

A photograph of an industrial facility, likely a refinery or chemical plant, at night. The facility is illuminated by numerous lights, and its reflection is visible in the water in the foreground. The sky is dark with some clouds.

# *45Q Update & Emerging Carbon Capture Policy*

*Wednesday, August 19, 2020*

*DOE-NETL's 2020 Integrated  
Project Review Meeting*

**Brad Crabtree**  
**Vice President, Carbon Management**  
**Great Plains Institute**



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**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

***Achieve economywide deployment of carbon capture to reduce emissions, foster domestic energy and industrial production, and support high-wage jobs.***

Climate, jobs and energy/industrial benefits **unite**  
**diverse interests in a common purpose.**

**Over 80 members**, including:

- Energy, industrial and technology **companies**;
- Energy and industrial sector labor **unions**; and
- Conservation, environmental & clean energy **NGOs**.



To learn more and view our  
complete membership list, visit  
[www.carboncapturecoalition.org](http://www.carboncapturecoalition.org)

## Participants

- Accelergy
- AFL-CIO
- Air Liquide
- Air Products
- AK Steel
- American Carbon Registry
- ArcelorMittal
- Archer Daniels Midland Co.
- Baker Hughes
- Bipartisan Policy Center Action
- Calpine
- Capital Power
- Carbon180
- Carbon Wrangler LLC
- Center for Climate and Energy Solutions
- Citizens for Responsible Energy Solutions Forum
- Clean Air Task Force
- Conestoga Energy Partners
- Core Energy LLC
- DTE Energy
- EBR Development LLC
- Elysian Ventures
- 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 Energy Risk
- New Steel International, Inc.
- NRG Energy
- Occidental
- Pacific Ethanol
- Peabody
- Prairie State Generating Company
- Praxair, Inc.
- Shell
- SMART Transportation Division (of the Sheet Metal, Air, Rail and Transportation Workers)
- Summit Power Group
- Svante
- The Nature Conservancy
- Third Way
- Thunderbolt Clean Energy LLC
- United Mine Workers of America
- United Steel Workers
- Utility Workers Union of America
- White Energy

## Observers

- Algae Biomass Organization
- Biomass Power Association
- Brown Brothers Energy & Environment, LLC
- Carbon Engineering
- Carbon Utilization Research Council
- Chart Industries
- ClearPath
- Cornerpost CO2 LLC
- Enhanced Oil Recovery Institute, University of Wyoming
- Environmental Defense Fund
- Growth Energy
- Institute of Clean Air Companies
- Melzer Consulting
- Portland Cement Association
- Renewable Fuels Association
- School of Energy Resources, University of Wyoming
- Systems International | The ZEROS Project
- Tellus Operating Group
- World Resources Institute

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

## **FUTURE Act (S. 1535)**

Furthering carbon capture, Utilization, Technology, Underground storage, and Reduced Emissions Act

### **U.S. Senate**

*25 Cosponsors*

**18 Democrats**

**6 Republicans**

**1 Independent**

### **U.S. House**

*50 Cosponsors*

**15 Democrats**

**35 Republicans**

Support spanned entire political spectrum and all regions of the country.

# Key Elements 45Q Tax Credit Reform

**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<sub>2</sub> or puts CO<sub>2</sub> 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<sub>2</sub> stored geologically through EOR.

**\$35/ton**

for other beneficial uses of CO<sub>2</sub> or CO such as converting carbon emissions into fuels, chemicals, or useful products like concrete.

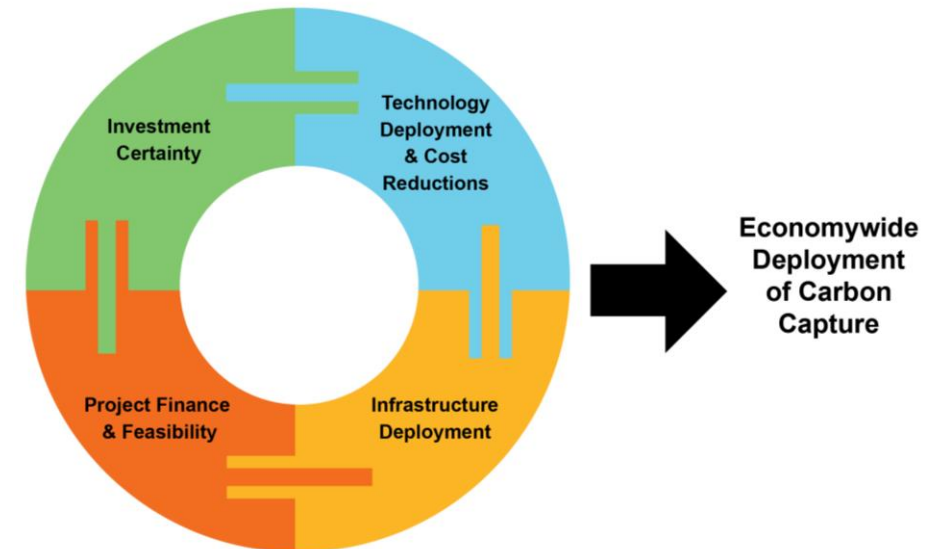
**\$50/ton**

for CO<sub>2</sub> stored in other geologic formations and not used in EOR.



# Carbon Capture Coalition's Federal Policy Blueprint

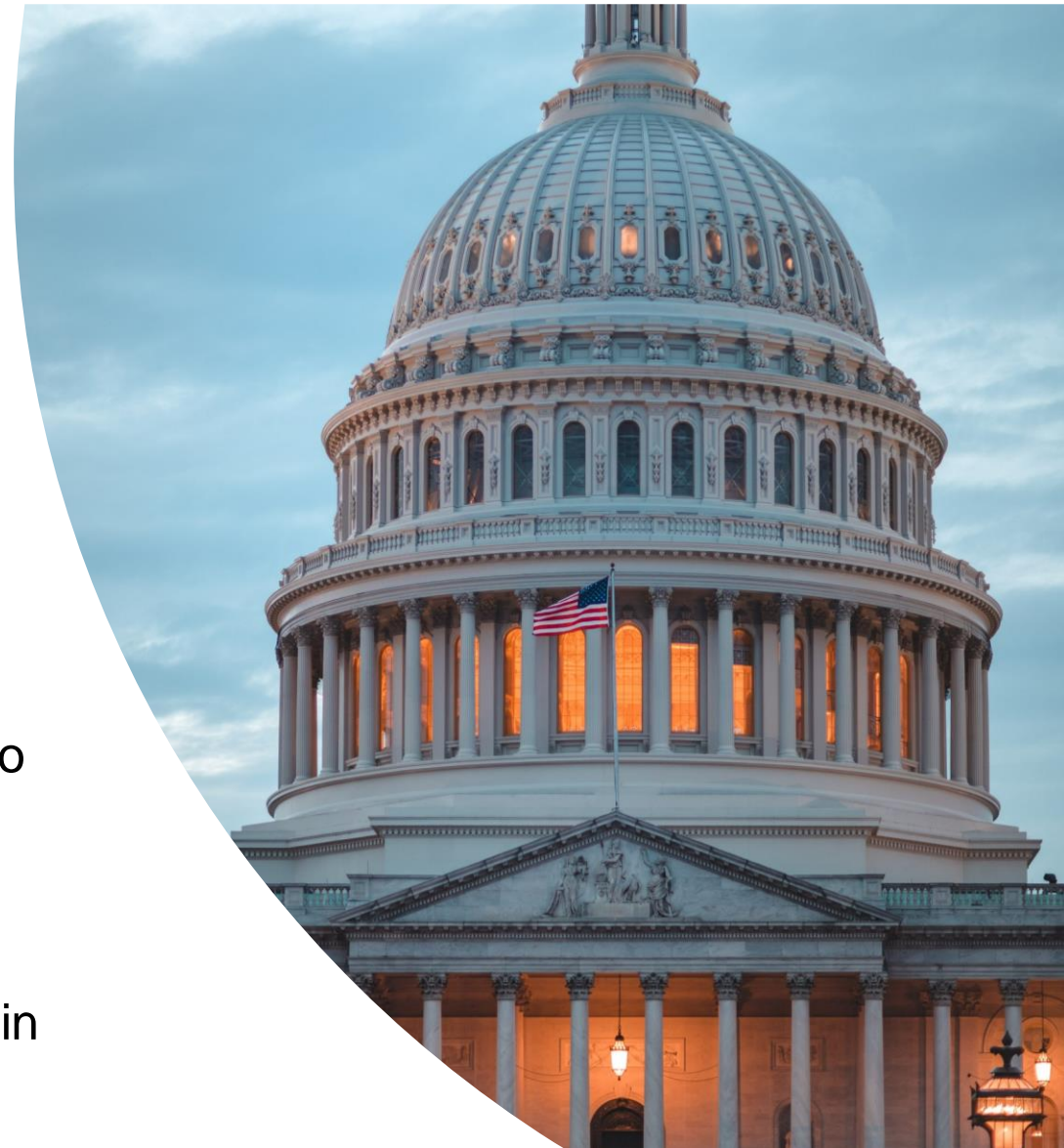
- ✓ Agenda for economywide deployment.
- ✓ Recommends full policy portfolio, similar to current support for wind, solar and other low and zero-carbon technologies.
- ✓ Consensus of Coalition's 80+ companies, unions, and NGOs.



# Federal Carbon Capture Policy Agenda Going Forward

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- Ensure effective implementation of 45Q by Treasury and IRS;
- Enact a broader portfolio of federal carbon capture policies to complement 45Q, similar to wind and solar;
- Incorporate federal support for CO<sub>2</sub> transport infrastructure into national infrastructure legislation;
- Increase prioritization and resources for industrial carbon capture and utilization in federal carbon capture policy; and
- Include direct pay and extension for 45Q and other measures in COVID 19-related legislation to sustain carbon capture deployment during and after the current crisis.





# Investment Certainty: Bipartisan, Bicameral Support for Extending Beginning Construction Deadline for 45Q Beyond End of 2023

## **Schweikert (R-AZ)-Wenstrup (R-OH) proposal:**

- Makes 45Q permanent, ending commence construction window.
- Included in House GOP climate package.

## **Sewell (D-AL) proposal:**

- 2-year commence construction extension.
- Included in House Ways and Means Majority GREEN Act and House Infrastructure bill (H.R. 2).

## **Capito (R-WV), Whitehouse (D-RI), Barrasso (R-WY) and Cramer (R-ND) proposal:**

- 5-year extension to commence construction.
- Offered as amendment to Senate energy package.



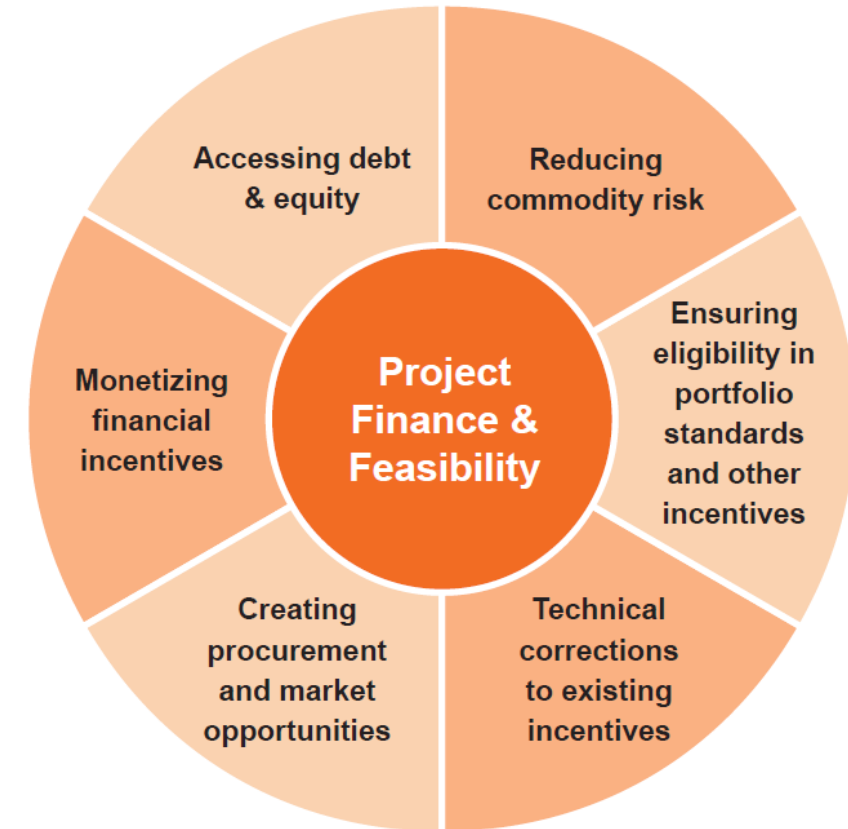
# Project Finance & Feasibility: Direct Pay and BEAT Fix for 45Q

## Direct Pay

- Option of estimated tax payment in lieu of monetizing tax credits
  - Finance projects more efficiently and cost-effectively by avoiding tax equity transactions.
  - Enable project financing in times of crisis when tax equity markets are constrained.
- Majority GREEN Act includes direct pay for 45Q, along with wind PTC and solar ITC (H.R. 2).
- Bipartisan RECOUPS Act of 2020 (H.R. 7896) provides direct pay for 45Q only (Bergman R-MI and Fletcher D-TX).

## BEAT Tax Fix

- Prevent disallowance of 45Q under BEAT, similar to treatment already afforded wind & solar in 2017 tax reform.



# Project Finance & Feasibility: Bipartisan Legislation to Fix 48A Tax Credit and Make Carbon Capture Eligible for Private Activity Bonds and Master Limited Partnerships

## Carbon Capture Modernization Act (S. 407 and H.R. 1796):

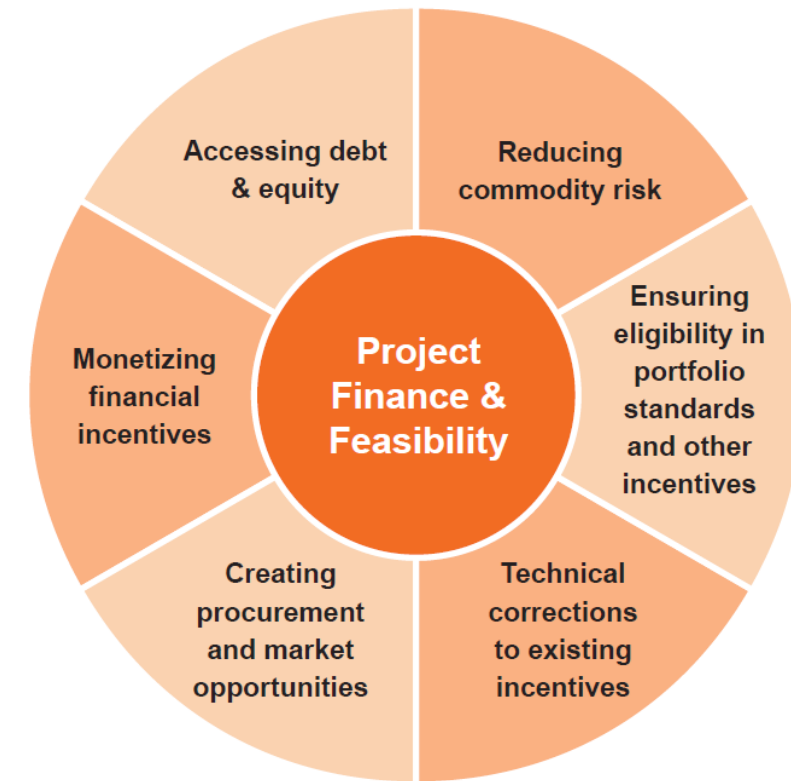
- Adjusts heat rate requirements for 48A tax credit to enable carbon capture retrofits of existing power plants.
- Unlocks \$2 billion in available financing for projects.

## Carbon Capture Improvement Act (S. 1763 and H.R. 3861)

- Allows carbon capture projects to be eligible for tax-exempt private activity bonds

## Financing our Energy Future Act (S. 1841 and H.R. 3249)

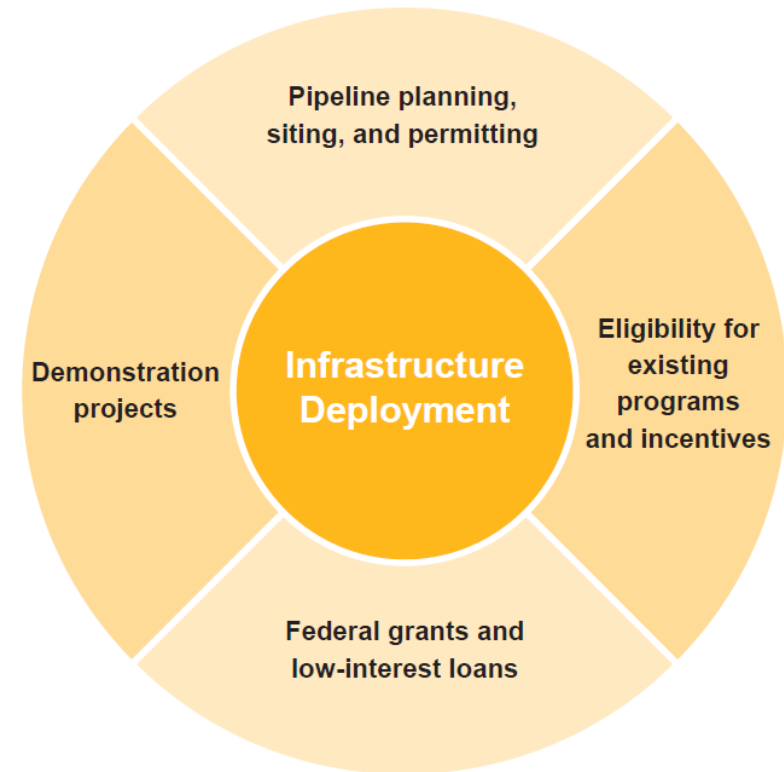
- Makes carbon capture projects eligible for MLPs



# Infrastructure Deployment

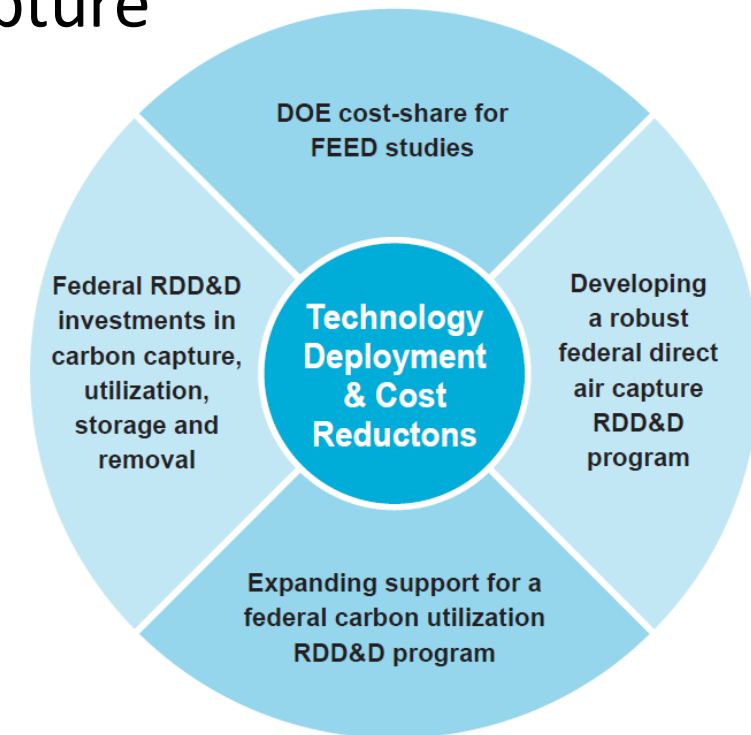
## H.R. 4905, INVEST CO<sub>2</sub> Act (Bustos, D-IL)

- Provides low-interest federal loans to leverage private capital investment in CO<sub>2</sub> transport infrastructure:
  - Trunk and feeder lines to build out regional CO<sub>2</sub> transport networks.
  - Regional demonstration projects featuring large-volume, long-distance interstate trunk lines linking multiple industrial facilities and power plants to multiple utilization and geologic storage sites.
- Encourages state and local governments to designate anthropogenic CO<sub>2</sub> pipelines as “pollution control devices” to enable tax abatement.



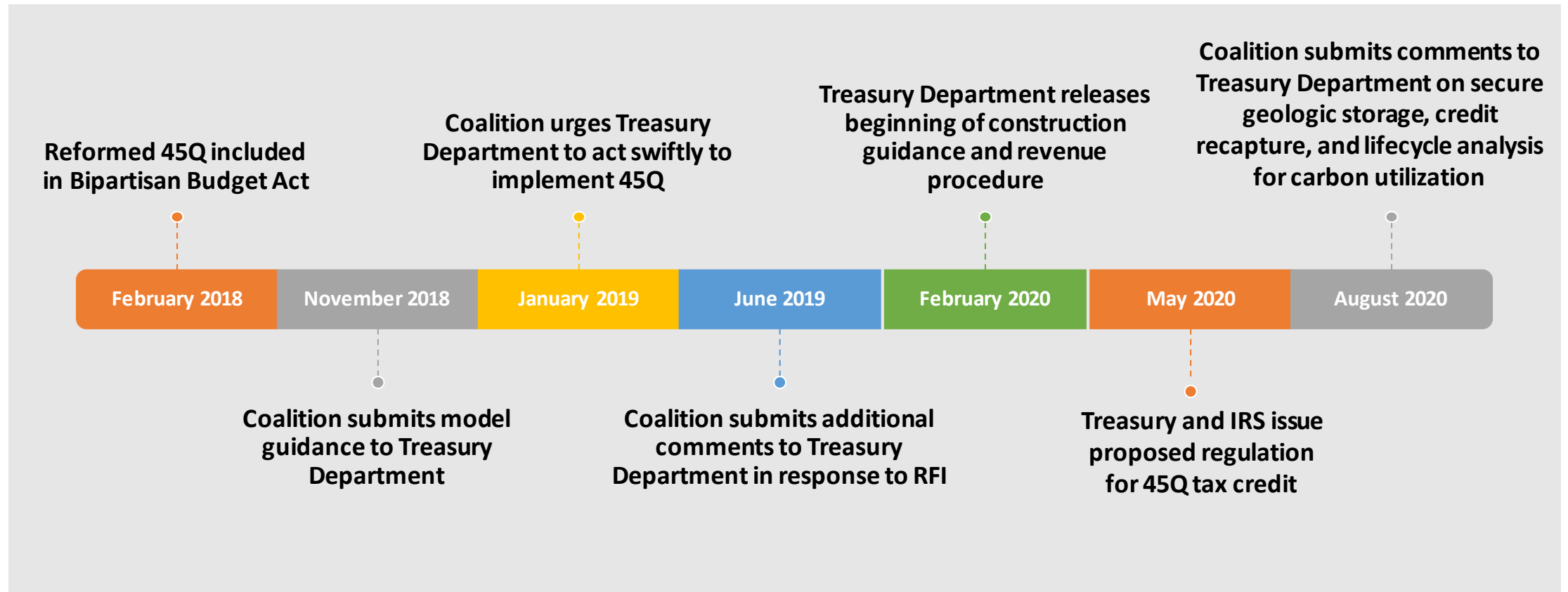
# Technology Deployment & Cost Reductions: Bipartisan Federal RD&D Legislation for Carbon Capture, Use, Removal & Geologic Storage

- **Senate American Energy Innovation Act (S. 2657)**  
combines 50+ bipartisan bills, including key carbon capture legislation:
  - EFFECT Act (S. 1201)
  - LEADING Act (S. 1685 and H.R. 3828)
  - Clean Industrial Technology Act-CITA (S. 4230)
- **USE IT Act (S. 383)**
- **Anticipated House energy innovation package:**
  - Fossil Energy R&D Act (H.R. 3607)
  - LEADING Act (S. 1685 and H.R. 3828)
  - Clean Industrial Technology Act-CITA (S. 4230)





# Shaping U.S. Treasury and IRS Guidance on 45Q Tax Credit



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

## Key Coalition Recommendations

Ensure flexible contractual **assurance and transferability** of the tax credit.

Establish a **one-year lookback period for credit recapture** based on physical properties of geologic storage and low risk of CO<sub>2</sub> leakage in significant volumes.

Provide clear and adequate definitions of **beginning construction and continuous construction** for projects.

Specify qualifications for a “**qualified independent engineer or geologist**” to provide third-party verification of implementation and compliance with an ISO-based MRV pathway.

Provide an equivalent **ISO-based monitoring, reporting and verification program** (in addition to EPA's Subpart RR Greenhouse Gas Reporting Program) for demonstrating secure geologic storage through CO<sub>2</sub>-enhanced oil recovery.

Create a clear pathway for **lifecycle analysis** that begins at the point of acquisition of the carbon oxide and based on measured performance to provide transparency and reward incremental improvement.



# IRS' 45Q Guidance and Notice of Proposed Rulemaking

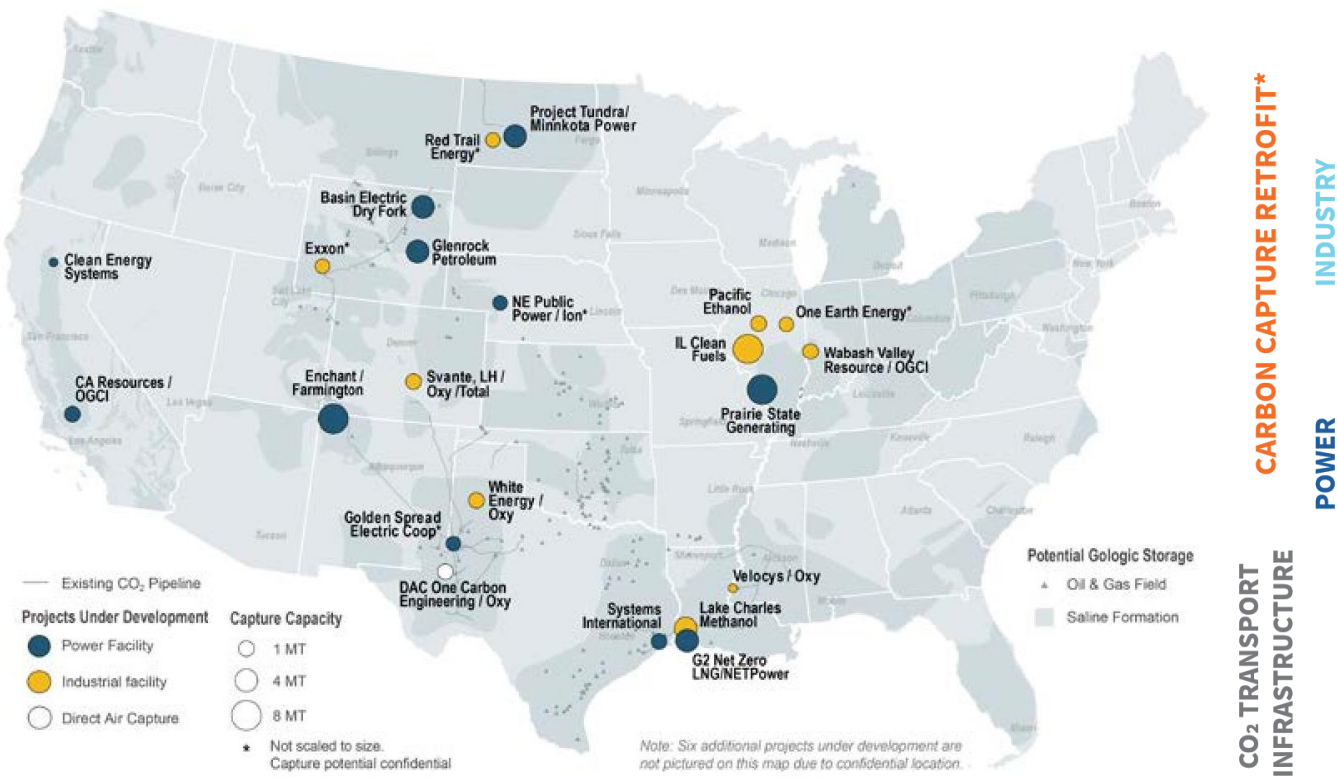
## February 2020 IRS guidance and revenue procedure:

- Defines beginning construction and continuous construction favorably for carbon capture projects.
- Clarifies rules for business partnerships claiming the credit.

## May 2020 NOPR includes:

- Establishes ISO-based monitoring, reporting and verification program in addition to EPA Subpart RR for demonstrating secure geologic storage through CO<sub>2</sub>-enhanced oil recovery.
  - IRS maintains strong standards for secure geologic storage in ISO MRV pathway, but does not require public disclosure and transparency equivalent to existing Subpart RR.
- Proposes a five-year lookback period for credit recapture.
- Addresses multiple definitional issues.

# Action Needed Going Forward: 45Q Tax Credit, Coupled with Near-Term Federal COVID Measures and Complementary State Policies, Poised to Drive Project Deployment and High-Wage Jobs in a Time of Crisis



	PROJECT JOBS	OPERATION JOBS
STEEL MILL	1,680 – 3,030	170 – 310
REFINERY	440 – 760	40 – 70
CEMENT PLANT	430 – 690	60 – 110
HYDROGEN PLANT	175 – 300	20 – 30
ETHANOL PLANT	30 – 50	5 – 10
COAL POWER PLANT	1,800 – 3,350	160 – 300
NATURAL GAS COMBINED-CYCLE POWER PLANT	1,140 – 2,090	100 – 180
TRUNK LINE (20" DIAMETER PIPELINE, 200 MILES LONG)	1,250 – 2,190	8 – 20
FEEDER LINE (12" DIAMETER PIPELINE, 50 MILES LONG)	250 – 370	2 – 5

\*By facility type

**Source:** Carbon Capture Coalition, *Carbon Capture Jobs and Project Development Status*, <https://carboncapturecoalition.org/wp-content/uploads/2020/06/Carbon-Capture-Jobs-and-Projects.pdf>





## Federal Policy Agenda for Economic Recovery from COVID-19

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- Coalition drew on existing Federal Policy Blueprint to identify legislative priorities for economic recovery from the pandemic.
- Based on following criteria:
  - Support near-term jobs & economic activity;
  - Rely on existing legislative authority where possible;
  - Avoid or minimize the need for further rulemaking or guidance procedures; and
  - Has potential for broad bipartisan support.



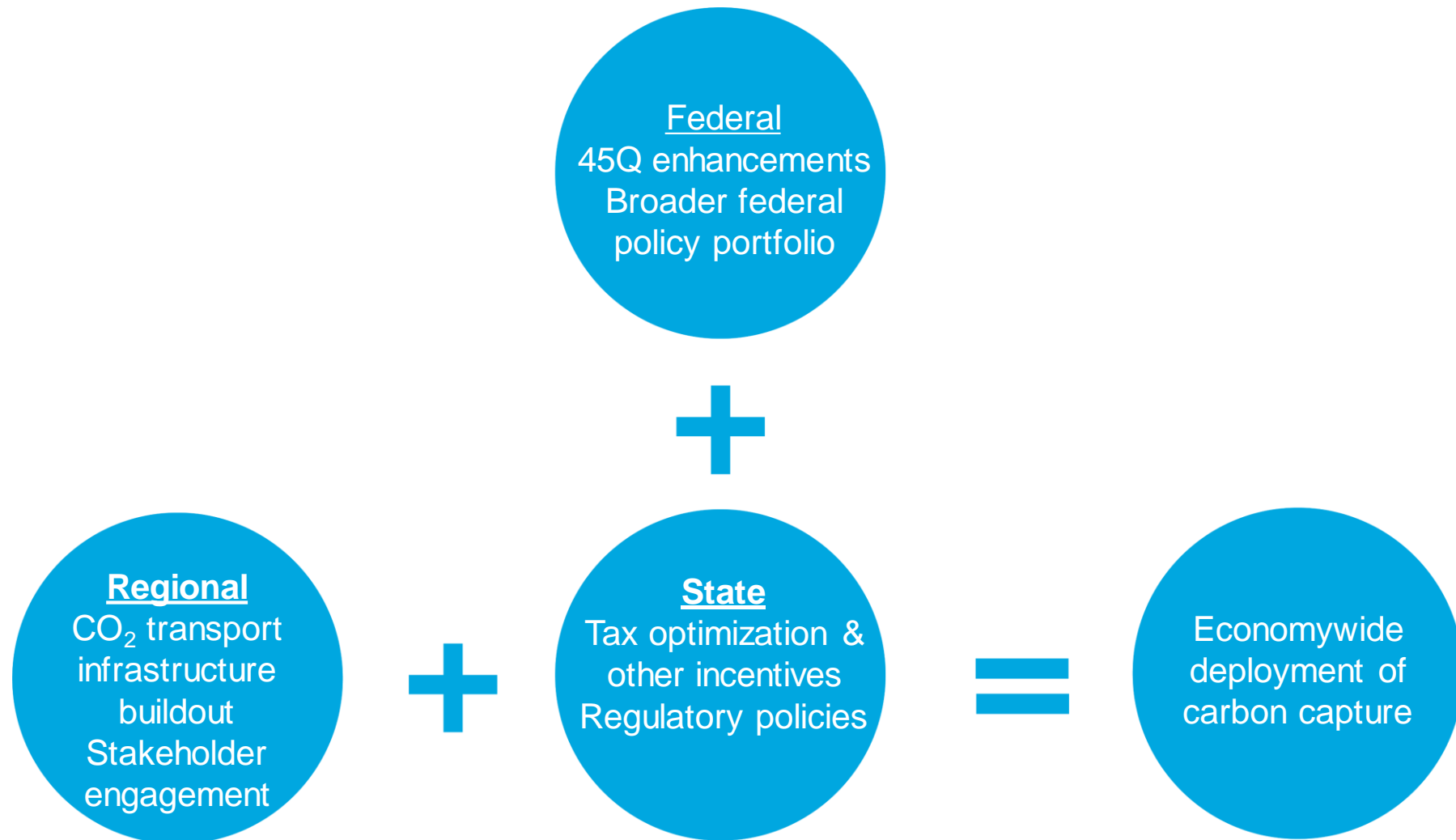
# Federal Policy Agenda for Economic Recovery from COVID-19 (continued)

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- **Top priorities:** Provide direct pay and multiyear extension of 45Q.
- Fix 48A tax credit to allow carbon capture retrofits at power plants to access available financing.
- Expand CarbonSAFE for ten projects to complete all four phases.
- Increase appropriations to EPA and states to expand capacity to permit saline geologic storage projects under 45Q.
- Allow carbon capture projects to access federal tax-exempt private activity bonds.
- Provide for a robust expansion of DOE cost-share funding for commercial demonstrations, FEED studies and large-scale commercial saline storage projects & associated infrastructure.
- Implement changes to the DOE Loan Program to unlock available financing.

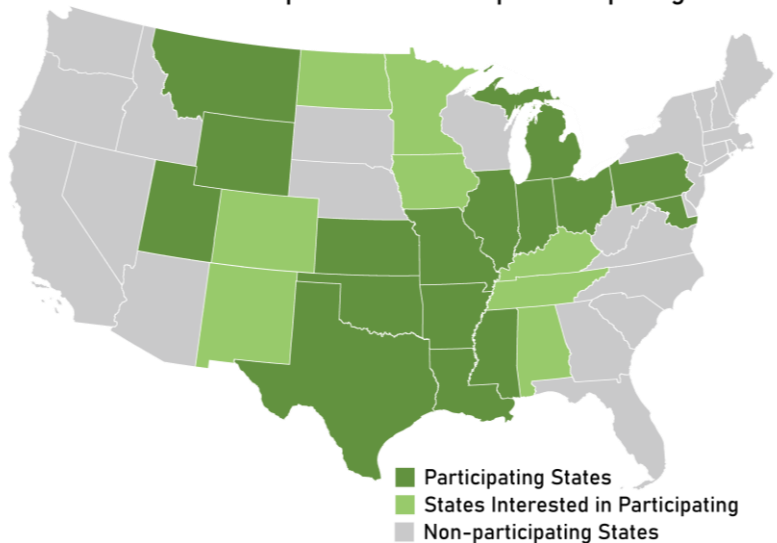


# Integrated Federal-State Policy Implementation is Key to Economywide Deployment



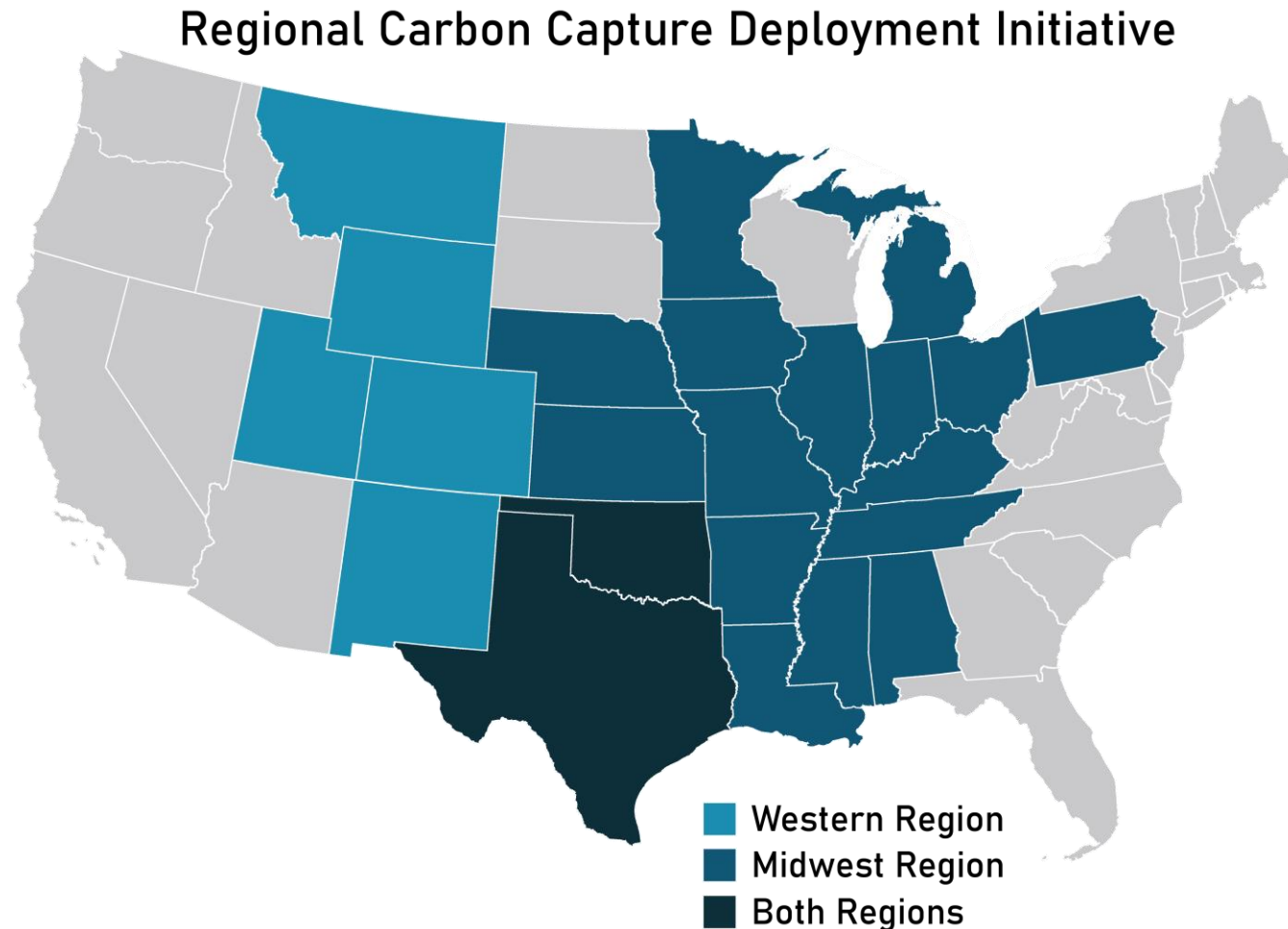
# STATE CARBON CAPTURE WORK GROUP

State Carbon Capture Work Group: Participating States



- Formed in 2015 by then Gov. Mead (R-WY) and Gov. Bullock (D-MT). Additional states showing interest (light green).
- Made comprehensive state and federal policy recommendations from 2015-2018.
- Coordinating Midwestern and Western Regional Deployment Initiatives that bring together nearly 400 state officials and stakeholders across ~25 states.
- Modeled candidate capture and storage projects and CO<sub>2</sub> transport infrastructure (2-year+ effort).
- Forming state policy teams to develop state policy recommendations to complement the federal 45Q tax credit and make states “carbon-capture ready.”

# Regional Deployment Initiatives: Western & Midwest Regions



REGIONAL  
CARBON  
CAPTURE  
DEPLOYMENT  
INITIATIVE

EPA GHGRP & eGRID  
US DOE EIA  
ABB / Energy Velocity

Stanford  
NETL, IEA  
National Petroleum Council

Advanced Resources  
International

NETL & USGS  
Los Alamos National Lab  
Indiana University  
Ohio State

NETL  
Los Alamos  
Princeton  
Industry Consulting

**CO<sub>2</sub> Supply**  
Industrial & Power

**Capture Costs**

**EOR**  
**Potential Demand**

**Saline**  
**Storage Potential**  
SCO<sub>2</sub>T

**Pipeline Costs**

**REGIONAL  
CARBON  
CAPTURE  
DEPLOYMENT  
INITIATIVE**

**SimCCS**  
Los Alamos

**GPI  
Coordinated  
Team**

**Identify potential  
early mover  
capture projects  
by state.**

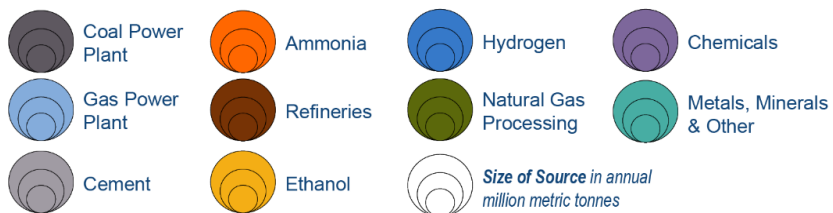
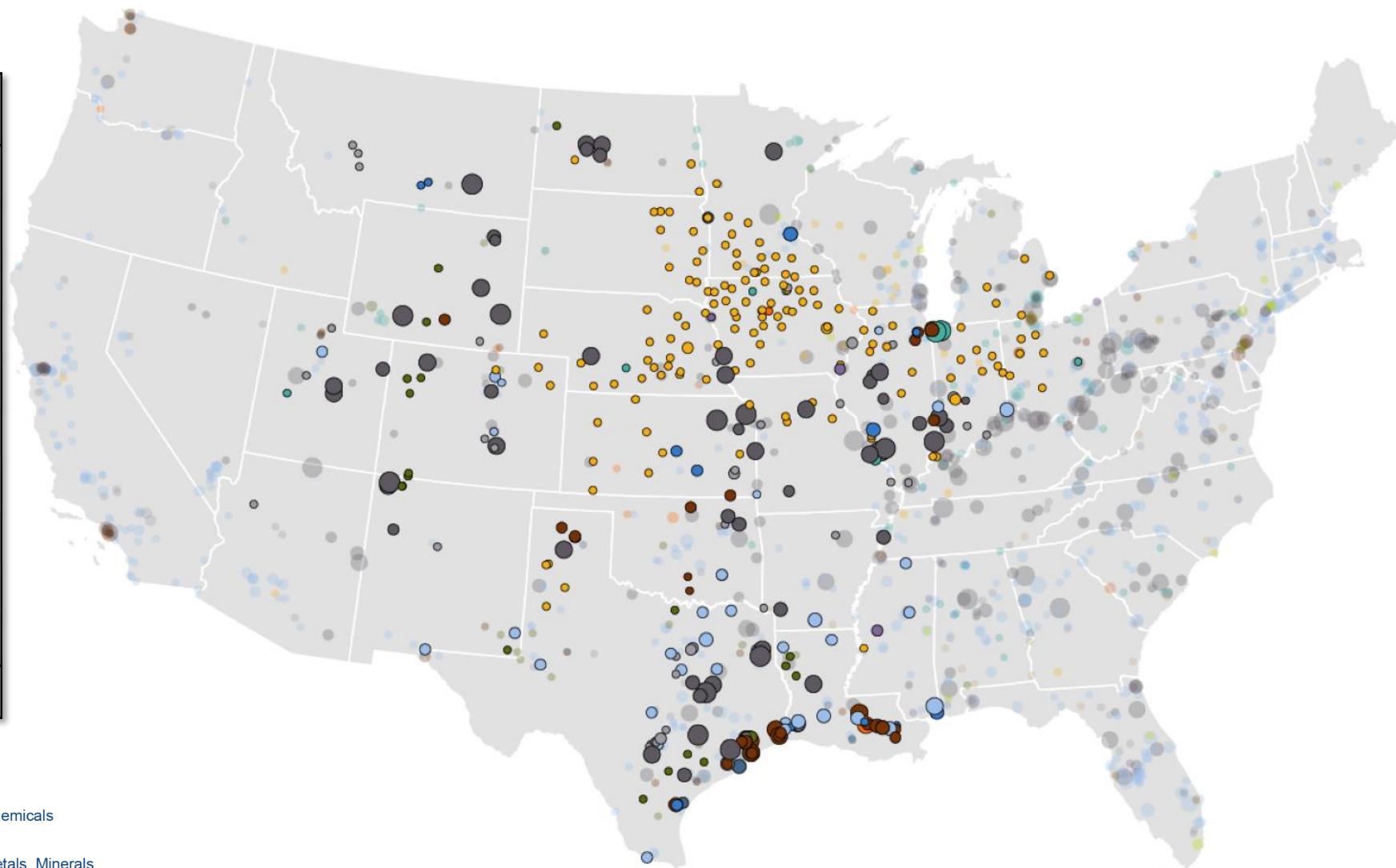
**Model regional  
CO<sub>2</sub> transport  
infrastructure to  
maximize  
feasible capture,  
use and storage.**



# Economically Feasible Capture Retrofit with 45Q

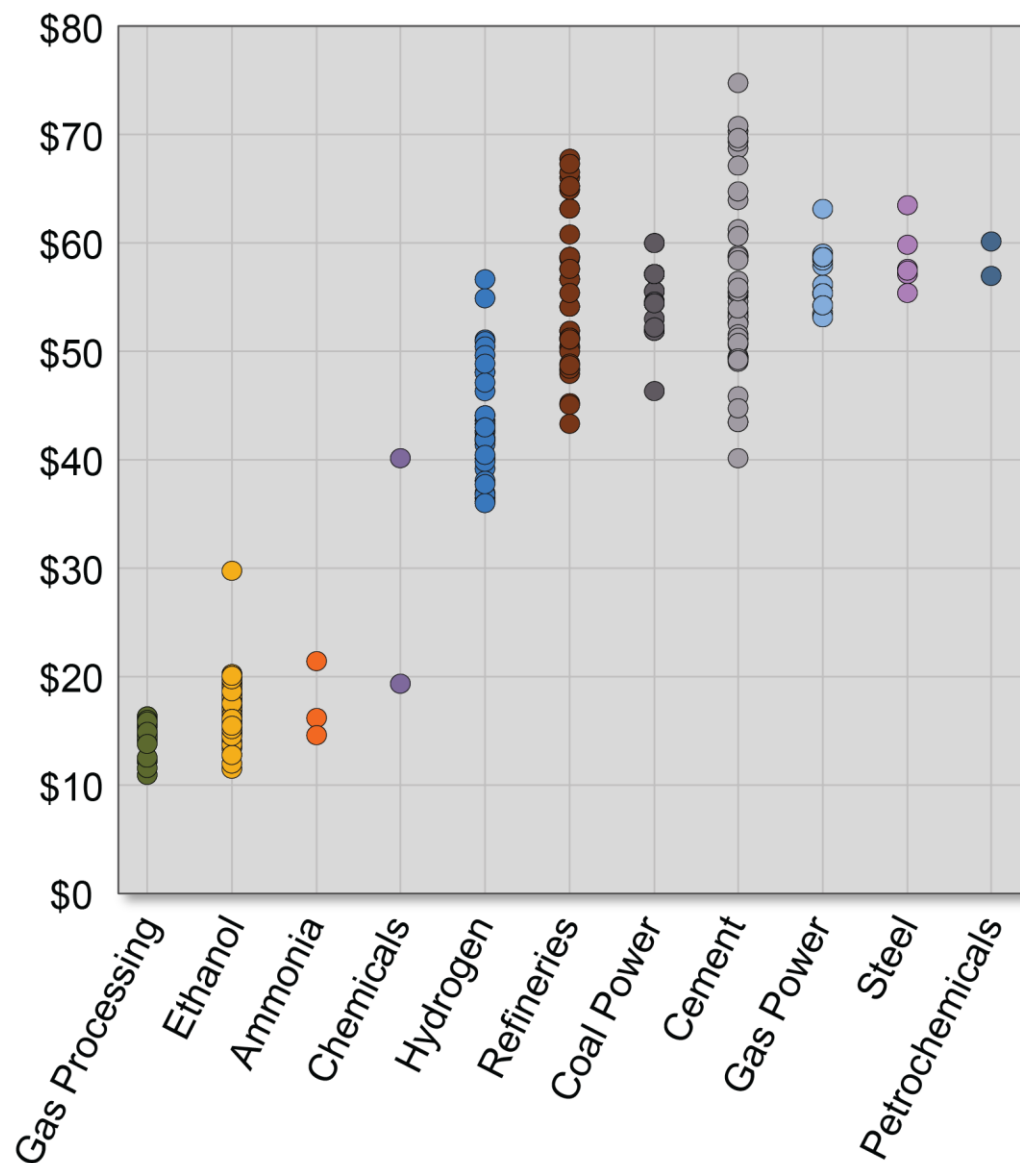
Facilities identified by Regional Deployment screening

Industry	Capture Target (million MT/yr)
Steel (Blast Furnace)	12.5
Cement	29.5
NG Processing	4.5
Ethanol	36.2
Refineries (FCC)	25.4
Hydrogen	14.7
Lime	0.9
NG Power Plants	65.9
Ammonia	0.7
Coal Power Plants	132.6
<b>Total</b>	<b>322.9</b>



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## Estimated cost of capture per industry for near-term facilities in study area



Industry	Average Estimated Cost \$/ton	Range of Cost Estimates \$/ton
Gas Processing	\$14	\$11 - \$16
Ethanol	\$17	\$12 - \$30
Ammonia	\$17	\$15 - \$21
Chemicals	\$30	\$19 - \$40
Hydrogen	\$44	\$36 - \$57
Refineries	\$56	\$43 - \$68
Coal Power Plant	\$56	\$46 - \$60
Cement	\$56	\$40 - \$75
Gas Power Plant	\$57	\$53 - \$63
Steel	\$59	\$55 - \$64
Petrochemicals	\$59	\$57 - \$60



# Base Scenario: Optimized transport network for CO2 capture and storage under 45Q

Capture and storage:  
~ 300 million metric  
tons per year



SimCCS CO2  
transport model

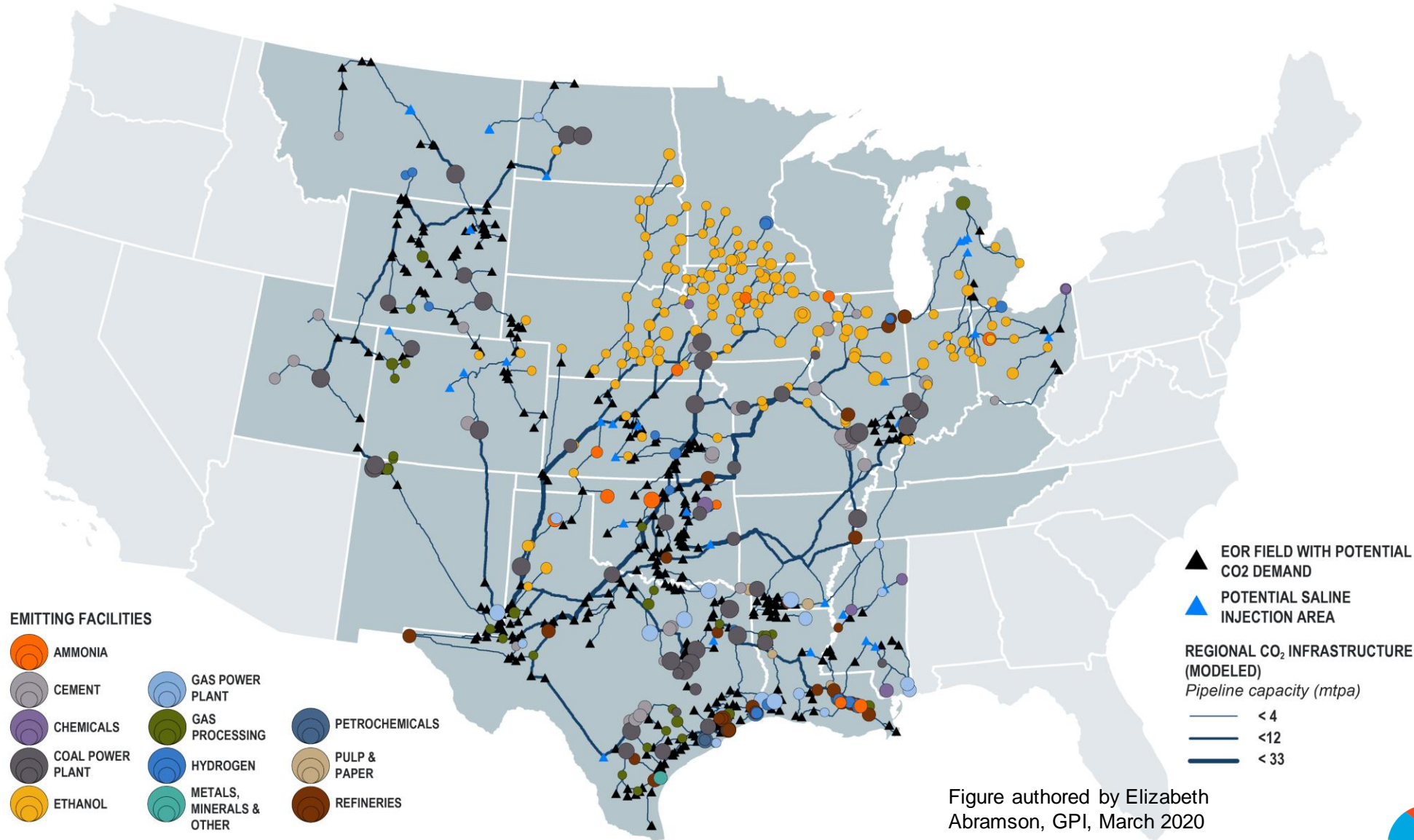


Figure authored by Elizabeth  
Abramson, GPI, March 2020



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# Long-term economy-wide deployment: Expanded storage in deep saline formations and petroleum basins

Capture and storage:  
~ 670 million metric  
tons per year



SimCCS CO<sub>2</sub>  
transport model

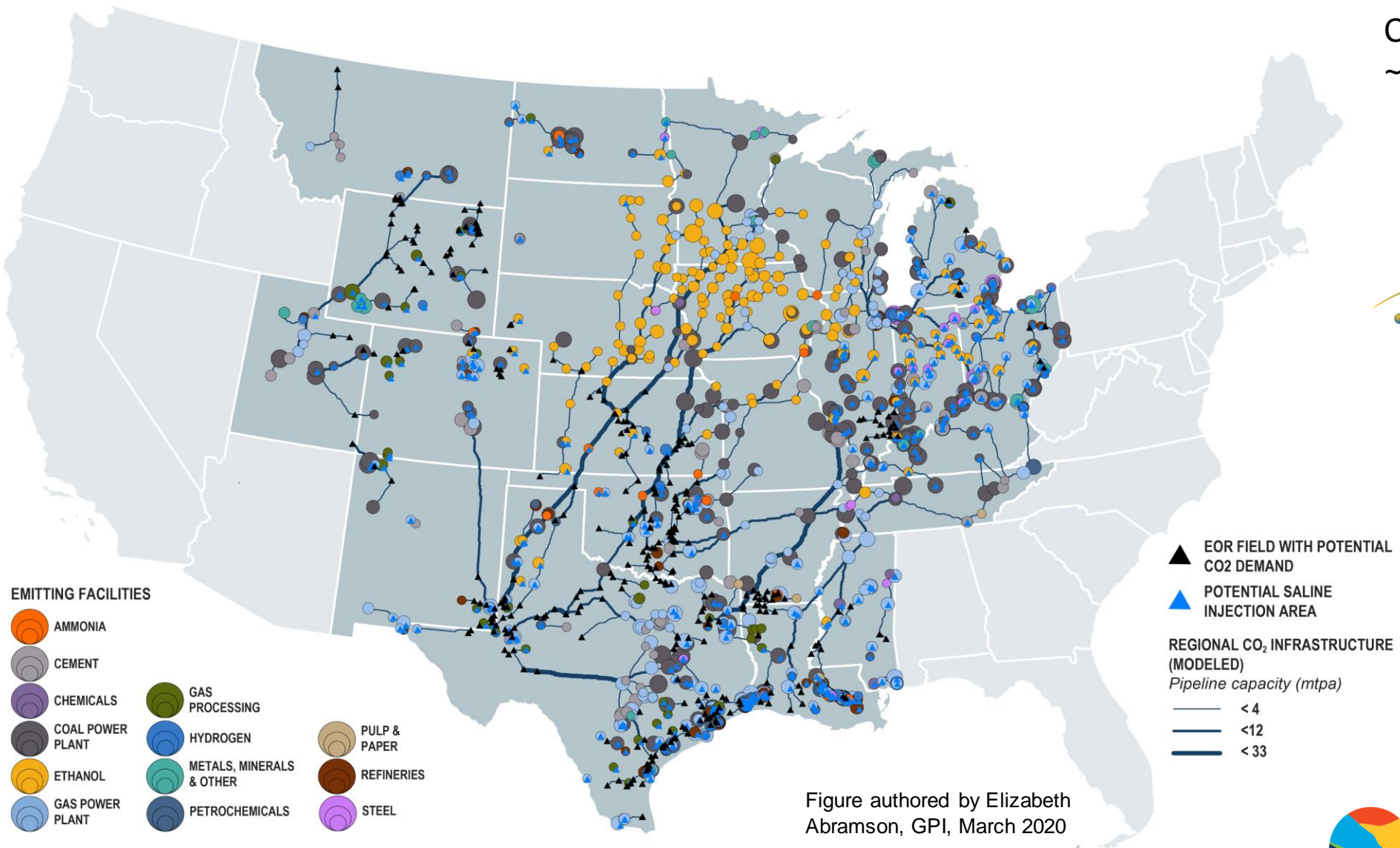
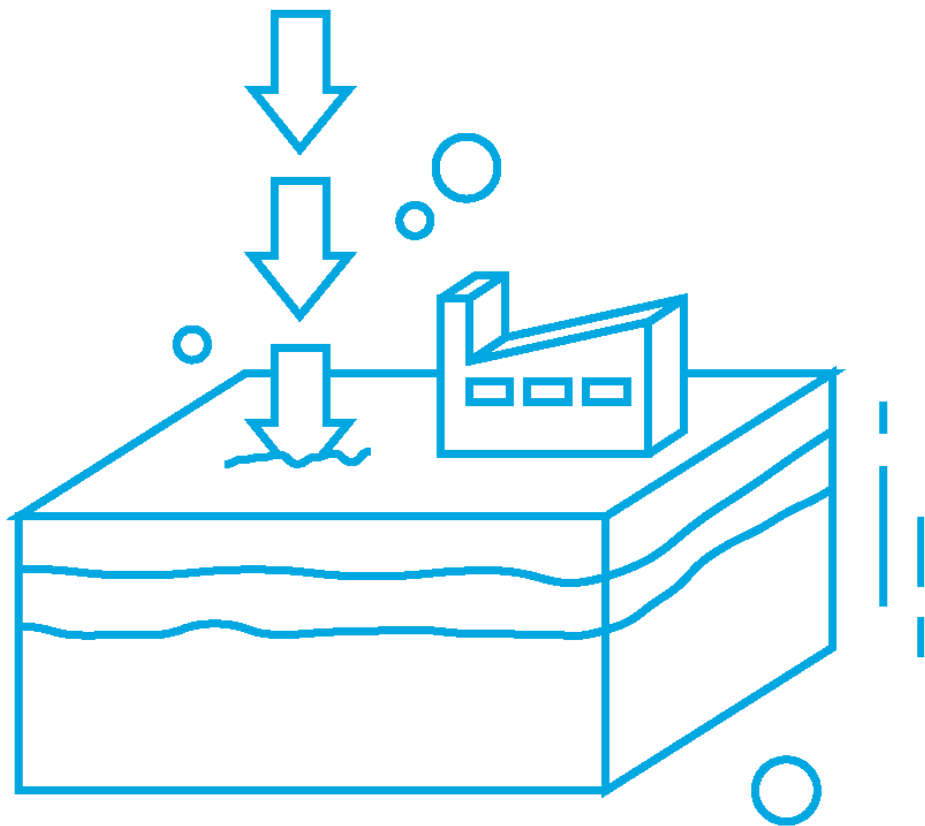


Figure authored by Elizabeth  
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**Carbon Capture  
Ready**

## Goal: Help States Become “Carbon Capture Ready” and Take Full Economic Advantage of 45Q Tax Credit Before End of 2023

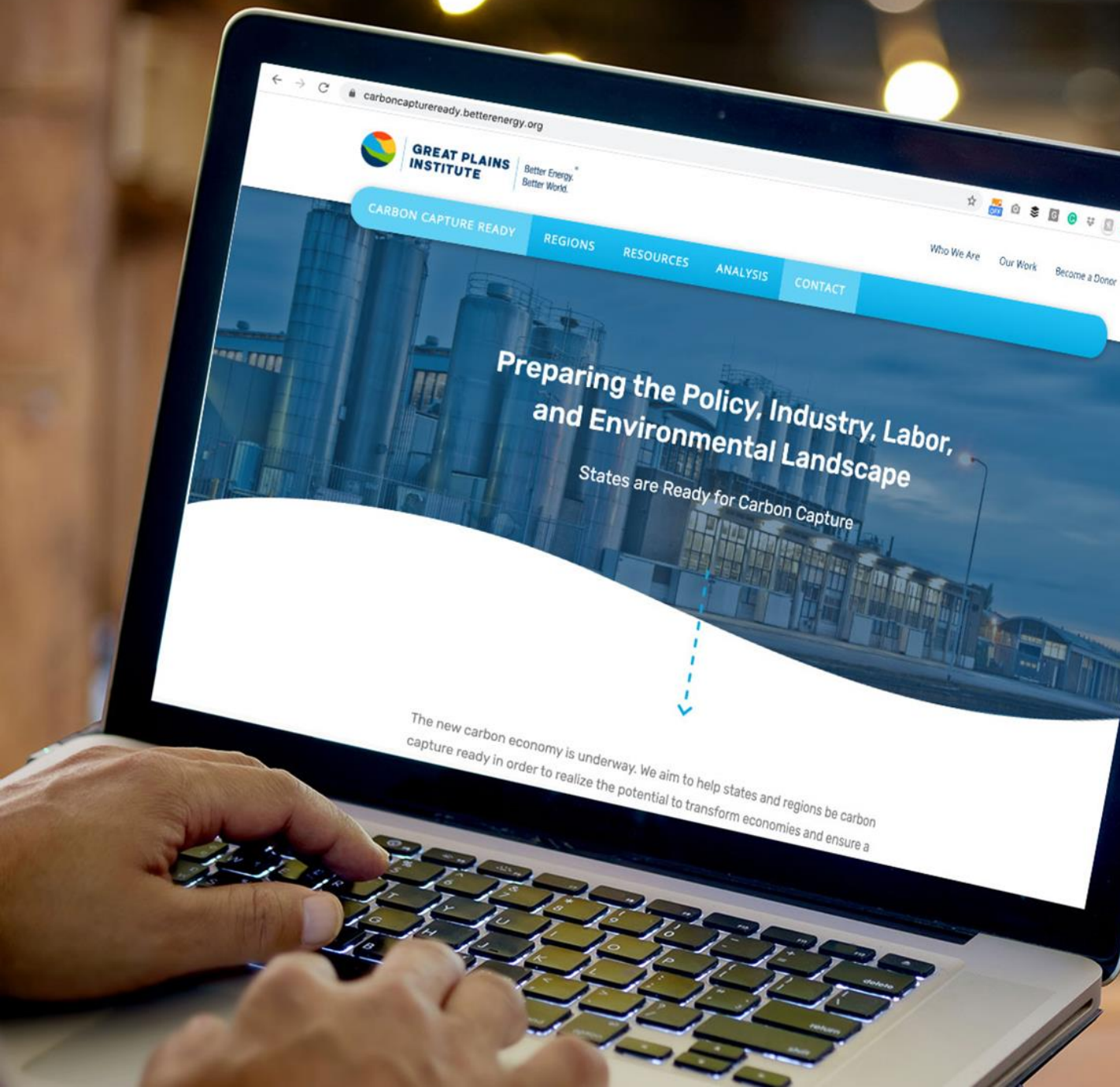
- Developing state policy frameworks to complement 45Q and other federal policies:
  - ✓ Delegation of EPA authority for permitting saline storage projects (federal UIC Class VI) to states
  - ✓ Rules for long-term CO<sub>2</sub> storage
  - ✓ Rules for CO<sub>2</sub> transport and storage space
  - ✓ Rules for clarifying the purpose of CO<sub>2</sub> 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 for their states, based on modeling and analysis.



# Building Out Web Tools for State Policymakers and Stakeholders

- Regional analysis & modeling.
- State-level factsheets detailing carbon capture opportunities.
- Best practices for states to become “carbon capture ready”.
- Detailed information on state policies already implemented.
- Additional resources, including one-page primers on carbon capture, 45Q and the federal policy landscape.

[www.carboncaptureready.org](http://www.carboncaptureready.org)



# Development of Multistate CO<sub>2</sub> Transport Infrastructure MOU



- Organized through State Carbon Capture Work Group; October launch anticipated.
- KS, LA, MD, MT, OK, PA and WY have signed on, with several other states currently considering joining the MOU, which aims to:
  - Develop an initial CO<sub>2</sub> transport infrastructure action plan within one year;
  - Make state and regional policy recommendations related to CO<sub>2</sub> transport infrastructure deployment to implement that plan;
  - Engage stakeholders to solicit input on policy recommendations;
  - Support efforts in Congress to incorporate CO<sub>2</sub> transport infrastructure into federal infrastructure legislation, including measures for federal financing; and
  - Support CO<sub>2</sub> transport infrastructure buildout through strategies identified in the plan, including state incentives and investments, public-private partnerships, and other mechanisms as appropriate.



# Thank You

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