



To: President Biden's Climate Team
From: Carbon Capture Coalition
Date: 1/21/2021
Re: First 100 Day Priorities for Carbon Capture, Removal, Transport, Use and Storage

EXECUTIVE SUMMARY

Members of the Carbon Capture Coalition (the Coalition) have prepared this memo to provide input to President Biden's climate team in the areas of climate, energy, infrastructure and related federal policy. Acting on these recommendations will ensure that carbon capture plays the necessary role in the Biden administration's stated goal of meeting a 100 percent clean energy economy and net-zero emissions by 2050, while generating new economic opportunities and good-paying union jobs and ensuring that affected communities and workers are not left behind in this transition.

The United States leads the world in the commercialization of carbon capture, removal, transport, use and storage (or carbon capture), and there is broad bipartisan support for capturing and utilizing CO₂ and its precursor carbon monoxide. The U.S. has 13 commercial-scale carbon capture facilities, with the capacity to capture about 25 million tons of CO₂ annually, representing approximately half of the 26 operational commercial-scale carbon capture projects operating worldwide.

Large-scale deployment of carbon capture is essential if we are to achieve the economywide decarbonization necessary to meet midcentury climate goals. The International Energy Agency (IEA) projects that the global carbon capture industry will need to scale up to over 2,000 facilities capturing 2.8 gigatons of CO₂ per year to limit warming to 2°C.

Deployment of carbon capture also provides a viable pathway for the decarbonization and continued operation of key industrial, manufacturing and energy facilities, thereby avoiding plant closures and the offshoring of jobs and livelihoods. One analysis estimates that capture deployment at industrial facilities and power plants and deployment of associated CO₂ transport infrastructure in 21 states across the Midwest, Great Plains, Gulf Coast and Rockies region can support an annual average of up to 68,000 project jobs and 35,800 ongoing operational jobs over a 15-year period and capture 592 million metric tons of CO₂ per year.

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. We are currently preparing an updated policy blueprint for early 2021 release, which will expand on the recommendations contained within this memo.

100 DAYS AGENDA: KEY CARBON CAPTURE COALITION PRIORITIES

In this memo to President Biden's climate team, the Coalition has provided a targeted list of recommendations for immediate action that the Biden administration can take through executive

action, as well as areas for collaboration with the 117th Congress. We look forward to working with the Biden administration on shared priorities around the essential role that carbon capture will play in emissions reduction and ensuring that a clean energy and industrial economy benefits all Americans.

LEGISLATIVE ACTIONS	EXECUTIVE ACTIONS
Enhanced Section 45Q tax credit: Allow for a direct pay option and further extend the commence-construction window to facilitate greater deployment of carbon capture.	Prioritize actions to maximize benefits of carbon capture projects to affected communities.
CO₂ transport and storage infrastructure: Provide low-cost federal financing, grants and front-end engineering and design studies to enable deployment of large-scale CO ₂ transport and storage infrastructure.	Coordinate federal actions to scale up regional hubs for geologic storage of CO ₂ .
Retooled and expanded RD&D programs: Fully fund robust authorizations for Department of Energy cost-share programs for carbon capture research, development, and demonstration contained in the Energy Act of 2020.	Include carbon capture and removal in international climate agreements.
Additional deployment incentives: Enhance other existing federal incentives to further enable the financing of carbon capture, use and removal projects.	

Figure 1: Key Carbon Capture Coalition priorities for the first 100 days.

THE BIDEN ADMINISTRATION'S ROLE IN CARBON CAPTURE DEPLOYMENT

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. However, 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 carbon capture technologies.

A federal portfolio of supportive policies includes enhancements to 45Q, other tax credits and incentives, expanded funding for research, development and demonstration (RD&D), and financing and grants for CO₂ transport and storage infrastructure, that together will facilitate and leverage private investment in carbon capture, removal, transport, utilization and storage projects. This expanded policy framework will, in turn, spur continued innovation, increased scale, and improved performance, driving down costs and attracting still more investment that further accelerates deployment.

Project developers and investors have announced over [30 carbon capture and removal projects](#) since the 45Q tax credit was reformed in 2018. However, the full potential of the credit has been

severely constrained by several factors: a nearly three-year delay in Treasury and the IRS finalizing 45Q guidance and a final rule, the short timeframe to qualify for the credit and long lead-times for projects, and hurdles encountered by project developers in securing tax equity financing on favorable terms.

Despite these headwinds, the [2020 omnibus](#) bill features the most significant legislative accomplishments for carbon capture and removal since bipartisan enactment of the FUTURE Act, including a two-year extension of the 45Q tax credit and robust RD&D authorizations for research, development and demonstration of carbon capture, removal, use and storage.

Together with the IRS finalizing the 45Q rulemaking in January, these provisions provide long overdue regulatory and investment certainty to unlock billions of dollars in private capital for carbon capture projects, which can now complete the planning, engineering, permitting and financing required to begin construction by the end of 2025 in order to qualify for the credit.

While these accomplishments are significant, they represent only an initial step toward fully enabling commercialization of carbon capture and removal technologies. If carbon capture is to play a role in achieving net-zero emissions by midcentury, we must scale federal investments and policy ambition accordingly. The Biden administration and Congress have a critical near-term opportunity to build on this momentum by advancing a comprehensive and ambitious policy portfolio for carbon capture deployment to deliver on its climate, energy and jobs potential, as part of broader COVID-19, infrastructure and climate actions to be considered during the first 100 days of the new administration and Congress.

ABOUT US

The [Carbon Capture 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.

PRIORITIES FOR THE FIRST 100 DAYS: LEGISLATIVE ACTIONS

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

Building on the recent IRS completion of guidance and a final rule, as well as Congress' two-year extension of the 45Q tax credit, the Coalition's top legislative priority for 2021 is to provide a [direct pay](#) option for 45Q, which can be implemented via budget reconciliation with a low budgetary score. A direct pay mechanism is the most important next step Congress and President Biden can take to enable economywide deployment of carbon capture technologies to meet midcentury climate goals, as well as provide a powerful spur for economic activity and job creation at a time when both are urgently needed for our nation's recovery from the COVID-19 pandemic.

Direct pay allows tax credit recipients the option of receiving the value of the credit as an estimated payment on their tax return, in lieu of needing to apply the tax credit to direct tax liability. It provides a vitally important alternative for the large majority of project developers that either lack sufficient taxable income to fully utilize the 45Q credit or are exempt from federal income tax liability (e.g., cooperatives and municipal utilities). Direct pay would alleviate the need for developers of carbon capture, utilization and removal projects to rely on limited and challenging tax equity markets to finance their projects.

The complexity and inefficiency of tax equity transactions impose further costs and burdens on project developers. Tax equity is a suboptimal means of financing carbon capture and removal technologies, even under normal market circumstances, because tax equity investors demand much higher margins than standard sources of capital, particularly for carbon capture projects and other less commercially mature technologies.

According to carbon capture project developers, the terms of tax equity investment typically consume around 20 percent or greater of the value of the tax credit, meaning that the effective value of 45Q tax credits flowing to tax equity-financed projects is roughly 20 percent less than the cost of those same tax credits to the federal government. For example, while Congress intended to provide an incentive of \$50 per metric ton for the capture and geologic storage of CO₂ in saline geologic formations, at typical tax equity investment rates, a project developer only realizes \$40 of that value from the tax credit, with the remaining \$10 of the federal incentive lost to the financial transaction.

By contrast, direct pay for 45Q would provide the same incentive value much more directly, efficiently and effectively, unlocking broader financial markets and private capital for investment and resulting in greater deployment of carbon capture, removal and utilization technologies—all at no extra cost to the government.

In addition to direct pay, further extension of the 45Q tax credit is needed to achieve the full emissions reduction potential of the credit. While the two-year 45Q extension in the recently passed 2020 omnibus provides near-term stability and helps project developers move forward with the 30-plus carbon capture projects already in various stages of project development and financing, this action alone will not give sufficient certainty to allow the needed expansion of carbon capture deployment.

More complex and capital-intensive carbon capture projects can have lead-times of five years or more before beginning construction, especially those projects pursuing CO₂ storage in saline geologic formations due to longer permitting timelines, or those deploying technology in certain industrial sectors with little or no experience with commercial-scale carbon capture to date.ⁱ This means that some potential projects starting today already risk missing the newly enacted 2025 commence-construction deadline.

A significant multiyear extension of the 45Q commence construction window remains necessary to provide the long-term certainty for private investment in commercial deployment that will be essential to scaling up carbon capture and removal technologies by midcentury, just as the federal wind production tax credit and solar investment tax credits have anchored long-term private investment in those technologies since 1992 and 2005, respectively.

RELEVANT BIPARTISAN BILLS IN THE 116th CONGRESS:

Direct Pay & 45Q Extension:

- The Accelerating Carbon Capture and Extending Secure Storage Act through 45Q ([ACCESS 45Q Act](#), H.R. 8858) provides a direct pay mechanism as well as a 10-year extension of 45Q (Representatives McKinley R-WV and Veasey D-TX).
- [45Q Carbon Capture, Utilization, and Storage Tax Credit Amendments Act of 2020](#) (S. 4966) would provide a direct pay mechanism and a 5-year extension of 45Q (Senators Capito R-WV and Whitehouse D-RI).
- 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 (inclusion of 45Q championed by Representative Sewell, D-AL) as well as a two-year extension of 45Q.
- The [RECOUPS Act](#) (H.R. 7896) provides direct pay for 45Q (Representatives Bergman R-MI and Fletcher D-TX).

Provide low-cost federal financing, grants and front-end engineering and design (FEED) studies to expand deployment of large-scale CO₂ transport and storage infrastructure as part of a broader infrastructure package

The Biden administration and Congress should prioritize inclusion of CO₂ transport and storage infrastructure as a necessary component of any broader infrastructure legislation, given its essential role in helping to achieve net-zero emissions economywide. Similar to the buildout of other forms of infrastructure to support deployment of low and zero-carbon technologies over the next 30 years, scaling a national CO₂ transport and storage system will be key to meeting midcentury climate goals.ⁱⁱ

Interconnected and responsibly-sited transport systems that collect CO₂ from multiple capture sources and deliver it to shared large-scale commercial saline geologic storage sites, or ‘carbon hubs’, are the infrastructure backbone needed for economywide deployment of carbon capture and removal at necessary scale.

RELEVANT BIPARTISAN BILLS IN THE 116th CONGRESS:

- **The Storing CO₂ and Lowering Emissions Act ([SCALE Act](#))** introduced by Representatives Veasey (D-TX), McKinley (R-WV), Bustos (D-IL), and Stauber (R-MN) in late 2020 expands on the [INVEST CO₂ Act](#) (H.R. 4905) introduced by Representative Bustos in 2019 to:
 - Finance shared CO₂ 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 CO₂, 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.

Additionally, the Coalition is working with sponsors of the SCALE Act to add funding for CO₂ transport FEED studies to the legislation upon reintroduction at the beginning of this Congress.

Fully fund robust authorizations for DOE cost-share programs for carbon capture RD&D contained in the recently-enacted Energy Act of 2020

The 2020 year-end omnibus package features robust authorization levels for carbon capture, removal, use and storage RD&D that President Biden and Congress can support as part of a near-term economic recovery package. In particular, money authorized for large-scale pilot projects, commercial demonstration projects and front-end engineering and design (FEED) studies for carbon capture, removal, use and storage projects can drive near-term jobs creation and economic activity, while spurring additional project development.

Additionally, President Biden should fully fund the entire Energy Act package of Department of Energy (DOE) carbon capture, removal, use and storage RD&D authorizations in his Fiscal Year 2022 Budget request to Congress. As Congress works to set budget allocations, lawmakers should support these robust authorization levels for DOE as part of a larger appropriations package.

There are long lead-times in advancing capital-intensive technologies from concept to demonstration to commercialization, which makes federal RD&D investments during the next decade critical to scaling up carbon capture and removal technologies. While DOE funding has played a crucial role in the success of recent large-scale carbon capture and storage projects in the U.S., carbon capture overall has suffered a significant lack of federal investment compared to historic levels of support for other clean energy technologies.

Fortunately, the 2020 omnibus package marks a course correction toward building a more ambitious federal RD&D policy framework and levels of federal investment in carbon capture that will be needed to achieve climate goals. It is imperative that these authorizations be fully funded.

RELEVANT PORTIONS OF THE ENERGY ACT OF 2020:

- Establishment of a **Carbon Capture Technology Program** for the development of transformational technologies that will significantly improve the efficiency, effectiveness, cost, emission reductions and environmental performance of coal and natural gas use, including in manufacturing and industrial facilities. This program includes significant authorizations for RD&D, large scale pilot projects, demonstration projects and FEED studies.
- Establishment of **Carbon Capture Test Centers** to advance RD&D of carbon capture technologies.
- A **Carbon Storage Validation and Testing** program that will coordinate federal agencies' work on assessing suitable CO₂ storage locations and developing demonstration and commercial storage sites.
- Establishment of a **Carbon Utilization** program to scale-up markets and identify technologies to convert captured carbon to valuable products and commodities.

RELEVANT PORTIONS OF THE ENERGY ACT OF 2020 CONTINUED:

- Establishment of a **Carbon Removal** program that will provide funding for RD&D related to direct air capture and bioenergy with carbon capture and storage.
- Reforms to the **DOE Loan Program** to allow for carbon capture, storage, use and direct air capture projects to access existing federal financing, including approximately \$8 billion remaining for Advanced Fossil Energy projects.

Enhance other existing federal incentives to further enable the financing of carbon capture, use and removal projects

Other existing federal financial incentives beyond the 45Q tax credit either exclude carbon capture projects or require technical modifications to allow projects to qualify. Expanding the suite of financing mechanisms available to carbon capture, use and removal projects will make additional private capital available on more favorable terms, thus increasing future deployment and emissions reduction potential.

RELEVANT BIPARTISAN BILLS IN THE 116th CONGRESS:

- **48A Tax Credit:** Representatives Peterson (D-MN) and McKinley (R-WV) and Senators Hoeven (R-ND) and Smith's (D-MN) [Carbon Capture Modernization Act](#) (H.R. 1796 and S. 407) would accomplish technical fixes to 48A to unlock \$2 billion in available tax credits to retrofit existing power plants with carbon capture.
- **Private Activity Bonds:** Representatives Burchett (R-TN) and Cartwright (D-PA) and Senators Bennet (D-CO) and Portman's (R-OH) [Carbon Capture Improvement Act](#) (H.R. 3861 and S. 1763) would make carbon capture at industrial facilities and power plants eligible for PABs, providing project developers access to tax-exempt debt. While not included in this legislation, direct air capture technologies should also be made eligible.
- **Master Limited Partnerships (MLPs):** Senators Coons (D-DE) and Moran (R-KS) and Representatives Thompson (D-CA) and Este's (R-KS) [Financing Our Energy Future Act](#) (S. 1841 and H.R. 3249) would make carbon capture and other low- and zero-carbon energy projects eligible for MLPs, a business structure that allows for raising equity on public markets, while providing the tax benefits of a partnership. MLPs are currently available to oil, gas, and coal projects.
- **Base Erosion and Anti-Abuse (BEAT) Tax:** Senators Capito (R-WV) and Whitehouse's (D-RI) [45Q Carbon Capture, Utilization, and Storage Tax Credit Amendments Act of 2020](#) (S. 4966) would grant the same tax treatment for carbon capture project investors as now enjoyed by investors in wind and solar projects by preventing the disallowance of 45Q credits under the BEAT Tax.

The Coalition is also working on a proposal for improvements to the **48B industrial tax credit** and will be providing recommendations to the Biden administration and Congress in the near future.

PRIORITIES FOR THE FIRST 100 DAYS: EXECUTIVE ACTIONS

Prioritize actions to maximize benefits of carbon capture projects to affected communities

The jobs associated with carbon capture, removal, use and associated CO₂ transport and storage infrastructure projects can bring significant equity benefits to communities and regions by providing the kinds of employment that has traditionally afforded a pathway to the middle class for many American families, as well as preserving jobs at existing industrial and energy facilities. However, these skilled, high-wage jobs may not be readily available to disadvantaged communities living in close proximity to facilities.

The communities most vulnerable to climate change also typically suffer the greatest impact from criteria air pollutants. While carbon capture has the potential to play a significant role in addressing both CO₂ and criteria air pollutants, much work remains to quantify potential air quality benefits from carbon capture retrofits. The Biden administration can take two immediate steps to leverage existing federal resources to prioritize near-term actions to better assist affected communities. Additionally, the Coalition will be putting forward further policy recommendations in this area during the 117th Congress.

NEAR-TERM EXECUTIVE ACTIONS:

- 1) **Department of Labor, Department of Agriculture (USDA), DOE:** Leverage existing federal apprenticeship and workforce training programs to expand support for training undertaken in partnership with community colleges, trade unions and other local institutions in affected communities.
- 2) **EPA and DOE:** Coordinate an interagency study to assess and quantify potential benefits and risks to local air quality from carbon capture retrofits at industrial and power facilities across technologies and sectors.

Coordinate federal actions to scale-up regional CO₂ storage hubs

The development of large-scale commercial saline geologic storage sites will be critical to meeting broader future net-zero emissions goals. While industry has decades of commercial experience safely storing CO₂ geologically at large scale, only one commercial-scale saline storage project exists in the U.S. today. Nevertheless, over half of the current 30-plus announced carbon capture and removal projects in development have already publicly declared their intent to store CO₂ in dedicated saline storage sites; therefore, ensuring timely federal permitting of saline storage will be key to bringing carbon capture projects in the development pipeline to fruition.

Carbon capture projects that seek to inject CO₂ for the sole purpose of long-term geologic storage are subject to the Environmental Protection Agency's Class VI well rule, which is part of EPA's Underground Injection Control (UIC) Program. The current Class VI permitting timeframe puts projects at risk of missing the commence-construction window to qualify for 45Q, especially when added to the time required to undertake planning, complete FEED studies, secure financing and accomplish other necessary components of project development.

In addition to increasing staffing resources for Class VI well permitting at the state and federal levels, the federal government can better coordinate and engage on the extensive planning that is involved in granting Class VI permits to projects.

NEAR-TERM EXECUTIVE ACTIONS:

- **EPA:** Establish a geologic storage accounting protocol in the EPA Greenhouse Gas Reporting Program for those companies claiming the 45Q tax credit that opt to demonstrate secure geologic storage through enhanced oil recovery under the ISO standard.
- **Interagency efforts:** Proactively implement key provisions of the USE IT Act and Energy Act that were passed as part of the omnibus spending bill in 2020 to encourage federal, state, tribal and stakeholder coordination and collaboration on permitting and responsible siting of CO₂ transport and storage infrastructure and carbon capture projects.
- **U.S. Geological Survey, DOI, USDA, DOE:** Direct federal agencies to identify and characterize suitable geological storage locations on federal lands and to facilitate the permitting of CO₂ storage sites on suitable federal lands.

Include Carbon Capture & Removal in International Climate Agreements

With the United States re-joining the Paris Agreement, the U.S. will be expected to provide an updated climate target to meet its nationally determined contribution (NDC) and align domestic emissions reductions with the stated goals Paris to limit warming to well below 2°C. This is an excellent opportunity for the incoming administration to quantify the expected contribution that carbon capture and removal will make towards meeting President Biden's goal of meeting a 100 percent clean energy economy by midcentury.

Additionally, while carbon capture, use and storage are considered by the UNFCCC Conference of the Parties (COP), carbon removal technologies including direct air capture are currently not considered in emissions accounting frameworks used by the COP. The administration can take steps to ensure that carbon removal, and its important contributions to reaching net zero targets, will be considered by the COP as an important step to ensuring greater international collaboration on RD&D and commercial scaling of carbon removal.

NEAR-TERM EXECUTIVE ACTIONS:

- **State Department:** Working through the Office of Global Change, include robust carbon capture, removal, transport, utilization and geologic storage deployment in the US NDC for meeting the 2 degree C goal agreed to in Paris.
- **State Department:** Establish carbon dioxide removal as an item for consideration by the Ad Hoc-Working Group on the COP framework.

APPENDIX

CARBON CAPTURE'S ROLE IN ADDRESSING CLIMATE CHANGE

Both the United Nation's Intergovernmental Panel on Climate Change (IPCC) and the IEA have concluded that economywide carbon capture technology deployment is critical for achieving global temperature targets. Dramatically accelerated use of carbon capture and removal is required to meet midcentury climate goals.

In modeling of scenarios to limit warming below 2°C, the IEA concludes that 15 percent of 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.ⁱⁱⁱ

The IEA estimates that the global carbon capture industry will need to scale-up to over 2,000 facilities capturing 2.8 gigatons of CO₂ per year to limit warming to 2°C. For the more ambitious 1.5°C scenario, the IPCC estimates that 10 gigatons of CO₂ 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.

CARBON CAPTURE AS A JOBS CREATOR

Carbon capture deployment at industrial facilities, power plants and direct air capture facilities 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 power plants pays higher than average local wages.

In addition, new and innovative high-skilled 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 CO₂ transport infrastructure in 21 states across the Midwest, Great Plains, Gulf Coast and Rockies regions can support an annual average of up to 68,000 project jobs and 35,800 ongoing operational jobs over a 15-year period and capture 592 million metric tons of CO₂ per year.

A typical direct air capture plant capturing 1 million tons of CO₂ per year can generate roughly 3,500 jobs across the various sectors in the supply chain. The construction, engineering, and equipment manufacturing sectors combined could see at least 300,000 new jobs associated with full scale direct air capture deployment, according to a Rhodium group [analysis](#).

		PROJECT JOBS	OPERATION JOBS
CARBON CAPTURE RETROFIT*	INDUSTRY		
	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	COAL POWER PLANT	1,800 – 3,350	160 – 300
	NATURAL GAS COMBINED-CYCLE POWER PLANT	1,140 – 2,090	100 – 180
CO ₂ TRANSPORT INFRASTRUCTURE	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

Figure 2: 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 BENEFITS TO AFFECTED COMMUNITIES

The communities that are most vulnerable to climate change also typically suffer the greatest impact from criteria air pollutants, and carbon capture has the potential to play a role in addressing both. While 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, carbon capture retrofits in many instances may significantly reduce conventional pollutant emissions for two primary reasons.

First, prior to CO₂ separation and capture, flue gas must undergo pretreatment to remove criteria air pollutants including sulfur oxides, particulate matter, and nitrogen dioxide to protect the solvent used in carbon capture from degradation. Second, installation of carbon capture may result in facilities having to meet more current and usually stricter emissions standards.^{iv}

Because carbon capture retrofits are capital intensive, there is little risk of old, inefficient and polluting facilities extending their lives by adding carbon capture. Younger and relatively more efficient plants with significant remaining economic life pose the most significant challenge to climate change; without capture, they will emit CO₂ unabated, potentially for decades. However, more research is needed to understand air quality impacts from carbon capture retrofits at different types of carbon capture facilities in different industries and then to develop appropriate mitigation measures where necessary in response to the findings of that analysis.

CONCLUSION

In summary, economywide deployment of carbon capture, removal, transport, use and storage is essential if we are to achieve the economywide decarbonization necessary to meet midcentury climate goals. We must implement lessons learned from our successful experiences commercializing wind, solar and other low and zero-carbon technologies to implement a broader policy framework for large-scale carbon capture deployment.

Deployment of carbon capture and removal also provides a viable pathway for the decarbonization and continued operation of industrial, manufacturing and energy facilities, thereby avoiding plant closures and the loss of jobs and livelihoods. This must be accompanied by additional job training, environmental policy and other measures to ensure that reductions in carbon emissions are accompanied by economic, public health and other benefits at the community level.

The U.S. is the world's leader in the capture, use and storage of carbon emissions, with nearly 50 years of successful commercial and operational experience across multiple sectors to leverage in building new industries and associated high-wage jobs. Expanding on the deeply bipartisan success of the 2018 FUTURE Act and subsequent bipartisan tax and RD&D provisions in the 2020 omnibus, the Biden administration and the 117th Congress have the opportunity enact a broad portfolio of federal incentives and other policies to commercialize carbon capture, removal, transport, use and storage.

ⁱ According to a timeline put together by the [Clean Air Task Force](#), carbon capture utilization and storage projects can take as long as five years, with investments near \$50 million before construction can begin.

ⁱⁱ 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.

ⁱⁱⁱ International Energy Agency (2020) Energy Technology Perspectives 2020: <https://www.iea.org/reports/ccus-in-clean-energy-transitions>.

^{iv} Energy Futures Initiative and Stanford University (2020) An Action Plan for Carbon Capture and Storage in California: Opportunities, Challenges, and Solutions: <https://sccc.stanford.edu/sites/g/files/sbiybj7741f/efi-stanford-ca-ccs-full-rev1.vf-10.25.20.pdf>