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
“All hands on deck” to achieve economywide deployment of carbon capture in the U.S.
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.
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 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.
Federal Carbon Capture Policy Agenda Going Forward

- 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$_2$ 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.
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.
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’s 45Q Tax Credit Guidance

Key Coalition Recommendations

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

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

- **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.

- **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.

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

- **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$_2$-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

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:
  o Support near-term jobs & economic activity;
  o Rely on existing legislative authority where possible;
  o Avoid or minimize the need for further rulemaking or guidance procedures; and
  o 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.
Integrated Federal-State Policy Implementation is Key to Economywide Deployment

Federal
- 45Q enhancements
- Broader federal policy portfolio

Regional
- CO₂ transport infrastructure buildout
- Stakeholder engagement

State
- Tax optimization & other incentives
- Regulatory policies

Economywide deployment of carbon capture
• 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 CO₂ 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
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

<table>
<thead>
<tr>
<th>Industry</th>
<th>Capture Target (million MT/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel (Blast Furnace)</td>
<td>12.5</td>
</tr>
<tr>
<td>Cement</td>
<td>29.5</td>
</tr>
<tr>
<td>NG Processing</td>
<td>4.5</td>
</tr>
<tr>
<td>Ethanol</td>
<td>36.2</td>
</tr>
<tr>
<td>Refineries (FCC)</td>
<td>25.4</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>14.7</td>
</tr>
<tr>
<td>Lime</td>
<td>0.9</td>
</tr>
<tr>
<td>NG Power Plants</td>
<td>65.9</td>
</tr>
<tr>
<td>Ammonia</td>
<td>0.7</td>
</tr>
<tr>
<td>Coal Power Plants</td>
<td>132.6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>322.9</strong></td>
</tr>
</tbody>
</table>
### Estimated cost of capture per industry for near-term facilities in study area

#### Average Estimated Cost

<table>
<thead>
<tr>
<th>Industry</th>
<th>Average Estimated Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Processing</td>
<td>$14</td>
</tr>
<tr>
<td>Ethanol</td>
<td>$17</td>
</tr>
<tr>
<td>Ammonia</td>
<td>$17</td>
</tr>
<tr>
<td>Chemicals</td>
<td>$30</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>$44</td>
</tr>
<tr>
<td>Refineries</td>
<td>$56</td>
</tr>
<tr>
<td>Coal Power Plant</td>
<td>$56</td>
</tr>
<tr>
<td>Cement</td>
<td>$56</td>
</tr>
<tr>
<td>Gas Power Plant</td>
<td>$57</td>
</tr>
<tr>
<td>Steel</td>
<td>$59</td>
</tr>
<tr>
<td>Petrochemicals</td>
<td>$59</td>
</tr>
</tbody>
</table>

#### Range of Cost Estimates

<table>
<thead>
<tr>
<th>Industry</th>
<th>Range of Cost Estimates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas Processing</td>
<td>$11 - $16</td>
</tr>
<tr>
<td>Ethanol</td>
<td>$12 - $30</td>
</tr>
<tr>
<td>Ammonia</td>
<td>$15 - $21</td>
</tr>
<tr>
<td>Chemicals</td>
<td>$19 - $40</td>
</tr>
<tr>
<td>Hydrogen</td>
<td>$36 - $57</td>
</tr>
<tr>
<td>Refineries</td>
<td>$43 - $68</td>
</tr>
<tr>
<td>Coal Power Plant</td>
<td>$46 - $60</td>
</tr>
<tr>
<td>Cement</td>
<td>$40 - $75</td>
</tr>
<tr>
<td>Gas Power Plant</td>
<td>$53 - $63</td>
</tr>
<tr>
<td>Steel</td>
<td>$55 - $64</td>
</tr>
<tr>
<td>Petrochemicals</td>
<td>$57 - $60</td>
</tr>
</tbody>
</table>
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
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
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$_2$ 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 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

Brad Crabtree
Vice President, Carbon Management
Great Plains Institute

701-647-2041 (o) | 701-830-0302 (m)
bcrabtree@gpisd.net