CARBON CAPTURE COALITION

To: President Trump's Reelection Campaign
From: Carbon Capture Coalition
Date: 10/28/20
Re: Priorities for Carbon Capture, Removal, Transport, Use and Storage

Executive Summary

The United States leads the world in the commercialization of carbon capture and there is bipartisan support for capturing and utilizing CO_2 and its precursor carbon monoxide. Carbon capture deployment at industrial facilities, power plants and through direct air capture is an essential tool to meeting climate goals, preserving and expanding a high-wage jobs base in key industrial sectors, as well as fostering continued domestic energy and industrial production and avoiding plant closures and the offshoring of jobs and livelihoods.

Climate

Both the United Nation's International Panel on Climate Change (IPCC) and the International Energy Agency (IEA) assert that carbon capture technology is critical to achieve midcentury global temperature targets. Absent carbon capture, reaching net-zero emissions by mid-century is much more costly and difficult. The IPCC finds that climate mitigation cost under the 2 degree Celsius scenario would be more than double if carbon capture were not included as an emissions reduction strategy.

In modeling of scenarios to limit warming below 2 ºC, the IEA concludes that a total of 15 percent all emissions reductions to meet net-zero by 2070 must come from carbon capture, with the largest relative emissions reduction contributions coming from carbon capture at industrial facilities. A faster transition to net-zero increases the need for carbon capture. Moving the net-zero goalposts from 2070 to 2050 would require 50 percent more carbon capture deployment.[i]

Carbon capture will be particularly key in addressing hard-to-decarbonize industrial sectors, providing firm, dispatchable low-carbon power, and enabling the scale-up of other zero- and low-carbon industries, such as hydrogen production. Additionally, direct air capture will provide an important mechanism to offset future emissions and emissions from particularly hard-to-abate sectors.

Jobs & Project Development Status

Carbon capture deployment at industrial facilities, power plants and direct air capture (DAC) will retain and grow domestic high-wage industrial, energy and manufacturing jobs. Carbon capture

projects provide some of the most desirable clean energy jobs since employment associated with heavy industry (refining, chemicals, cement, steel, etc.) and electric power generation pays higher than average local wages.

According to a recent Rhodium Group analysis, carbon capture deployment at industrial facilities and power plants and deployment of associated CO_2 transport infrastructure in 21 states of the Midwest, Great Plains, Gulf Coast and Rockies can support an annual average of up to 68,000 project jobs over a 15-year period and 35,800 ongoing operational jobs and capture 592 million metric tons of CO_2 per year[ii].

A typical DAC plant capturing 1 million tons per year can generate roughly 3,500 jobs across the various sectors in the DAC supply chain. The construction, engineering, and equipment manufacturing sectors combined could see at least 300,000 new jobs associated with full scale DAC deployment, according to a Rhodium group analysis.

The Carbon Capture Coalition has identified over 30 carbon capture projects in various stages of project development driven by the 45Q tax credit, spanning industry, electric power, transportation fuels, and direct air capture technologies. If these projects all proceed to commercial operation, it will represent roughly a tripling of operating carbon capture projects in the U.S. and an essential early down payment on long-term deployment goals for midcentury climate targets.

Key Carbon Capture Coalition Priorities

The landmark bipartisan reform and expansion of the federal 45Q tax credit through passage of the FUTURE Act in 2018 is foundational for commercial-scale deployment of carbon capture technologies. Similar to the commercialization of other low- and zero-emissions technologies such as wind and solar, a broad suite of federal policies will be necessary to enable large-scale deployment of these technologies including:

- Both a direct pay option and a multiyear extension of the commence-construction window for the Section 45Q tax credit;
- Enhancements to other existing federal financing mechanisms to allow carbon capture projects to qualify;
- Significantly expanded U.S. Department of Energy (DOE) cost-share funding for commercial-scale carbon capture demonstrations; and
- Low-cost federal financing and grants to spur development of necessary CO_2 transport and storage infrastructure.

About Us

The Carbon Capture Coalition (the Coalition) is a nonpartisan collaboration of more than 80 businesses and organizations dedicated to advancing federal policy for economywide deployment of carbon capture, removal, transport, use, and storage. Our mission is to **reduce carbon emissions to meet midcentury climate goals, foster domestic energy and industrial production, and support a high-wage jobs base** through the adoption of carbon capture from industrial facilities, power plants and ambient air through direct air capture.

Coalition membership includes industry, energy, and technology companies; energy and industrial sector labor unions; and conservation, environmental and energy policy organizations.

Coalition participants have prepared this memo to provide joint input into the deliberations and planning being undertaken by President Trump's reelection campaign in the areas of climate, energy and related federal policy. In 2019, the Coalition released its first-ever Federal Policy Blueprint, which lays the groundwork for a full federal policy portfolio for carbon capture that enhances and builds on the landmark 45Q tax credit. The recommendations put forward in this memo by the Coalition are drawn from the Blueprint and prioritized for near-term impact on economic development and job creation.

Priorities for the First 100 Days

The recommendations below represent the Coalition's highest priorities for the first 100 days of a second Trump administration and the 117th Congress. These recommendations are crucial to ensuring that announced carbon capture and storage projects move to construction, and that economywide carbon capture deployment at industrial facilities, power plants and DAC can deliver on climate, energy and jobs potential.

The current COVID-19 pandemic has wreaked havoc on much of the economy, and the power and industrial sectors are no exception. The IEA estimates that global investment in energy technology is set to drop 20 percent in 2020, the largest ever one-year decrease, and thousands of jobs have been lost as energy projects have stalled. The current pandemic offers both the challenge and opportunity to rebuild and retool our energy sector better and cleaner than before. Carbon capture has a unique role to play in the broader economic recovery – both as a jobs creator and as an emissions reduction tool.

1) Allow for a direct pay option and extend the commence-construction window for the Section 45Q tax credit to facilitate greater deployment of carbon capture

Project developers and investors are building out a carbon management industry in response to the reformed and expanded Section 45Q credit enacted by Congress in February 2018. By enacting a direct pay option and extending the 45Q tax credit, the United States will more quickly deploy carbon capture technologies at the appropriate scale required by midcentury climate targets.

Allowing 45Q tax credit recipients to receive a direct cash payment from the Treasury will alleviate the need to rely on tax equity markets. Not only are tax equity markets constrained by the current COVID-19-induced economic and market crisis, carbon capture projects remain more challenging to finance than incumbent low and zero-carbon technologies, and tax equity transactions are complex, inefficient and costly for developers of such projects.

Additionally, a multiyear extension of the 45Q commence construction window will ensure that projects, both announced and under development, continue to move forward despite near-term economic and market headwinds. A multiyear extension will also provide long-term certainty for private investment in commercial deployment of carbon capture technologies in the marketplace.

Relevant bills in the 116th Congress:

Direct Pay:

- House Ways and Means majority GREEN Act passed the House as part of H.R. 2, which includes **direct pay for 45Q**, as well as for the wind PTC and solar ITC (championed by Representative Sewell D-AL); and
- The bipartisan RECOUPS Act (H.R. 7896) provides **direct pay for 45Q** (Representatives Bergman R-MI and Fletcher D-TX).

Multiyear extension of the commence construction window:

- House Ways and Means majority GREEN Act, which passed the House as part of H.R. 2, includes a **two-year extension of 45Q** (championed by Representative Sewell D-AL);
- Representative Schweikert's (R-AZ) H.R. 5883 to **make 45Q permanent**; and
- Senators Capito (R-WV), Whitehouse (D-RI), Barrasso (R-WY) and Cramer's (R-ND) proposed bipartisan amendment (S. Amdt. 1374) to the American Energy Innovation Act (S. 2657), which is a **five-year extension of 45Q**.

2) Enhance other federal incentives to expand eligibility for available financing mechanisms to carbon capture projects

Other existing federal incentives either exclude carbon capture projects or need technical modifications to allow carbon capture projects to qualify. Expanding financing mechanisms available to carbon capture projects will increase prospects for future deployment.

Relevant bills in the 116th Congress:

- **48A Tax Credit:** Representative McKinley (R-WV) and Senator Hoeven's (R-ND) bipartisan Carbon Capture Modernization Act (H.R. 1796 and S. 407) would accomplish the technical fixes to 48A to unlock $2 billion in available federal incentives.
- **Private Activity Bonds:** Representative Burchett and Senator Bennet's bipartisan Carbon Capture Improvement Act (H.R. 3861 and S. 1763) would make carbon capture at industrial facilities and power plants eligible for PABs. While not included in this legislation, direct air capture technologies should also be eligible for PABs.

3) Enact a comprehensive energy package to expand DOE cost-share programs for carbon capture research, development, demonstration and deployment

There are long lead times in advancing capital-intensive technologies from concept to demonstration to commercialization, making it challenging even in normal economic conditions to attract private investment to scale up these technologies in the marketplace. DOE cost share funding has played a crucial role in the success of recent large-scale carbon capture and storage projects in the U.S. Increased investment will help ensure economywide deployment of carbon capture, removal, utilization and geologic storage technologies.

Relevant bills in the 116th Congress:

House-passed Clean Economy Jobs and Innovation Act (H.R. 4447), particularly Title III which includes the following:

- Authorization of a commercial carbon capture, utilization and storage commercialization program ($7.5 billion over five years);
- Reauthorization of saline geologic storage research, development and demonstration (RD&D) programs ($3.1 billion over five years);
- Authorization of a carbon utilization RD&D program ($165 million over five years);
- Establishment of a carbon removal RD&D program, including a $180 per ton direct air capture prize program through 2030; and
- Provisions to establish an industrial emissions technology program and technical assistance to implement industrial emissions reductions.

The Senate American Energy Innovation Act (AEIA), which includes key carbon capture legislation:

- EFFECT Act (S. 1201);
- LEADING Act (S. 1685 and H.R. 3828); and
- Clean Industrial Technology Act – CITA (S. 4230).

4) Provide low-cost federal financing and grants to expand deployment of large-scale CO_2 transport and storage infrastructure as part of broader infrastructure package

Interconnected and responsibly-sited transport systems that collect CO_2 from multiple capture sources and deliver it to shared geologic storage sites, or 'hubs', are the key backbone infrastructure needed for economywide carbon capture deployment at the necessary scale. Analyses[iii] have found that a significant buildout of CO_2 transport and storage infrastructure is necessary for the U.S. to achieve net-zero emissions by midcentury.

Existing and anticipated bills in the 116th Congress:

Anticipated bipartisan House and potentially Senate legislation yet this Congress will expand on the INVEST CO_2 Act (H.R. 4905) to:

- Finance shared CO_2 transport infrastructure through flexible, low-interest loans and grants for projects;
- Build upon the CarbonSAFE program to provide DOE cost share funding for large-scale commercial saline geologic storage hubs;
- Provide EPA with increased funding for permitting Class VI wells for saline geologic storage of CO_2, and grants for states to establish their own Class VI permitting programs; and
- Establish DOE infrastructure-related carbon utilization programs, including the establishment of a carbon-to-value test center to support development of beneficial uses of captured carbon.

Appendix

The Federal Role in Carbon Capture Deployment

Reform and expansion of the federal 45Q tax credit through passage of the FUTURE Act in 2018 has spurred tremendous interest from lawmakers, states, and stakeholders in commercializing carbon capture technologies. Since then, the Carbon Capture Coalition has spent over two years building consensus on the effective implementation of 45Q, including three comprehensive submissions of consensus model guidance and recommendations in comments to Treasury and the IRS in November 2018, June 2019 and July 2020. IRS finalizing the proposed rule for 45Q will provide long overdue regulatory and investment certainty to unlock billions of dollars in private capital for carbon capture projects to complete planning, engineering, permitting and financing to begin construction by the end of 2023 in order to qualify for the credit.

Looking ahead, and building on the success of wind, solar and other low- and zero-carbon technologies, carbon capture will need a full portfolio of federal policies and comparable support to achieve economywide deployment. It is well established that there are long lead times for advancing capital intensive energy technologies from concept to demonstration to commercialization, making it difficult to attract sufficient private investment to scale up these technologies in the marketplace, absent federal support.

A federal portfolio of supportive policies includes tax credits and other incentives, funding for RD&D, and financing in order to leverage private investment in carbon capture, removal, transport, utilization and storage projects that will spur continued innovation and improved performance, thus driving down costs and attracting still more investment that further accelerates deployment.

Carbon Capture's Role in Addressing Climate Change

Nearly every global climate mitigation scenario put forth by international organizations and agreements requires dramatically accelerated use of carbon capture and removal to meet its goals. Underscoring carbon capture's central role in mitigating climate change, the IPCC finds that climate mitigation cost under the 2 ºC scenario would be more than double if carbon capture were not included as an emissions reduction strategy.

In modeling of scenarios to limit warming below 2 ºC, the IEA concludes that a total of 15 percent all emissions reductions to meet net-zero by 2070 must come from carbon capture, with the largest relative emissions reduction contributions coming from carbon capture at industrial facilities. A faster transition to net-zero increases the need for carbon capture. Moving the net-zero goalposts from 2070 to 2050 would require 50 percent more carbon capture deployment.[iv]

Carbon capture has been successfully deployed at large scale in certain industrial sectors for decades and has entered commercial-scale operation in the power sector in recent years. Industrial CO_2 emissions account for about 33 percent of US stationary emissions, according to the US Environmental Protection Agency. Many industrial facilities in ethanol, gas processing,

ammonia and hydrogen production offer immediate opportunities for relatively low-cost capture due to the high purity and concentration of CO_2 emissions from their production processes.

The IEA estimates that the global carbon capture industry will need to scale-up to over 2,000 facilities capturing 2.8 gigatons of CO_2 per year to limit warming to 2°C. To meet the more ambitious 1.5°C scenario, the IPCC estimates that 10 gigatons of CO_2 must be captured annually. The Global CCS Institute estimates that more than 2,500 large-scale carbon capture facilities will need to come online by 2040 to achieve the 1.5°C goal; half of these facilities are expected to be in power generation, the other half in industrial sectors. Post-2050, direct air capture will play an increasing role in offsetting any remaining anthropogenic emissions in particularly hard-to-abate sectors such as aviation. Today, there are 20 large-scale carbon capture projects operating worldwide, with another 30 in various stages of development. Globally, these 20 large-scale facilities currently capture approximately 40 million metric tons of CO_2 per year. the U.S. has 13 commercial-scale carbon capture facilities, with the capacity to capture about 25 million tons of CO_2 annually.[1]

Carbon Capture as a Jobs Creator

Fostering carbon capture deployment at levels needed to meet midcentury climate goals will result in dramatic growth in employment provided by the carbon capture industry, including both project jobs (primarily construction) and operational jobs featuring a mix of skillsets.

Carbon capture retrofits of industrial facilities and power plants support high-wage jobs in particular; indeed, they provide among the most desirable clean energy jobs, given that employment associated with heavy industry (refining, chemicals, cement, steel, etc.) and and electric power generation pays higher than average local wages. In addition, new and innovative high-skill and high-wage industries will play a role in commercializing carbon capture, including jobs associated with new negative emissions and carbon utilization technologies. Carbon capture retrofits will reduce emissions from existing facilities, preventing their retirement and loss of associated high-wage jobs.

According to a recent Rhodium Group analysis, carbon capture deployment at industrial facilities and power plants and deployment of associated CO_2 transport infrastructure in 21 states in the Midwest, Great Plains, Gulf Coast and Rockies can support an annual average of up to 68,000 project jobs over a 15-year period and 35,800 ongoing operational jobs and capture 592 million metric tons of CO_2 per year[v].

A typical DAC plant capturing 1 million tons per year can generate roughly 3,500 jobs across the sectors in the DAC supply chain. Construction, engineering and equipment manufacturing sectors combined could see at least 300,000 new jobs associated with full scale DAC deployment, according to a Rhodium group analysis.

[1] The global total compiled by the Global CCS Institute includes 11 of the 13 U.S. commercial-scale facilities.

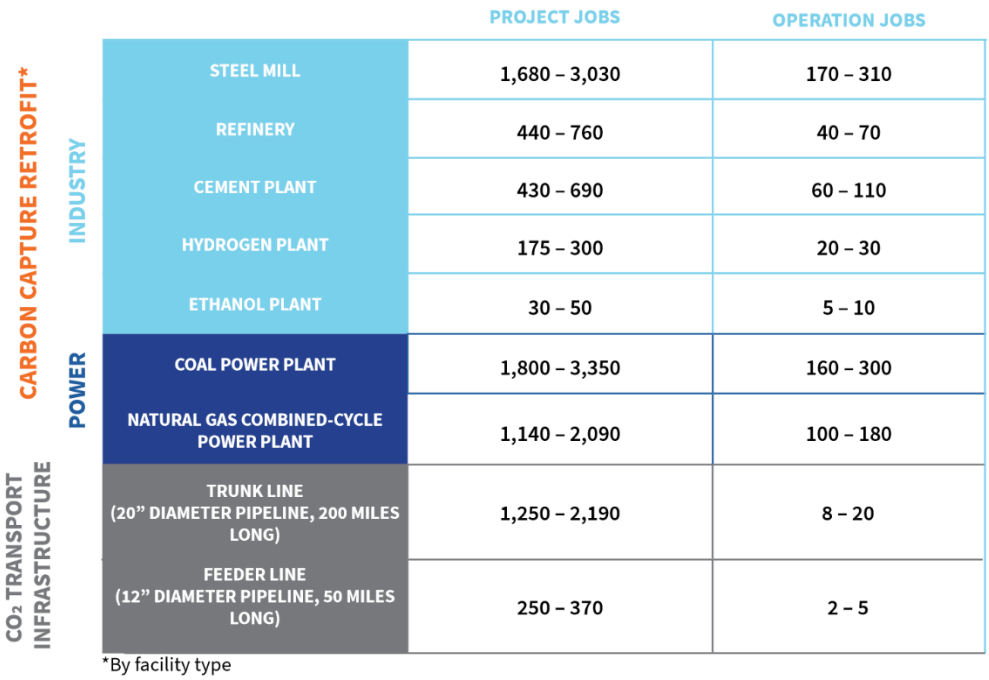

Figure 1: Job Estimates by Facility Retrofit. Building upon modeling of economically feasible capture projects from the Great Plains Institute, the Rhodium Group has provided preliminary analysis of the jobs potential for a typical carbon capture facility across several industries. The range in jobs numbers reflect differences in project sizes in the Great Plains Institute project database. Source: Rhodium Group, 2020.

Carbon Capture and Benefits to Affected Communities

Carbon capture is a flexible pollution control technology that works on a wide range of industrial facilities and power plants. The differences between cement plants, refineries, iron and steel, and gas-fired power plants make generalizations about carbon capture's impacts on conventional pollutants difficult. Conventional air pollutants include sulfur, nitrogen oxides, particulates and volatile organic compounds that impact visibility and increase premature deaths and morbidity.

In many instances, carbon capture retrofits significantly reduce conventional pollutant emissions. If the flue gas contains sulfur oxides, particulate matter, or nitrogen dioxide, the pretreatment steps common to many carbon capture applications remove these pollutants to protect the solvent used in carbon capture from degradation. On the other hand, the carbon capture equipment requires additional electricity and steam. The fuel burned to provide these services could increase emissions of nitrogen oxides, a precursor to smog, unless the plant upgrades existing pollution controls.

Existing industrial facilities and power plants can use carbon capture to remove CO_2 from their emissions. That attribute is critical because the IEA states that if the world's present energy infrastructure, including industrial plants, continues to operate without change, the emissions from these existing facilities will lock in 1.65º Celsius of temperature increase. Retrofitting carbon capture to existing industrial and power sources is essential to preventing this outcome.

There is little risk of old, inefficient and polluting facilities extending their lives by adding carbon capture. Installing carbon capture is capital-intensive. Investors will only add it to industrial facilities or power plants with many years of remaining life. These younger, more efficient, long-lived plants are precisely the ones that pose the most significant challenge to climate change; without capture, they will emit CO_2 unabated for years, if not decades. In contrast, plants with only a small amount of remaining life will close, rather than invest in carbon capture.

The jobs associated with installing carbon capture retrofits or DAC facilities, as well as associated transport, use and storage, lend themselves to labor forces and skillsets in oil and gas, mining and key industrial sectors, and can bring significant equity benefits to communities and regions, through durable, high-wage jobs that have been a traditional pathway to the middle class for many American families. However, the skilled, high-wage jobs that carbon capture and CO_2 transport infrastructure projects help retain and create may not be readily available to disadvantaged communities living in close proximity to an industrial, power or direct air capture plants, whose residents may not have access to the education, training and skills required for such employment.

Ideally, the enhancement of incentives and other federal support for carbon capture, removal, transport, use and storage would be accompanied by expanded support for training and apprenticeship programs undertaken in partnership with community colleges, trade unions and other local institutions in affected communities, to expand the economic participation of local community members in jobs associated with the retrofit of industrial facilities and power plants, construction of direct air capture plants and their long-term operation.

Conclusion

In summary, economywide deployment of carbon capture, removal, transport, use and storage is not optional if we are to decarbonize industry and achieve midcentury climate goals. Carbon capture technology provides a viable pathway to enable the decarbonization and continued operation of industrial facilities, while avoiding plant closures and the offshoring of jobs and livelihoods. The U.S. is the world's leader in the capture, use and storage of carbon emissions from industry, with nearly 50 years of successful commercial and operational experience on which to build. In addition, we now have the opportunity to build new industries and associated high-wage jobs with both DAC and carbon utilization technologies.

Building on the deeply bipartisan success of the 2018 FUTURE Act, President Trump's administration and the 117th Congress has the opportunity enact a broad portfolio of federal incentives and other policies to commercialize carbon capture, removal, transport, use and storage. We must implement lessons learned from our successful experiences with wind, solar and other low and zero-carbon technologies to implement a broader policy framework for economywide carbon capture deployment. Carbon capture must play a central role in meeting midcentury climate goals, sustaining U.S. leadership in energy technology and helping create and preserve high-wage jobs in critical industrial and energy sectors.

[i] International Energy Agency (2020) Energy Technology Perspectives 2020: https://www.iea.org/reports/ccus-in-clean-energy-transitions.
[ii] Complete analysis of the jobs implications of economywide deployment of carbon capture in all 48 states will be completed later this year.
[iii] U.S. Department of Energy (2015) Quadrennial Energy Review: Energy Transmission, Storage, and Distribution Infrastructure: https://www.energy.gov/policy/downloads/quadrennial-energy-review-first-installment; Great Plains Institute (2020) Transport Infrastructure for Carbon Capture and Storage – Whitepaper on Regional Infrastructure for Midcentury Decarbonization.
[iv] International Energy Agency (2020) Energy Technology Perspectives 2020: https://www.iea.org/reports/ccus-in-clean-energy-transitions.
[v] Complete analysis of the jobs implications of economywide deployment of carbon capture in all 48 states will be completed later this year.