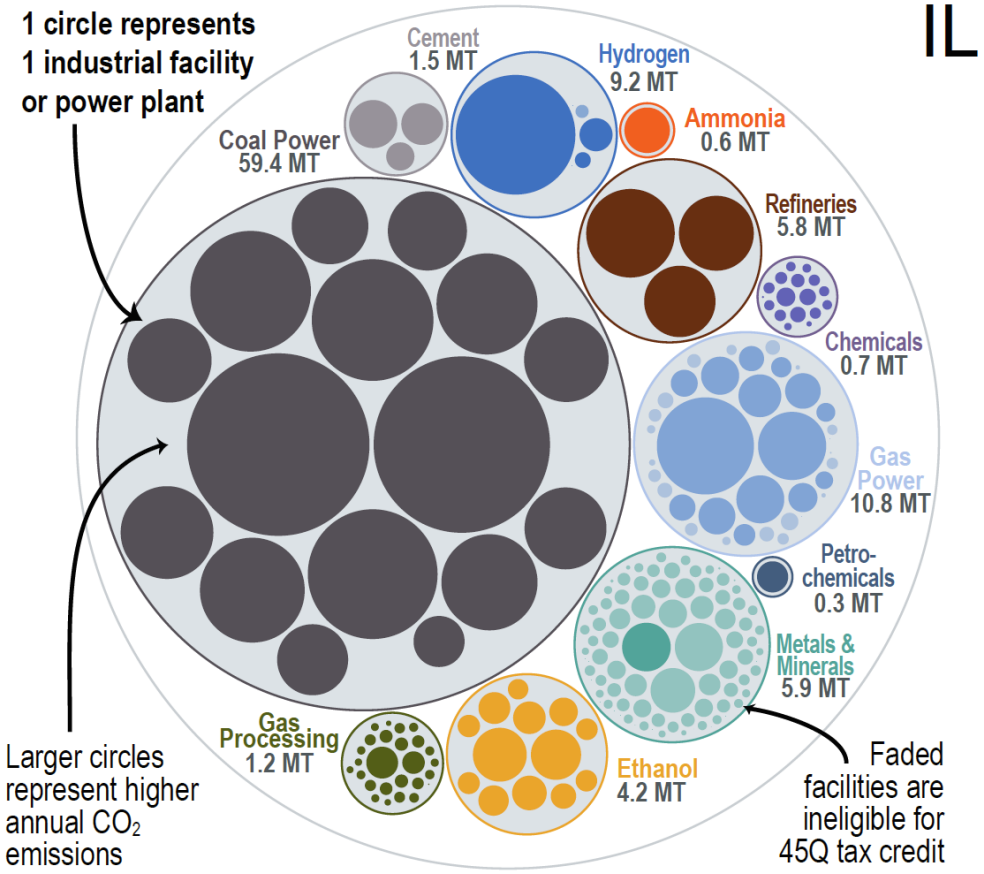
CO2 Deployment Fact Sheets: Tailored to Each State





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Figures authored by Elizabeth Abramson, Great Plains Institute, 2019

Modeling is Setting Stage for Longer-Term Development of Regional Carbon Capture, Transport and Storage Hubs

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- Modeling is driving awareness among state officials and industry, labor and NGO stakeholders of the opportunity presented by the 45Q tax credit.
- **Strategy**: Advance state CO_2 transport infrastructure planning and policy development in conjunction with CO_2 pipeline financing legislative effort in Congress.
- **Reframing the challenge as opportunity**: Building a new carbon economy for emissions reductions, domestic energy and industrial production and high-wage jobs.

Thank You

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