



**Western Interstate
Energy Board**

The Case for Carbon Capture, Utilization & Storage

NARUC-WIEB Carbon Capture,
Utilization, and Storage Workshop

FRIDAY, SEPT. 11, 2020 | 1 – 2 PM ET

SPEAKERS

- **Kipp Coddington**, Director of Center for Energy Research & Policy Analysis, Energy Innovation Center, University of Wyoming
- **Brad Crabtree**, Vice President, Carbon Management, Great Plains Institute
- **Cecile Conroy**, Director of Government Affairs, International Brotherhood of Boilermakers



Western Interstate
Energy Board



SCHOOL OF ENERGY RESOURCES

“The Case for Carbon Capture, Utilization & Storage (CCUS)”

**WIEB/NARUC Subcommittee on Clean Coal and Carbon Management
CCUS Workshop Webinar Series; Webinar #1**

**Kipp Coddington
University of Wyoming, School of Energy Resources
September 11, 2020**



UNIVERSITY
OF WYOMING

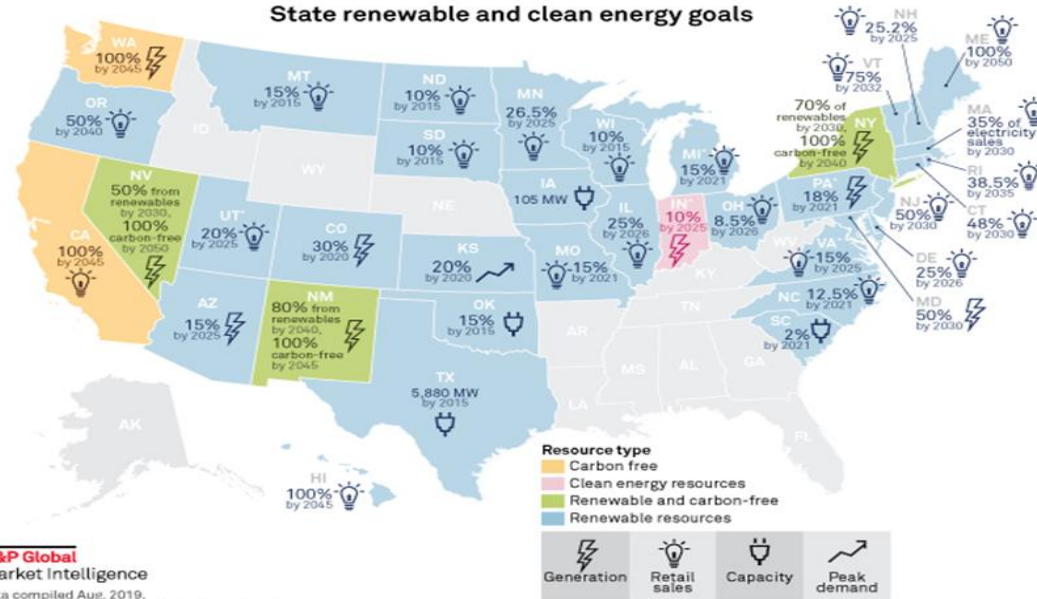
Carbon Reductions Requirements Are the Law or Otherwise Embedded in Policymaking

- ✓ International -- The Paris Agreement
- ✓ U.S. Federal -- Numerous Clean Air Act provisions (e.g., Affordable Clean Energy Rule, other)
- ✓ State Requirements
- ✓ Corporate Commitments
- ✓ Investor/Shareholder Preferences

... and the current trend includes Carbon Dioxide Removal (CDR) and Negative Emission Technologies (NETs) ...



State Low-Carbon Policies Are Expanding



S&P Global
Market Intelligence

Data compiled Aug. 2019.

* Includes non-renewable alternative resources.

Indiana, Kansas, North Dakota, Oklahoma, South Carolina, South Dakota, Utah and Virginia have renewable portfolio goals instead of standards.

Virginia's RPS goal is based on the volume of electricity sold in 2007.

Map credit: Ciaralou Agpalo Palicpic

Sources: S&P Global Market Intelligence; Sierra Club; Union of Concerned Scientists; Database of State Incentives for Renewables & Efficiency; and state public utility commission websites

Source: S&P



Private Sector Carbon Reduction Commitments Are Embedded & Growing

| Utility | GHG Reduction GOAL |
|----------------------------|--|
| AEP (February 2018) | <ul style="list-style-type: none"> 60% below 2000 levels by 2030 80% below 2000 levels by 2050 |
| AES (November 2018) | <ul style="list-style-type: none"> Reduce carbon intensity 50% from 2016 levels by 2022 Reduce carbon intensity 70% from 2016 levels by 2030 |
| Alliate (June 2017) | <ul style="list-style-type: none"> 40% below 2005 levels by 2030 |
| Alliant (August 2018) | <ul style="list-style-type: none"> 40% below 2005 by 2030 80% below 2005 by 2050 |
| Ameren (September 2017) | <ul style="list-style-type: none"> 35% below 2005 levels by 2030 50% below 2005 levels by 2040 80% below 2005 levels by 2050 |
| AVANGRID (2016) | <ul style="list-style-type: none"> Reduce CO₂ intensity 25% below 2015 levels by 2020 100% carbon neutral by 2035 |
| Avist (April 2019) | <ul style="list-style-type: none"> Carbon-neutral electricity by 2027 100% clean electricity by 2045 |
| CMS Energy (March 2019) | <ul style="list-style-type: none"> 90% below 2005 levels by 2040 |
| Dominion (March 2019) | <ul style="list-style-type: none"> 55% below 2005 by 2030 At least 80% below 2005 by 2050 Reduce methane intensity 50% below 2010 levels by 2030 |
| DTE Energy (March 2019) | <ul style="list-style-type: none"> 30% below 2005 levels by the early 2020s At least 50% below 2005 levels by 2030 80% below 2005 levels by 2040 More than 80% below 2005 levels by 2050 |

Oil giant BP is latest to pledge net zero emissions by 2050

Published: Feb 12, 2020 12:27 p.m. ET

Sources: Utility web sites, media, MarketWatch (<https://www.marketwatch.com/story/oil-giant-bp-is-latest-to-pledge-net-zero-emissions-by-2050-2020-02-12>)



... and Federal Carbon Policy Could Be Dramatically More Stringent 4 Months From Now ...

| Approach | Bill | Body | Sector |
|------------------|-----------|--------|----------------|
| CES/RPS | H.R. 2597 | House | Electricity |
| CES/RPS | H.R. 330 | House | Electricity |
| CES/RPS | H.R. 2711 | House | Oil & Gas |
| Carbon Tax | H.R. 763 | House | Economy wide |
| Carbon Tax | H.R. 4058 | House | Economy wide |
| Carbon Tax | H.R. 3966 | House | Economy wide |
| Carbon Tax | H.R. 4142 | House | Economy wide |
| Cap & Trade | H.R. 1960 | House | Economy wide |
| Policy Statement | | Senate | Transportation |

Source: Thomas.gov



CCUS Is A Broad-Based Solution

- ✓ Fossil power generation – e.g., coal, natural gas, biomass
- ✓ Fuel production – e.g., refineries, ethanol
- ✓ Industrial/Manufacturing – e.g., cement plants
- ✓ Once you take CO₂ out of the atmosphere (CDR), you are going to have to utilize or store it

... and the technology generally enjoys bipartisan support – e.g., Congressional funding for R&D, §45Q tax incentive, California's CCS methodology for the LCFS, other ...



CCUS Is Deemed to Be Required to Meet Mid-Century Decarbonization/CDR/NETs Requirements

overshoot, renewables are projected to supply 70–85% (interquartile range) of electricity in 2050 (*high confidence*). In electricity generation, shares of nuclear and fossil fuels with carbon dioxide capture and storage (CCS) are modelled to increase in most 1.5°C pathways with no or limited overshoot. In modelled 1.5°C pathways with limited or no overshoot, the use of CCS would allow the electricity generation share of gas to be approximately 8% (3–11% interquartile range)

-- IPCC, 2018: Summary for Policymakers, C2.2 (p. 15), In Global Warming of 1.5°C, An IPCC Special Report (available at https://www.ipcc.ch/site/assets/uploads/sites/2/2019/05/SR15_SPM_version_report_LR.pdf) (emphasis added)



Q&A

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The Case for Carbon Capture

Carbon Capture, Utilization & Storage Workshop Webinar Series Part I

Western Interstate Energy Board &
NARUC Subcommittee on Clean Coal and Carbon Management

Wednesday, August 19, 2020

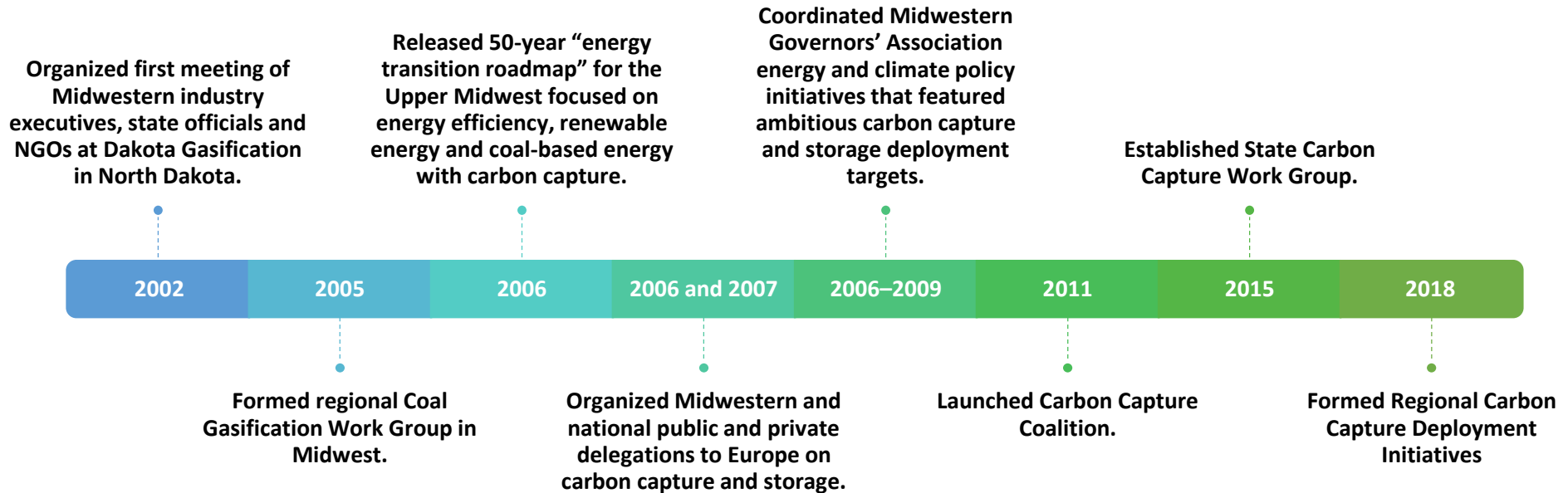
Brad Crabtree
Vice President, Carbon Management
Great Plains Institute



**GREAT PLAINS
INSTITUTE**

Better Energy.
Better World.

Great Plains Institute: Nearly Two Decades Working to Advance Carbon Capture





CARBON CAPTURE
COALITION

STATE
CARBON
CAPTURE
WORK
GROUP

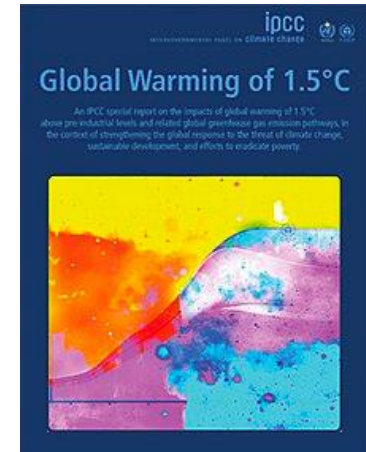
REGIONAL
CARBON
CAPTURE
DEPLOYMENT
INITIATIVE

“All hands on deck” to achieve economywide deployment of carbon capture, transport, use, removal and geologic storage in the U.S.

Carbon Capture is Not Optional: It is Essential to Meeting Mid-Century Emissions Reduction Goals—and Doing So Affordably

- **IEA modeling of 2° C goal:** Carbon capture achieves 1/5th of reductions by midcentury; nearly half from industrial facilities.
- **IPCC 5th Assessment:** Meeting 2° C goal costs 138% more without carbon capture.

IPCC 1.5 C modeling: Atmospheric CO₂ removal through direct air capture and bioenergy with carbon capture needed—in addition to economywide industrial and power plant capture.



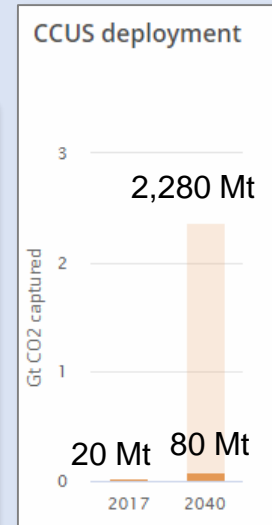
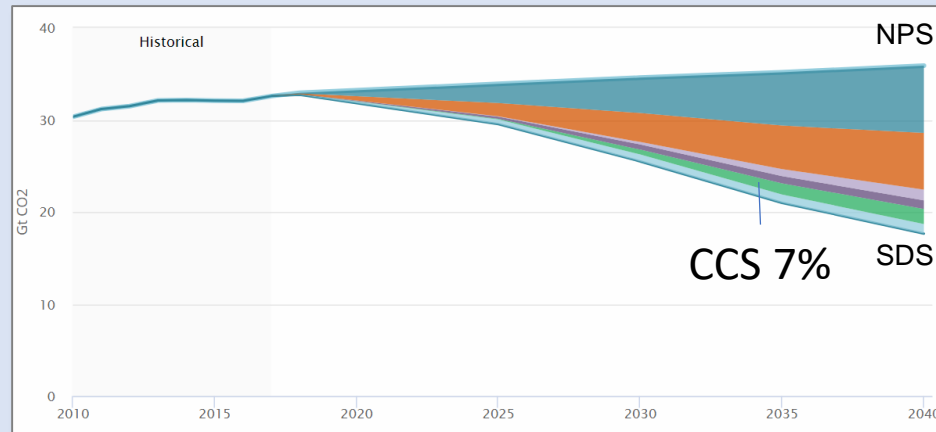
IEA World Energy Outlook Sustainable Development Scenario

IEA & UN call for *economywide deployment of CCS* by midcentury

Increased Emissions (NPS) VS Sustainable Development Scenario (SDS)

CCS accounts for 7% of the cumulative global emissions reduction by 2040 and 20% annually by 2050 in the IEA Sustainable Development Scenario (SDS)

“Rapid scale-up of CCUS deployment, from around 30 million tonnes (MT) of CO₂ currently captured each year to 2,300 Mt per year by 2040.”





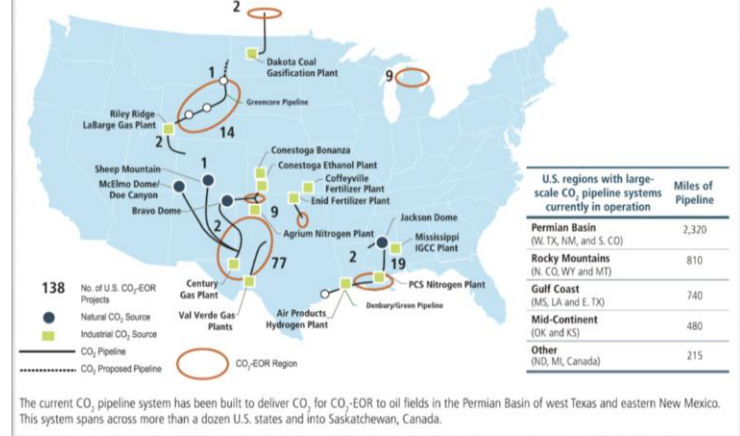
Carbon Capture is About Much More than Power Plants and Fossil Fuels

- 12 of the 13 U.S. commercial-scale carbon capture facilities in the U.S. are in industry, not power generation.
- Roughly one-third of U.S. and global carbon emissions come from industrial sectors.
- Over half of industrial emissions occur in just three sectors: steel, cement and basic chemicals.
- And over half of emissions from these three sectors are inherent to the chemistry of industrial processes and cannot be eliminated through efficiency or decarbonization of energy inputs.

- 1972: Val Verde Gas Processing Plants in Texas
- 1982: Koch Nitrogen Company Enid Fertilizer Plant in Oklahoma
- 1986: Exxon Shute Creek Gas Processing Facility in Wyoming
- 2000: Dakota Gasification's Great Plains Synfuels Coal Gasification Plant in North Dakota
- 2003: Core Energy/South Chester Gas Processing Plant in Michigan
- 2009: Chaparral/Conestoga Energy Partners' Arkalon Bioethanol Plant in Kansas
- 2010: Occidental Petroleum's Century gas processing plant in Texas
- 2012: Air Products Port Arthur Refinery Hydrogen Production in Texas
- 2012: Conestoga Energy Partners/PetroSantander Bonanza Bioethanol Plant in Kansas
- 2013: ConocoPhillips Lost Cabin Gas Processing Plant in Wyoming
- 2013: Chaparral/CVR Energy Coffeyville Fertilizer Gasification Plant in Kansas
- 2014: SaskPower Boundary Dam Coal Power Plant Post-Combustion Capture Retrofit in Saskatchewan
- 2015: Shell Quest hydrogen production at bitumen upgrader in Alberta
- 2016: Emirates Steel's Mussafah direct reduction iron plant in the United Arab Emirates
- 2017: NRG Petra Nova Coal Plant Post-Combustion Retrofit in Texas
- 2017: Archer Daniels Midland large-scale ethanol capture in Illinois

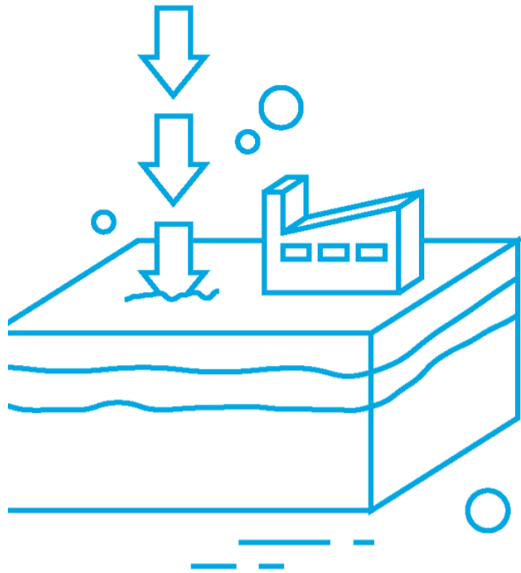
Carbon Capture Works: Nearly 50 Years Commercial Experience at Scale

Figure 7-8. Current CO₂-EOR Operations and Infrastructure¹¹²



- **13 commercial-scale U.S. facilities capturing ~25 million metric tons of CO₂ per year.**
- **Over 5,000 miles of CO₂ transport infrastructure.**

Carbon Capture is More Than a Niche



- U.S. industry has purchased, transported and injected into oil fields nearly 1.5 billion tons of CO₂ over the past half century with no fatalities, serious injuries, or major environmental incidents.
 - ~37% net lifecycle emissions reductions achieved by geologically storing industrial and power plant CO₂ through enhanced oil recovery (EOR), *including the additional oil produced* (IEA analysis).
- Globally, over a quarter billion tons of anthropogenic CO₂ have been stored geologically to date.
- Saline geologic storage of CO₂ without oil production has been demonstrated successfully at scale in multiple locations.
- Centuries to thousands of years' worth of geologic storage potential exists in U.S. saline formations and oil and gas fields.

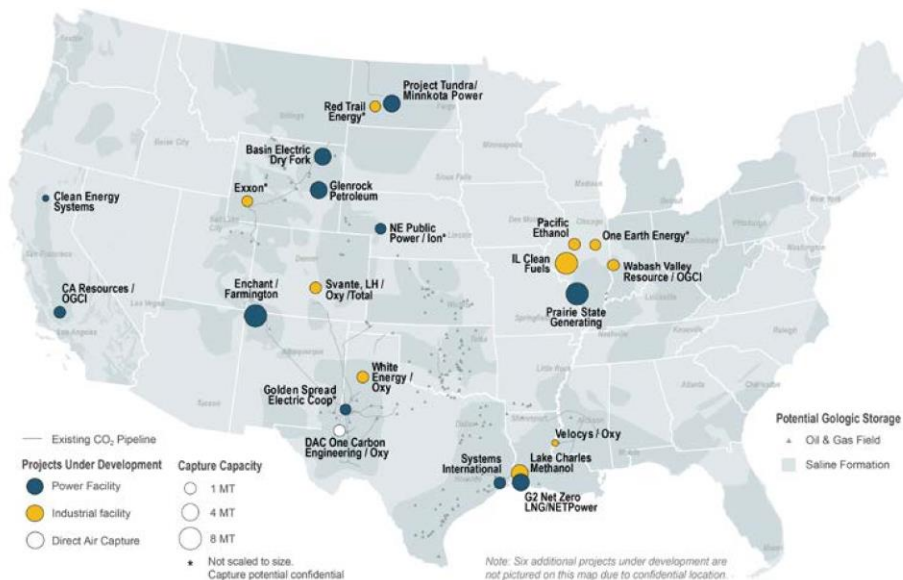
Carbon Capture is Cost-Effective: Preliminary Revised Estimates of Capture Costs Compare Favorably to Other Low and Zero-Carbon Options

| Capture Category (CO2% is molar concentration) | Main Equipment Needed | Industrial Application | US\$ per MT Captured/Compressed |
|---|---|---|---------------------------------|
| Pure CO2 emissions | Compression & Dehydration only | Ethanol, Natural Gas Processing, Ammonia | \$15-20/metric ton |
| CO2 emissions @ 16-50% concentration | Amine CO2 separation equipment plus Compression | Hydrogen Plants, Cement, Fluidized Catalytic Cracking Unit (Refineries), Blast Furnace Gas Combustion (Steel) | \$40-60 |
| CO2 emissions @ ~13-15% concentration | | Pulverized Coal Power Plants | \$55-65 |
| CO2 emissions @ ~4% | | Natural Gas Combined Cycle Power Plants | \$65-75 |

Source: Jeff Brown, Stanford University. These figures above are broad category summaries, and individual projects costs vary widely.
Key price assumptions: \$50/MWh for electricity, \$3.50/MMBtu natural gas, 10% Capital Recovery Factor.
Capture plant size: For amine solvent carbon capture systems cited above (all at 85% capacity factor) capture plant size for hydrogen is 350k MTPA (metric tons per annum), cement 1 million MTPA, FCCU 500k MTPA, Blast Furnace 3 million MTPA, Pulverized Coal Power 3 million MTPA, NGCC, 1.5 million MTPA. Pure emissions have compression/dehydration only.
Power and steam supply: Coal power plants and NGCCs can supply parasitic electric and steam loads from the power plants themselves, or can buy grid electricity and build separate steam boilers. The exact impact of this supply decision depends on power plant value, fuel costs, and the local grid.

Carbon Capture is Critical to Retaining and Growing a U.S. Domestic High-Wage Energy, Industrial and Manufacturing Jobs Base

30+ Carbon Capture Projects under Development
in Response to Federal 45Q Tax Credit



Estimated Jobs at Representative Capture and
CO₂ Transport Infrastructure Projects

| | PROJECT JOBS | OPERATION JOBS | |
|--|--|----------------|-----------|
| INDUSTRY CARBON CAPTURE RETROFIT* | 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 |
| POWER CO ₂ TRANSPORT INFRASTRUCTURE | 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>



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

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
- 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
- Growth Energy
- Institute of Clean Air Companies
- Melzer Consulting
- Portland Cement Association
- Republic Services
- School of Energy Resources, University of Wyoming
- Systems International | The ZEROS Project
- Tellus Operating Group

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.



CARBON CAPTURE
COALITION

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 CO₂ or puts CO₂ 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 CO₂ stored geologically through EOR.

\$35/ton

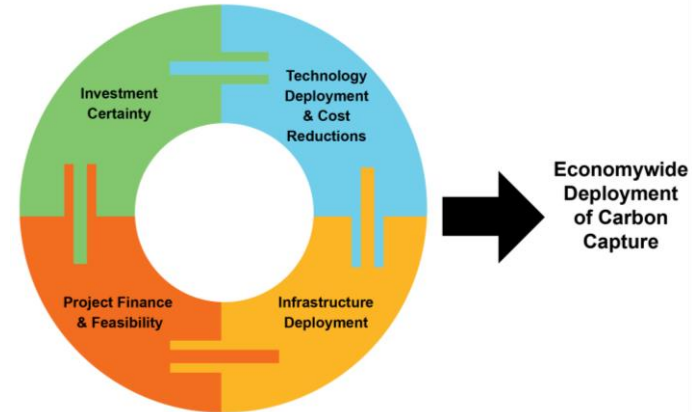
for other beneficial uses of CO₂ or CO such as converting carbon emissions into fuels, chemicals, or useful products like concrete.

\$50/ton

for CO₂ 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.

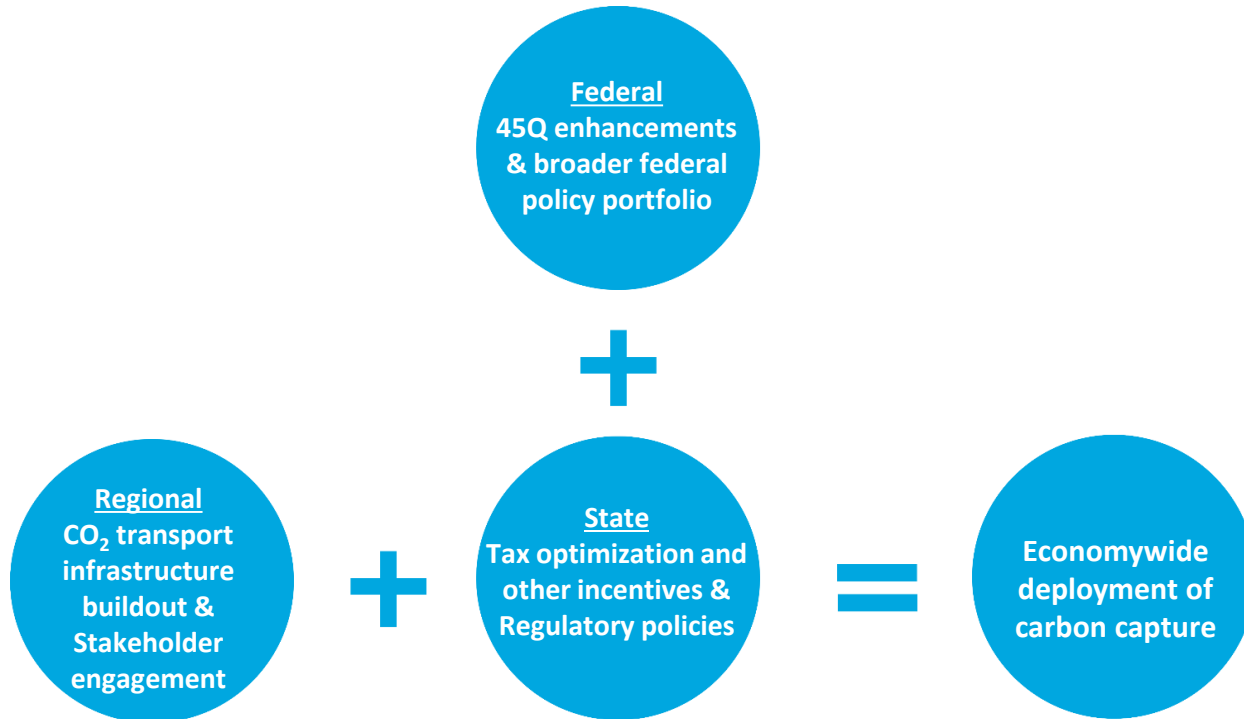


Toward a Full Carbon Capture Policy Portfolio: The Federal Policy Agenda Going Forward

- Ensure effective implementation of 45Q by Treasury and IRS;
- Enact a broader portfolio of federal carbon capture policies to enhance and complement 45Q, similar to wind and solar;
- Incorporate federal support for CO₂ transport infrastructure into national infrastructure legislation;
- Increase prioritization and resources for the entire carbon capture value chain, including transport, industrial capture, carbon utilization, and direct air capture; 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.

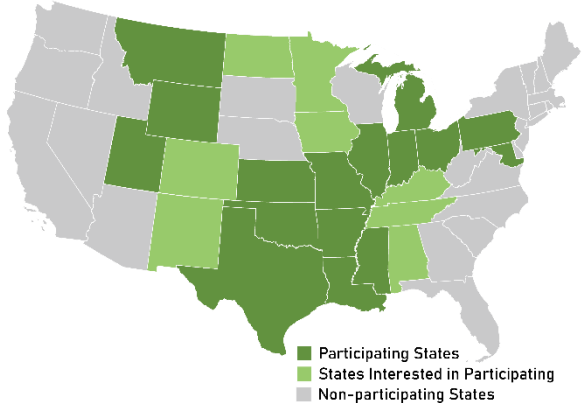


Integrated Federal-State Policy Implementation: Key to Economywide Deployment that Achieves the Full Emissions Reduction, Economic & Jobs Potential of Carbon Capture



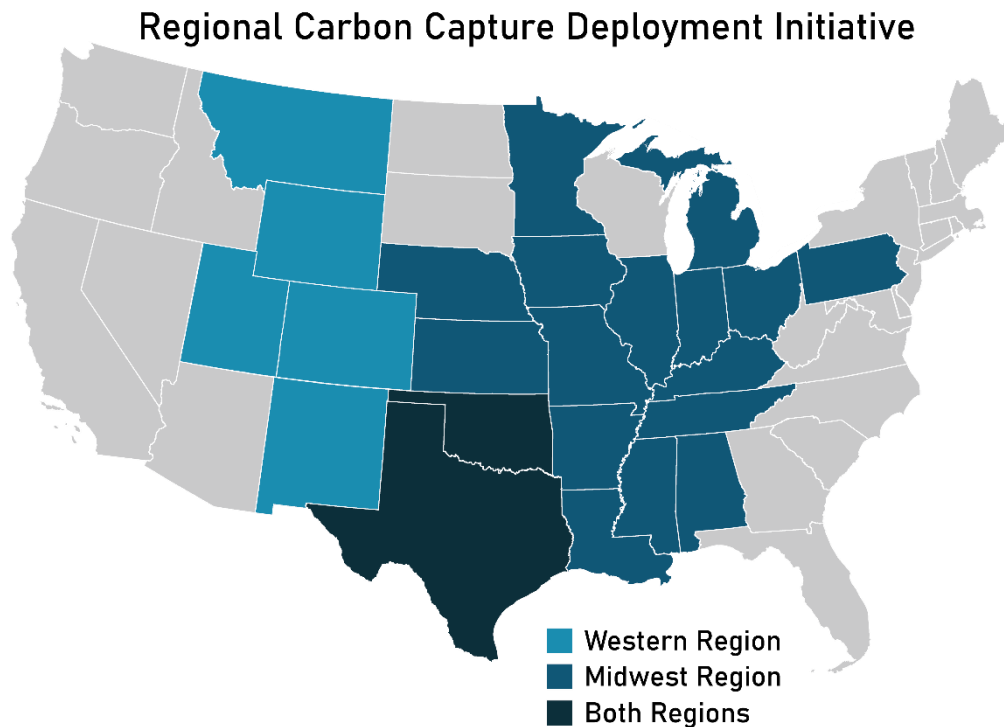
STATE CARBON CAPTURE WORK GROUP

State Carbon Capture Work Group: Participating States



- Formed in 2015 by Governors Mead (R-WY) and Gov. Bullock (D-MT) and convenes 16 states.
- Made comprehensive state and federal policy recommendations from 2015-2018.
- Coordinates Midwestern and Western Regional Deployment Initiatives that bring together nearly 400 state officials & stakeholders from ~25 states.
- Modeled candidate capture and storage projects and CO₂ transport infrastructure (2-year+ effort).
- Forming state policy teams to develop policy recommendations to complement the 45Q tax credit and make states “carbon-capture ready.”

Regional Deployment Initiatives: Western & Midwestern Regions



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

**REGIONAL
CARBON
CAPTURE
DEPLOYMENT
INITIATIVE**

SimCCS
Los Alamos

**GPI
Coordinated
Team**

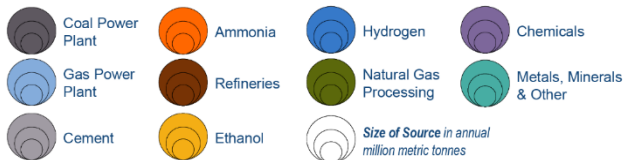
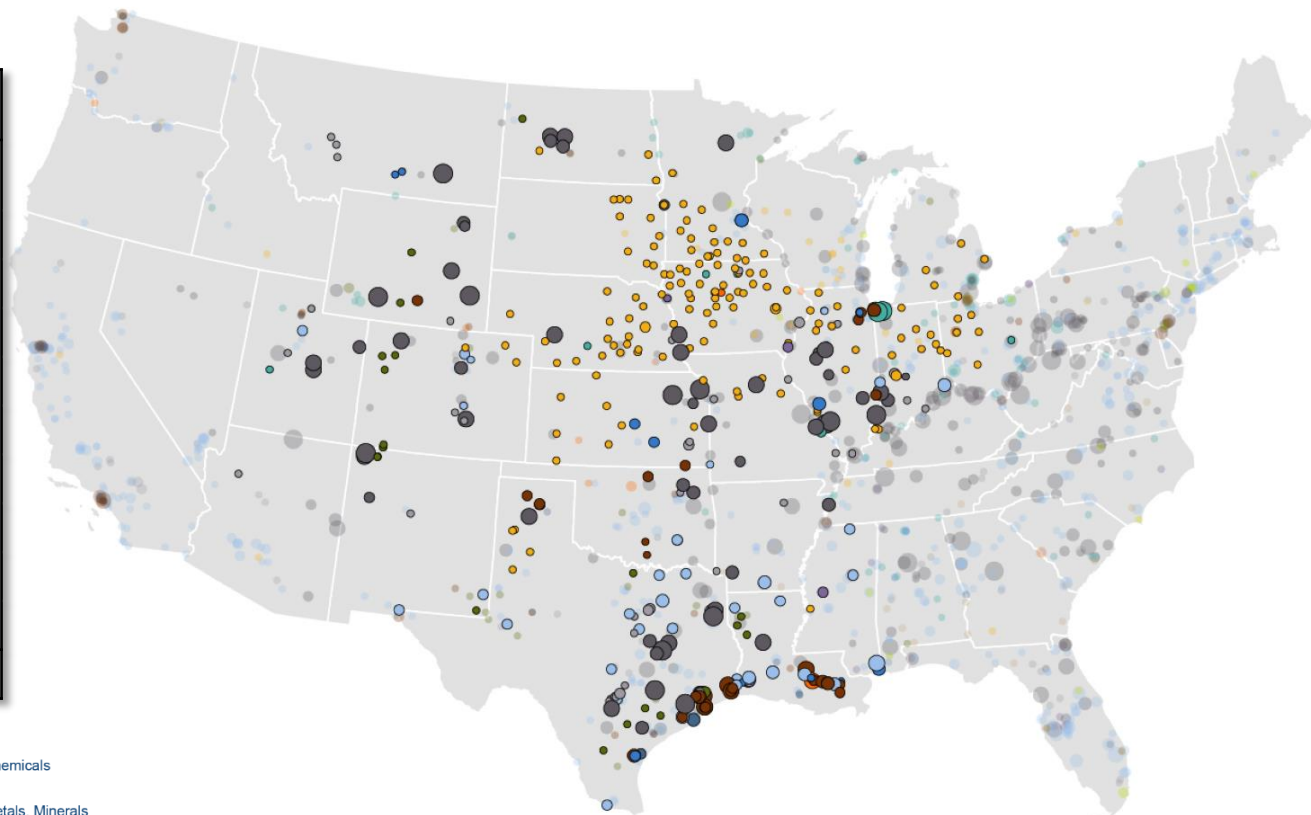
**Identify potential
early mover
capture projects
by state.**

**Model regional
CO₂ transport
infrastructure to
maximize
feasible capture,
use and storage.**

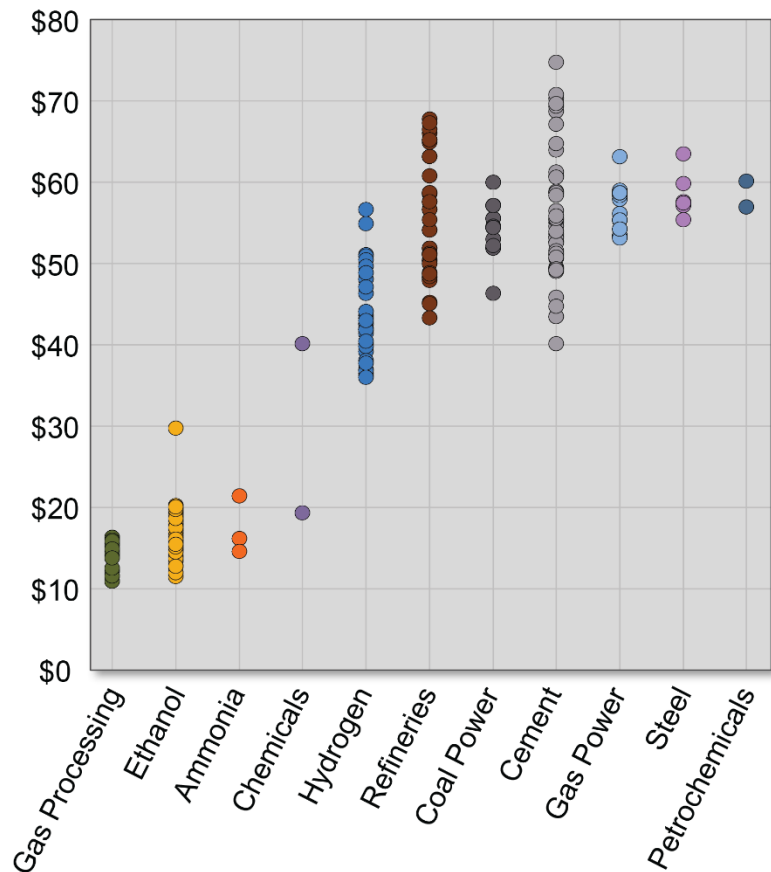
Economically Feasible Capture Retrofit with 45Q

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 |
| Total | 322.9 |



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



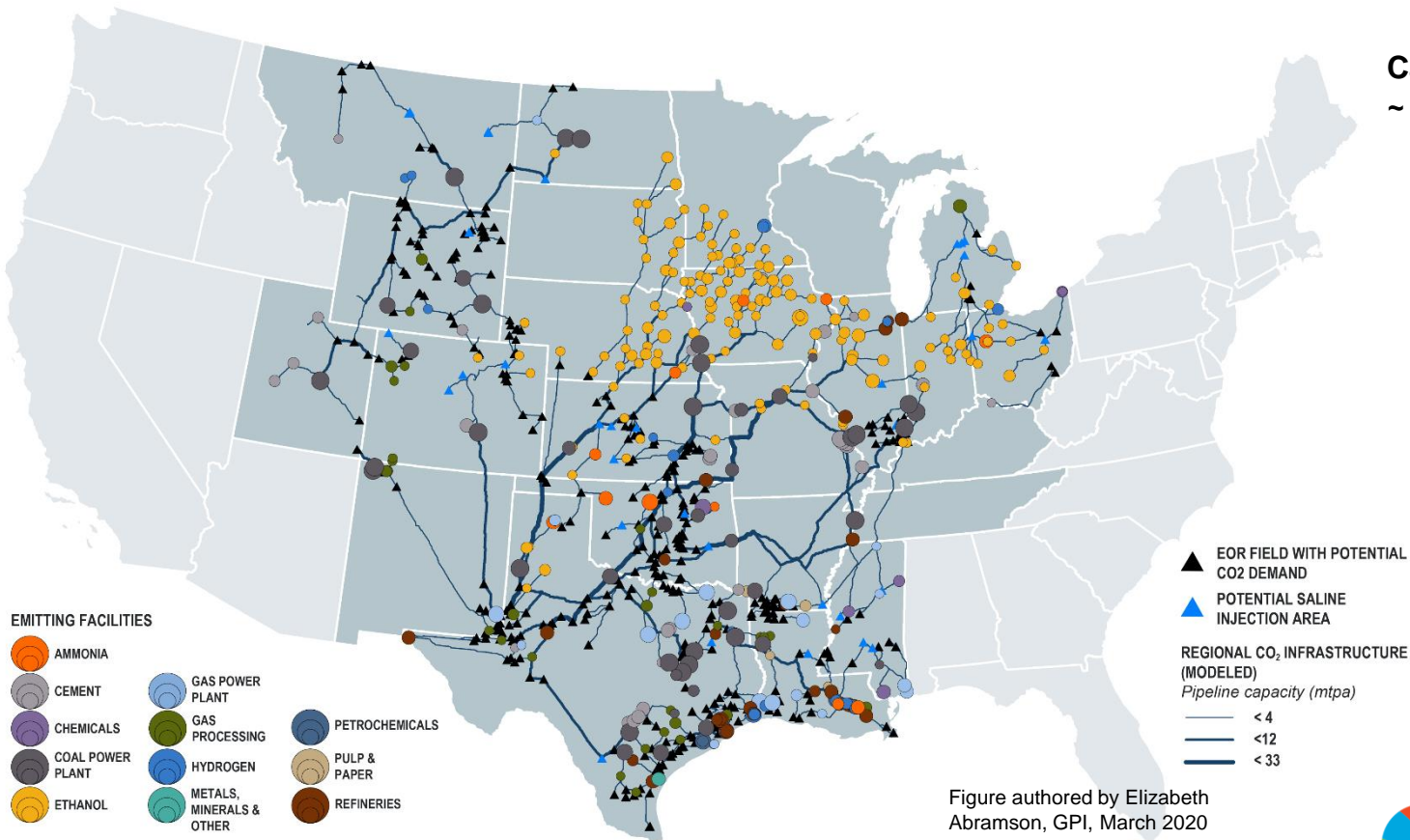
| Industry | Average Estimated Cost \$/ton | Range of Cost Estimates \$/ton |
|------------------|----------------------------------|-----------------------------------|
| Gas Processing | \$14 | \$11 - \$16 |
| Ethanol | \$17 | \$12 - \$30 |
| Ammonia | \$17 | \$15 - \$21 |
| Chemicals | \$30 | \$19 - \$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 near- to medium term transport network for CO₂ capture and storage under 45Q

Capture and storage:
~ 300 million metric tons per year



SimCCS CO₂
transport model



EMITTING FACILITIES

- AMMONIA
- CEMENT
- CHEMICALS
- COAL POWER PLANT
- ETHANOL
- GAS POWER PLANT
- GAS PROCESSING
- HYDROGEN
- METALS, MINERALS & OTHER
- PETROCHEMICALS
- PULP & PAPER
- REFINERIES

- EOR FIELD WITH POTENTIAL CO₂ DEMAND
 - POTENTIAL SALINE INJECTION AREA
- REGIONAL CO₂ INFRASTRUCTURE (MODELED)**
Pipeline capacity (mtpa)
- < 4
 - < 12
 - < 33

Figure authored by Elizabeth Abramson, GPI, March 2020



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

**Capture and storage:
~ 670 million metric tons per year**



SimCCS CO₂ transport model

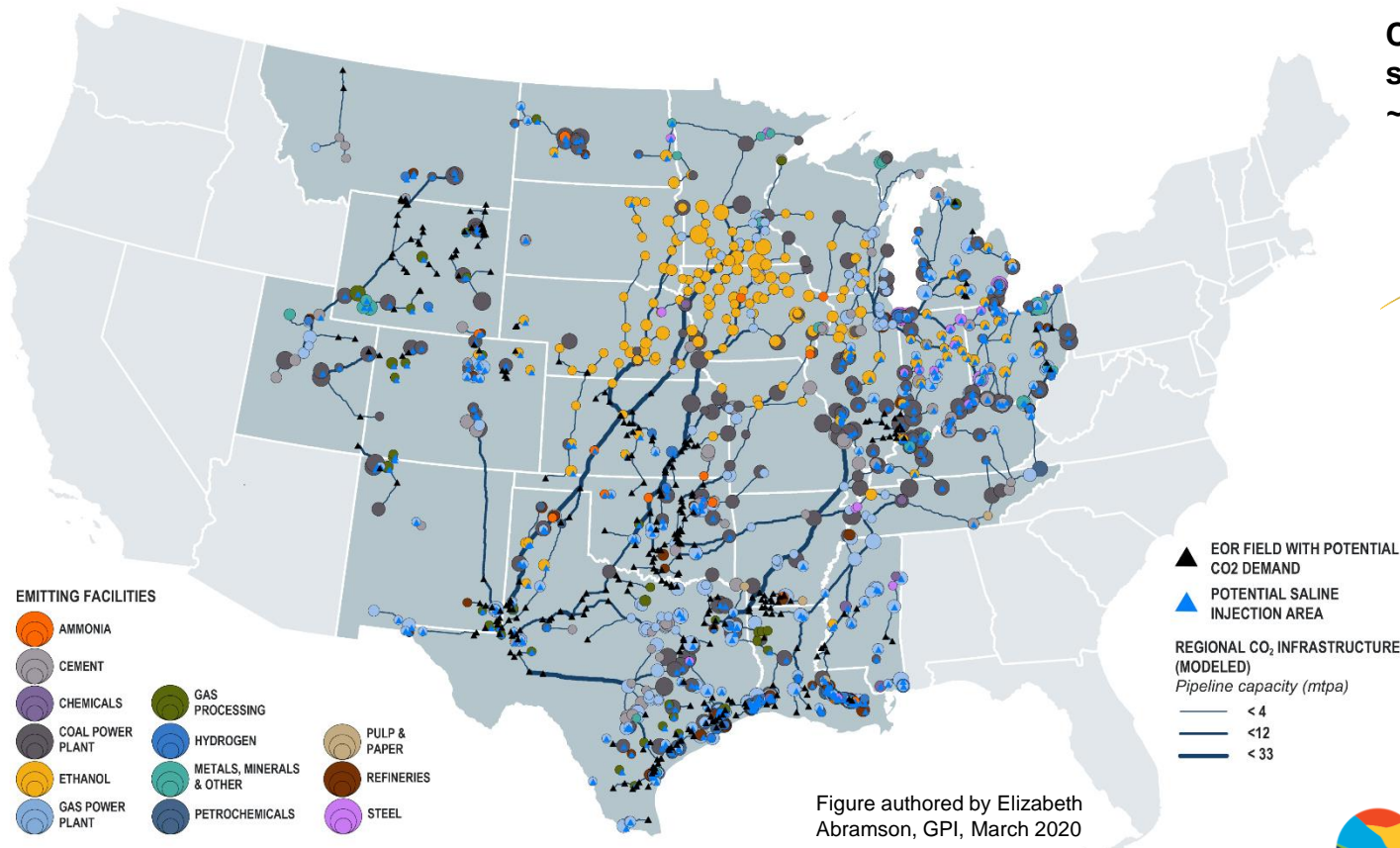
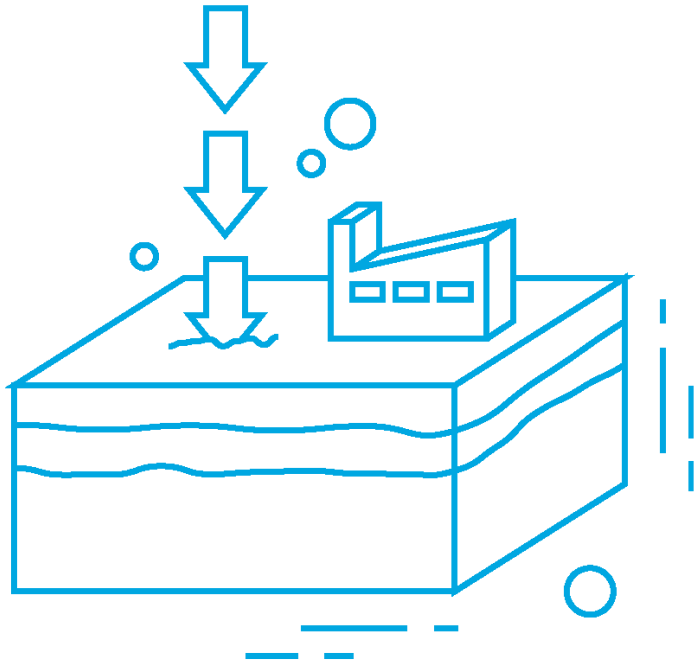


Figure authored by Elizabeth Abramson, GPI, March 2020





Carbon Capture Ready

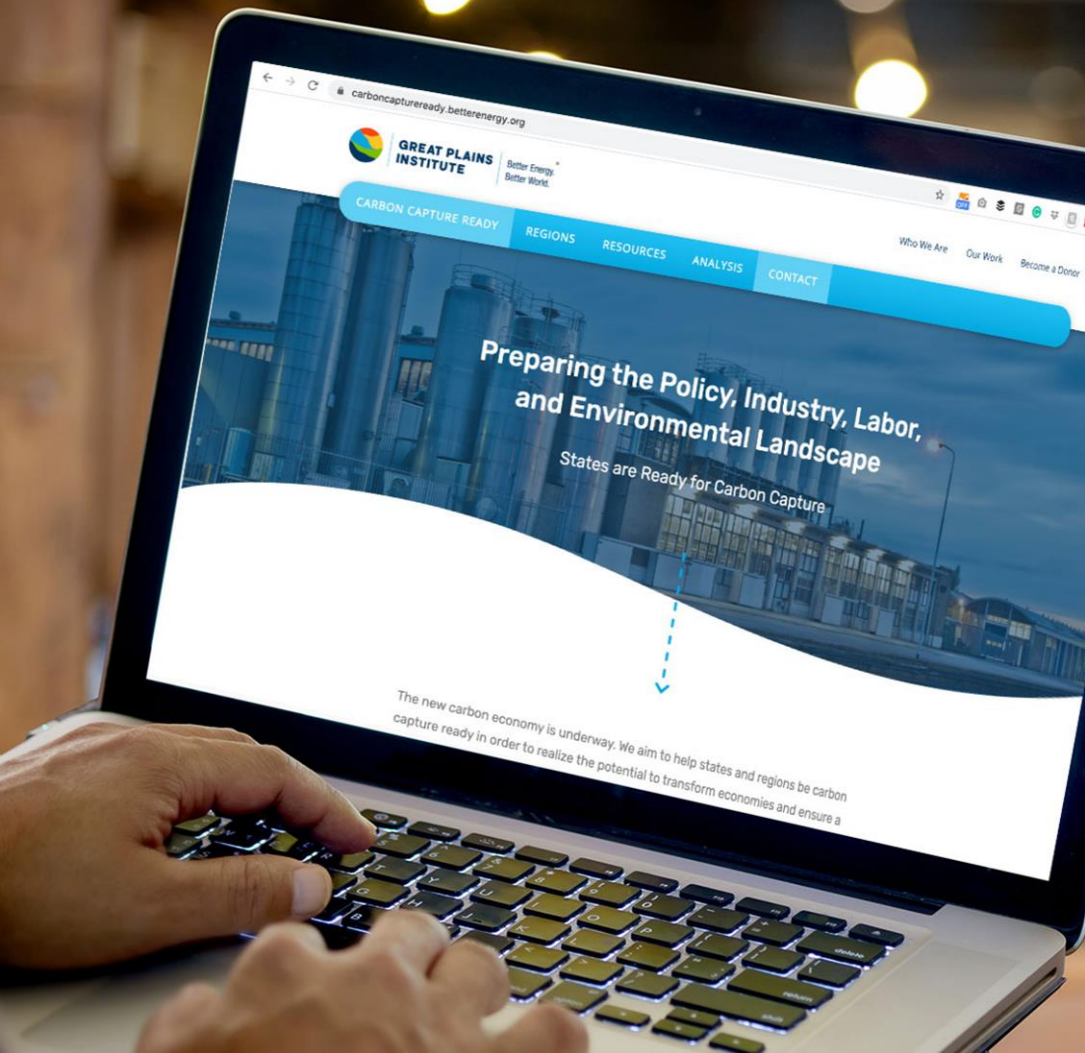
Goal: Help States Become “Carbon Capture Ready” and Take Full Economic Advantage of 45Q Tax Credit Before the End of 2023

- Developing state policy frameworks to complement 45Q and other federal policies, including:
 - ✓ Delegation of EPA authority for permitting saline storage projects (federal UIC Class VI) to states;
 - ✓ Rules for long-term CO₂ storage;
 - ✓ Rules for CO₂ transport and storage space;
 - ✓ Financial incentives for carbon capture; and
 - ✓ 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



Development of Multistate CO₂ 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 CO₂ transport infrastructure action plan within one year;
 - Make state and regional policy recommendations related to CO₂ transport infrastructure deployment to implement that plan;
 - Engage stakeholders to solicit input on policy recommendations;
 - Support efforts in Congress to incorporate CO₂ transport infrastructure into federal infrastructure legislation, including measures for federal financing; and
 - Support CO₂ 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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**GREAT PLAINS
INSTITUTE**

Better Energy.
Better World.



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

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

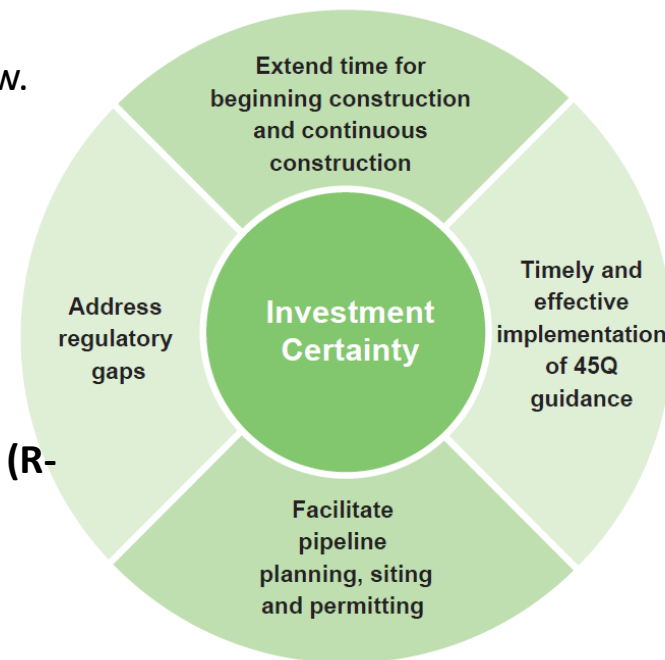
- Makes 45Q permanent, ending commence construction window.
- Included in House GOP climate package.

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.



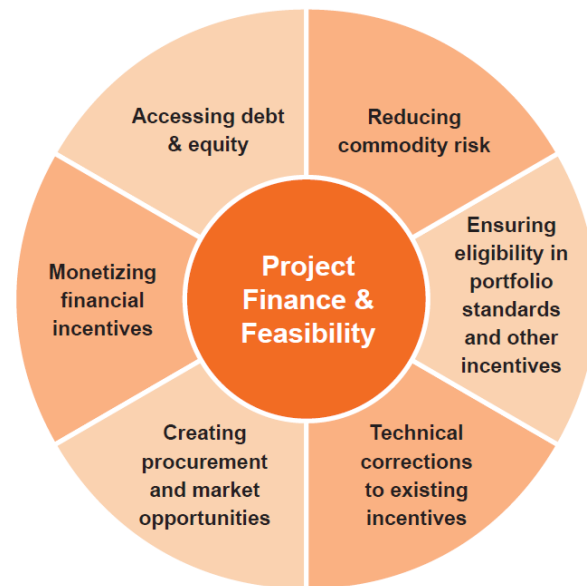
Project Finance & Feasibility: Direct Pay and BEAT Fix for 45Q

Direct Pay

- Option of estimated tax payment in lieu of monetizing tax credit:
 - 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)

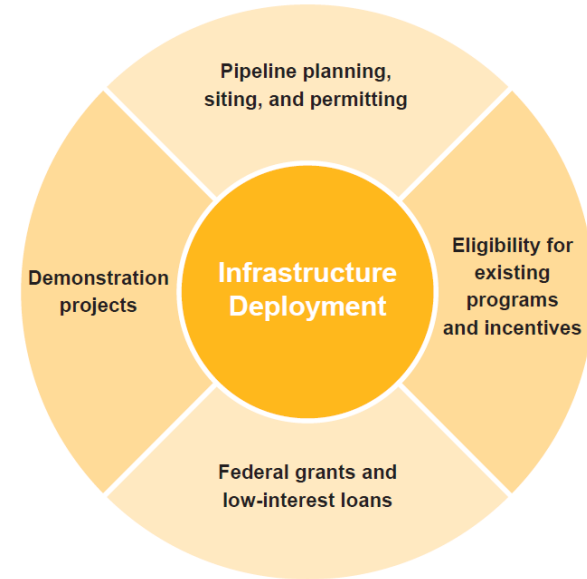
- Makes carbon capture projects eligible for MLPs



Infrastructure Deployment

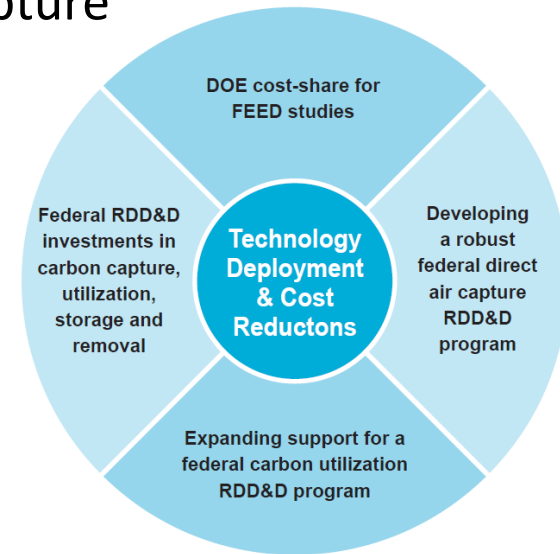
H.R. 4905, INVEST CO₂ Act (Bustos, D-IL)

- Provides low-interest federal loans to leverage private capital investment in CO₂ transport infrastructure:
 - Trunk and feeder lines to build out regional CO₂ 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 CO₂ pipelines as “pollution control devices” to enable tax abatement.

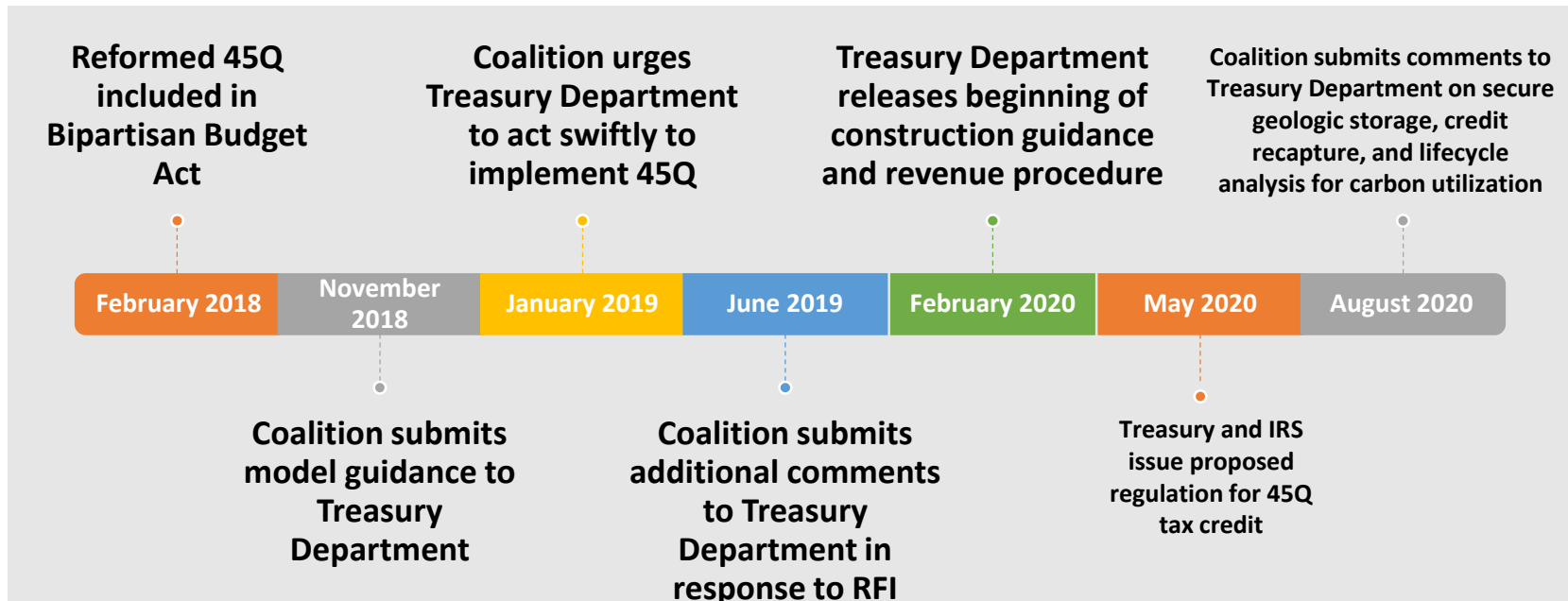


Technology Deployment & Cost Reductions: Bipartisan Federal RD&D Legislation for Carbon Capture, Use, Removal & Geologic Storage

- **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 CO₂ 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 CO₂-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 CO₂-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.



Federal Policy Agenda for Economic Recovery from COVID-19

- 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)

- **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.



CECILE CONROY

DIRECTOR OF GOVERNMENT AFFAIRS, INTERNATIONAL
BROTHERHOOD OF BOILERMAKERS

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BRIDGE-TO-A-CLEANER-ENERGY-FUTURE-1500](https://boilermakers.org/about/videos/ccs-bridge-to-a-cleaner-energy-future-1500)

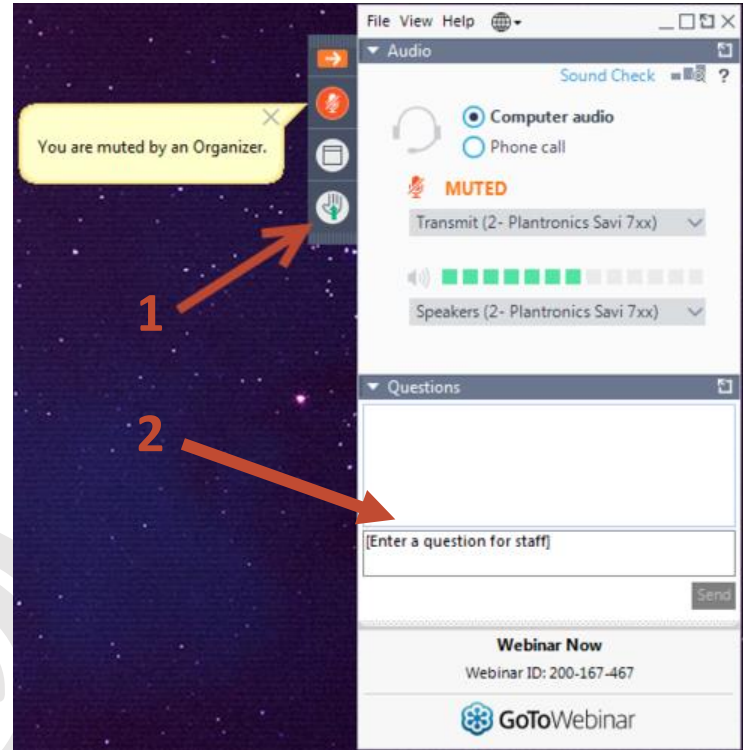


**Western Interstate
Energy Board**

QUESTIONS

Submit questions two ways:

1. Raise your hand and the moderator will call on you to unmute your line
2. Type a question into the question box



Western Interstate
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NARUC-WIEB CCUS WORKSHOP SCHEDULE

1. **Sept. 11: The Case for Carbon Capture, Utilization, and Storage**
2. Sept. 18: Breaking It Down: CCUS Technologies
3. Sept. 25: Financial Incentives and Investment Efforts
4. Oct. 2: Project Update Part I: Domestic CCUS Development Efforts
5. Oct. 9: Project Update Part II: International CCUS Development Efforts
6. Oct. 16: Regulatory Considerations and Policy Recommendations

[Full Agenda](#) | [Registration](#)

All webinars are held from 1:00 – 2:00 pm ET



Western Interstate
Energy Board

UPCOMING NARUC EVENTS

Innovation Webinars

- Sep 17, 3-4PM (ET): [Leveraging Behavioral Strategies to Drive Building Decarbonization](#)
- Oct 22, 3-4PM (ET): [Emerging Possibilities for Bulk Energy Storage](#)
- Nov 19, 3-4PM (ET): [Where the Wind Blows: Offshore Wind Outlook for State Regulators](#)

NARUC Annual Meeting – Nov 9-11

- Registration opening on Sep 14
- <https://www.naruc.org/meetings-and-events/naruc-annual-meetings/2020-annual-meeting/>



UPCOMING WIEB EVENTS

Save-the-Dates

Fall 2020 JOINT CREPC-WIRAB MEETING Webinar Series

Fridays: October 23, October 30, November 6, and November 13, 2020

11:00 – 12:30 PM (MT) / 10:00 – 11:30 AM (PT)

You are invited to join us on Fridays this October and November for the Fall 2020 Joint CREPC-WIRAB Meeting Webinar Series, where western electric utility policymakers and regulators, industry experts, consumer advocates, and other stakeholders will explore and discuss current and emerging electricity trends, challenges, and opportunities for the Western Interconnection.

<https://westernenergyboard.org/>

Joint CREPC-WIRAB Meetings are conducted by the Committee on Regional Electric Power Cooperation (CREPC)—a joint committee of the Western Interstate Energy Board and the Western Conference of Public Service Commissioners—and the Western Interconnection Regional Advisory Body (WIRAB).



THANK YOU

Join us for the next webinar in the
NARUC-WIEB CCUS Workshop

Friday, Sept. 18 | 1:00 – 2:00 pm ET

[Breaking It Down: CCUS Technologies](#)

- Dr. Holly Krutka, University of Wyoming
- Jason Begger, Wyoming Energy Authority
- Scott Quillinan, University of Wyoming



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