Testimony of:

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Before the U.S. Senate Committee on Environment & Public Works

Hearing on Advancing Carbon Capture, Utilization and Sequestration Technologies and Ensuring Effective Implementation of the USE IT Act

February 12, 2025

Chairman Capito, Ranking Member Whitehouse, and Members of the Committee:

Thank you for the opportunity to appear before you today to discuss the implementation of the USE IT Act and ways to advance carbon management technologies.

My name is Jack Andreasen Cavanaugh, and I oversee carbon management policy at Breakthrough Energy. Breakthrough Energy was founded to accelerate energy innovation and build the industries of the future without emissions, and we deploy for-profit investment funds, nonprofit and philanthropic programs, and policy efforts toward that mission. Innovative technologies are at the heart of our work, and carbon management practices like carbon capture and its associated infrastructure are central to reducing emissions in the industrial and power sector of our economy. In addition to its emissions reduction benefits, Breakthrough Energy also views carbon management as beneficial to the economy through the jobs it creates, the economic opportunities it provides for our communities, and its strategic benefits to American industries.

Alongside my role at Breakthrough Energy, I serve on the White House Task Force for Carbon Dioxide Capture, Utilization, and Sequestration Subcommittee for Federal Lands and Outer Continental Shelf Permitting. This Task Force was established by the USE IT Act, and it has been instrumental in convening industry experts to accelerate the rapid, efficient, and safe deployment of carbon management technologies and infrastructure across the U.S.

Not only do I work on carbon management professionally, but I also live it in my personal life. I was born and raised in Hastings, Nebraska. My family has a small farm south of town. In 2024, we agreed to allow a CO2 pipeline project that was a retrofit of an existing natural gas pipeline to cross our land. My mother, uncles and I worked with the company and fellow farmers to ensure the infrastructure was installed safely, and everyone was compensated fairly. This project would not have been possible without the 45Q tax credit, the decades of federally-funded research and development of low-carbon fuel[1], pipeline and storage technologies. This pipeline will take carbon dioxide (CO2) from bioethanol facilities and send it to Class VI wells in Wyoming for safe geologic storage. It is the perfect example of public/private partnership opportunities in carbon management, benefiting Americans.

[1] https://tallgrass.com/newsroom/press-releases/tallgrass-to-capture-and-sequester-co2-emissions-from-adm-corn-processing-complex-in-nebraska

Figure 1: *Pipeline and Safety Shut Off Installation on the DGRS farm outside Glenville, Nebraska*

Climate Justification for Carbon Management

Breakthrough Energy has a mission to help deploy technologies that abate emissions because of their role as the primary driver of climate change. This mission drives Breakthrough's efforts on carbon management, and I want to briefly review some of the current climate science that helps guide that work, noting for the Committee that this is not my own research and that I am not a climate scientist.

Global temperatures have risen 1.3 C (2.34 F) since pre-industrial levels as a result of human activity, namely, the burning of hydrocarbons which contribute to the greenhouse gas effect. To put this number in perspective, the difference in global average temperature between the middle of the last ice age – 20,000 years ago – and today is around 6 C[2]. The primary driver of this warming has been carbon dioxide (CO2), but other greenhouse gases like methane, nitrous oxide, and halocarbons contribute to warming. Figure 2 below[3], from the Lead Climate Scientist for Stripe, Dr. Zeke Hausfather, shows the change in warming over time, relative to all drivers of that warming. The take-away from this figure is simple: the rate of warming has increased over the last century, and CO2 emissions have consistently been the main positive contributing factor for the rate of warming.

[2] https://news.ucar.edu/132755/scientists-nail-down-average-temperature-last-ice-age
[3] https://www.theclimatebrink.com/p/exploring-the-drivers-of-modern-global

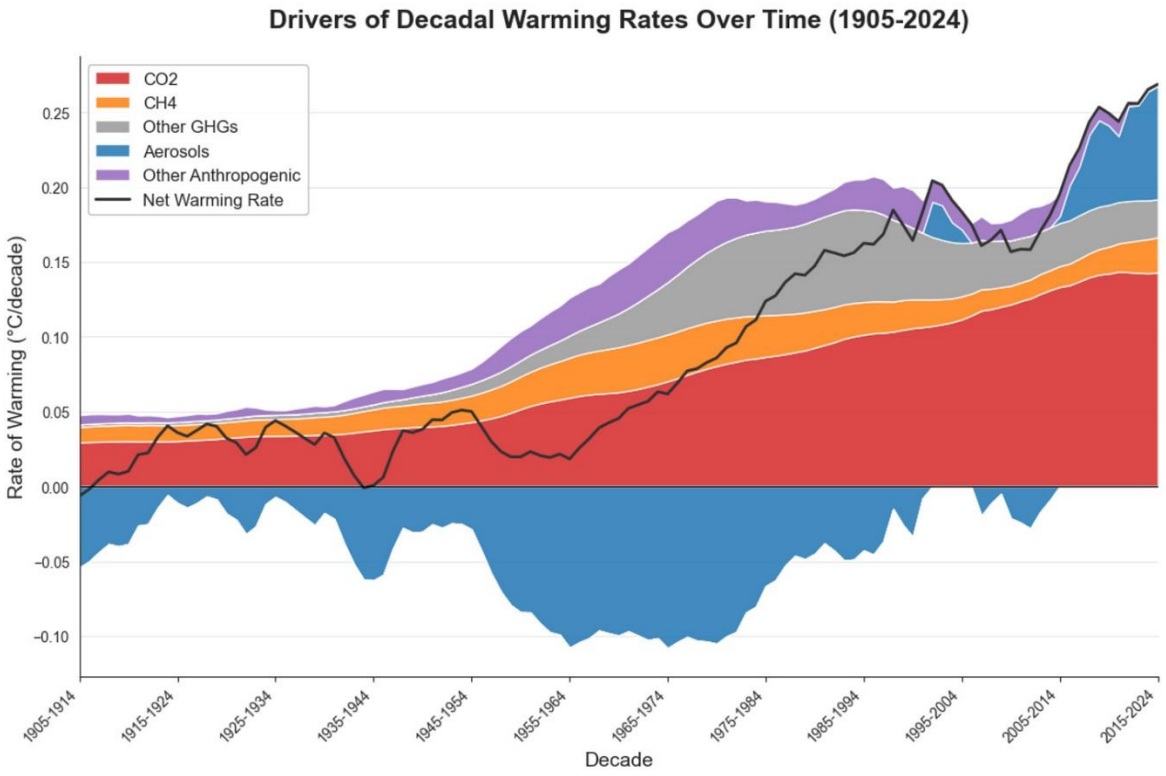

Figure 2: *Analysis of decadal warming rates (black line) as the sum of different contributing factors (colored areas) between 1905 and 2024.*

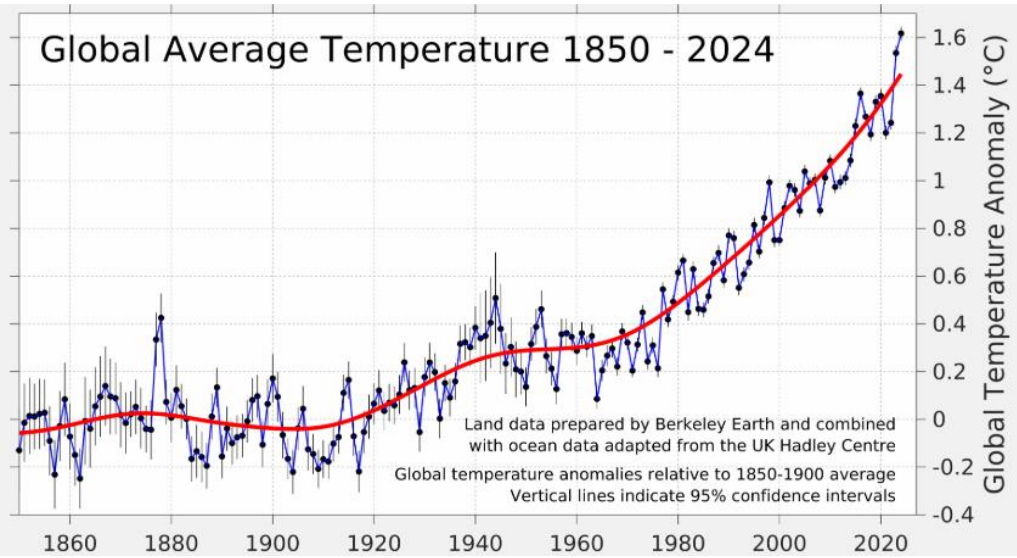

Figure 3: *Global Average Temperature anomalies, note the 1.6 C for 2024*[4]

[4] https://berkeleyearth.org/global-temperature-report-for-2024/

As the above Figure 3, from Berkeley Earth shows, in 2024, the global temperature was 1.6 C warmer than pre-industrial levels, which marks the first time, within a year, that warming passed the 1.5 C target set forth in the 2015 Paris Climate Accords. While the 2024 data does not yet mean we have exceeded 1.5 C for long term warming, each individual 0.1 C rise in temperature matters, and the climate impacts of each subsequent 0.1 C rise in temperature means climate impacts get progressively worse[5].

Today, climate impacts are already taking place with considerable impact to our economy.

Homes in Florida[6] and California[7] have become uninsurable due to increasing costs associated with natural disasters. Hurricanes and fires have caused billions of dollars in damage to each state, and in the case of California, these fires could have been mitigated not just through insurance products, but also better land management practices, building design, and urban planning.

Whether you are looking at discrete phenomena, like the passing of 1.5 C targets for 2024, long term trends, the increasing warming rate, or the effects of the warming, the climate is changing, and warming, largely due to the increased emissions of greenhouse gases, namely CO2.

And yet, we can change that trend, and narrative. We have technologies that can not only bring us a more stable, and healthy climate, but also usher in a new era of economic prosperity. Carbon capture with storage (CCS) or utilization (CCUS), and carbon dioxide removal (CDR) are two of those critical technologies. In many sectors, CCS is the best short- to medium-term solution available to eliminate emissions. Meanwhile, we know we will need carbon removal over the long run to draw down carbon already in our atmosphere.

Carbon Management's Role in Decarbonization

The world has several available technologies to decarbonize every sector of the economy. Some, like nuclear, hydro, wind, solar, and batteries, are proven and being deployed at scale today. Others remain in the lab or at demonstration-stage, being developed by groundbreaking entrepreneurs and innovators across the U.S. who are building the industries of the future. And across all of these sectors, there is a suite of technologies that fall into the bucket of "carbon management", including carbon capture both for power sector and industrial applications, as well CDR. Breakthrough Energy supports all these technologies.

A central driving theme of our organization is "Energy is prosperity"[8]. There is a direct positive correlation between energy usage and quality of life[9], and so we strongly stand on the side of those

[5] https://www.un.org/en/climatechange/science/climate-issues/degrees-matter
[6] https://www.tampabay.com/news/business/2024/06/09/florida-other-states-beg-insurers-not-drop-climate-threatened-homes/
[7] https://www.cbsnews.com/news/fires-california-palisades-fire-homeowners-insurance-state-farm-fair-losses/
[8] https://www.breakthroughenergy.org/newsroom/articles/energy-is-prosperity/#:~:text=Breakthrough%20Energy%20was%20created%20to,understand%20their%20perspectives%20and%20imperatives.

in the U.S. and around the world who want to use energy to provide a better quality of life for their families and communities. That's why our approach is centered on providing the world with the technologies that can provide energy, and the prosperity it brings, without emissions.

Power Sector Applications

With the growing electricity demand in the power sector, driven by AI innovation[10], we see a clear market signal for clean firm power[11]. Nuclear, geothermal, hydropower and natural gas with CCS are all tools we should use to satisfy this demand. West Virginia has been a leader in the installation of CCS at a new natural gas facility[12] and the state recently received conditional approval for their Class VI primacy application[13]. Carbon capture in the power sector has been progressing and natural gas CCS facilities have the technical capacity to achieve 90% capture rates[14]. It is important that natural gas facilities not only achieve this 90% capture rate but also use high-quality carbon removal for any remaining process emissions and eliminate upstream methane leakages. This ensures that the power is not only reliable, but also clean. This type of CCS technology is referred to as "post-combustion" CCS, that is the carbon is captured post combustion of the natural gas. There is another new technology to produce low carbon power, known as the Allam Cycle.

Net Power is developing a technology using the Allam Cycle, which uses oxy-combustion to produce power by burning natural gas. However, this process only produces carbon dioxide and water in a closed-loop system. The Allam Cycle has demonstrated capture rates above 93%[15] and provided it accounts for process emission and upstream leakages, it could also play a role in providing clean, firm power if it is proved at scale.

Industrial Applications

While there are several promising solutions to decrease emissions in the industrial sector, including from chemical, plastic, cement, and ammonia production, these technologies don't yet exist at scale. This stands in contrast to the electric power sector, which is replete with already-deployed low-carbon generation options. The industrial sector relies heavily on fossil fuels, not just as a power and heat source, but as an input into the industrial process itself. This is why carbon capture is so valuable for the sector, especially in the short- to medium-term while emerging

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[9] https://www.researchgate.net/figure/Quality-of-Life-Indicator-against-a-Energy-consumption-per-capita-and-b-Electrical_fig1_317689456
[10] https://www.energy.gov/articles/doe-releases-new-report-evaluating-increase-electricity-demand-data-centers
[11] https://sustainability.atmeta.com/blog/2024/12/03/accelerating-the-next-wave-of-nuclear-to-power-ai-innovation/
[12] https://www.eenews.net/articles/climate-law-spurs-ccs-at-new-west-virginia-gas-plant/
[13] https://governor.wv.gov/article/governor-morrisey-and-wvdep-secretary-ward-announce-epas-approval-west-virginias-class-vi
[14] https://netl.doe.gov/sites/default/files/netl-file/24HCR_Bui.pdf
[15] https://netl.doe.gov/sites/default/files/2020-06/8-Rivers-Capital-Final-Pre-FEED-Report-Allam-Cycle-Coal-%208924331RFE000015-Public-Version-May-19.pdf

technologies mature. Many of the high-heat industrial applications, like cement, cannot achieve consistent, low-cost, high-grade heat from non-fossil technologies deployed today[16].

This asymmetry in the industrial sector necessitates a clear view in where CCS is most likely to be needed and where it is not.

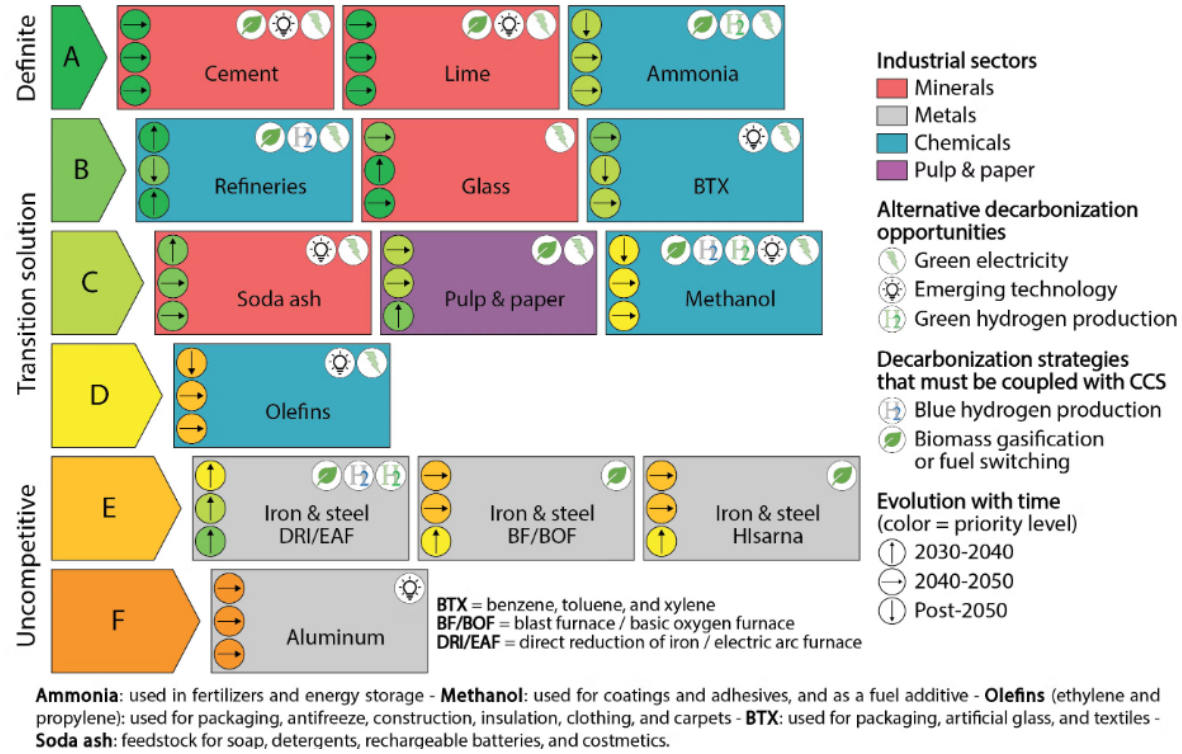


Figure 4: *Prioritization of industries for CCS adoption, "A" being the top priority and "F" the industries for which alternative decarbonization strategies may be more competitive. The ranking shown applies to today, and the evolution of that ranking is depicted by the arrows on the left-hand side of each industry box. In addition, alternative solutions for decarbonization or solutions that can be combined with CCS for increased decarbonization are shown on the top right corner of each industry box.*

Figure 4 is a U.S. CCS Ladder for Industrial Decarbonization from the University of Pennsylvania[17]. It shows where the U.S. is most likely to need CCS for decarbonization. This analysis looked at five key criteria establish a ranking from which CCS is best applied and where other decarbonization tools may take the lead:

1. CCS feasibility
2. CO2 mitigation potential
3. Alternative decarbonization technology readiness and availability
4. Potential for CCS to enable fossil-fuel or emissions-intensive technology lock-in
5. Geospatial dispersion

[16] https://www.energy.gov/eere/iedo/cement-and-concrete-manufacturing#:~:text=Ninety%20percent%20of%20emissions%20from,clinker%2C%20necessary%20in%20making%20cement.
[17] https://kleinmanenergy.upenn.edu/commentary/blog/u-s-ccs-ladder-for-industrial-decarbonization/

While CCS is not the best way to decarbonize every single industrial sector, Figure 4 clearly shows that alternative low-carbon cement production technologies are not at the scale needed today to meet current demand, so CCS is currently the best way to continue to produce cement, at scale, without the emissions. This is because cement emissions come from two sources, fuel and calcination process in the cement kiln. This means that even if we completely electrify the input energy, we will still have CO2 released during the calcination process. For those process emissions, CCS is the best pathway for decarbonization. [18]. This is true for other sectors like ammonia, which could deploy CCS and steam methane reformation (a mature technology) to capture the carbon dioxide from a natural gas feedstock, while using the hydrogen for ammonia production. Glass production uses high thermal heat, currently from fossil fuels. There are not cost-competitive alternatives to provide the thermal heat needed for glass production, and capturing the emissions with CCS is the best available pathway for decarbonization.

Carbon capture in the industrial sector not only reduces carbon emissions but also decreases local air pollution, leading to better health outcomes[19]. It will also make the U.S. more competitive in a global market that values decreasing pollution. Not only are many of these industrial products the bedrock of civilization, but they also encompass key exports for the United States economy. The U.S. is at a global disadvantage related to the trade of these materials as the relative low-carbon-intensive production of these products is not adequately priced into global markets.

Carbon Dioxide Removal

The United States is also making advances in the deployment and use of CDR. These technologies and approaches remove carbon dioxide directly from the atmosphere and range from planting trees and soil carbon management to direct air capture (DAC) systems, which remove CO2 directly from the air we breathe.

The need for CDR to decarbonize the globe, meet climate targets and draw down atmospheric carbon after decarbonization is clear.

According to a 2023 study by the Potsdam Institute[20], CDR is needed in nearly every one of the hundreds of decarbonization scenarios modeled. Furthermore, this paper states “CDR from new technologies must increase 1,300-fold by the year 2050”. This sentiment is echoed in essentially all large scale climate models, including Rhodium Group[21], Net Zero America from Princeton[22], the International Energy Agency[23], and the IPCC[24].

[18] https://www.energy.gov/sites/default/files/2023-11/Industry%20Guide%20to%20CCS%20at%20Cement%20Plants_Nov%2029%202023_0.pdf
[19] https://www.catf.us/resource/air-pollutant-reductions-carbon-capture/
[20] https://www.pik-potsdam.de/en/institute/departments/climate-economics-and-policy/mcc-archive/mcc-news-3006
[21] https://rhg.com/research/pathways-to-net-zero-us-emissions-beyond-2030/
[22] https://netzeroamerica.princeton.edu/the-report
[23] https://www.iea.org/energy-system/carbon-capture-utilisation-and-storage/direct-air-capture
[24] https://www.ipcc.ch/report/ar6/wg3/downloads/outreach/IPCC_AR6_WGIII_Factsheet_CDR.pdf

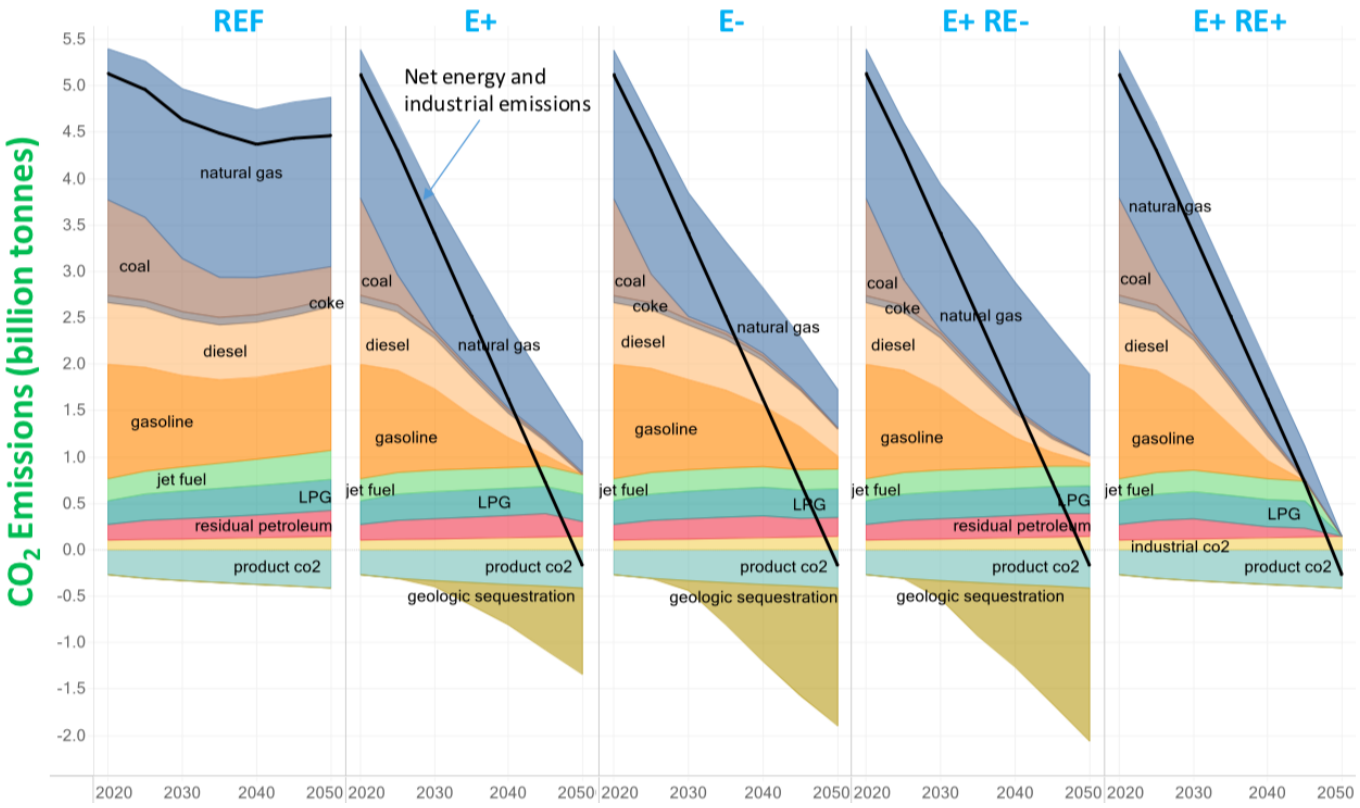


Figure 5: *Net Zero America Study CO_2 emissions for the U.S. energy and industrial system in different pathways, geologic sequestration includes CDR and CCS pathways*

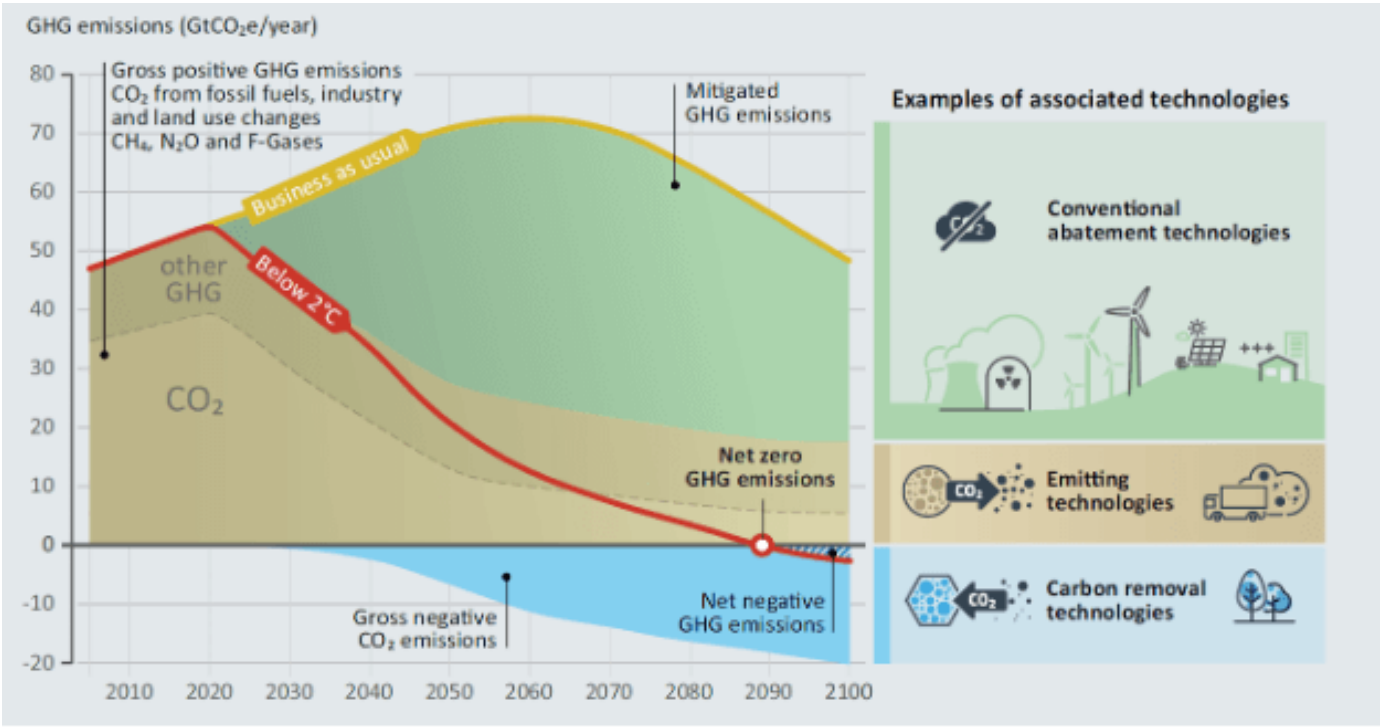
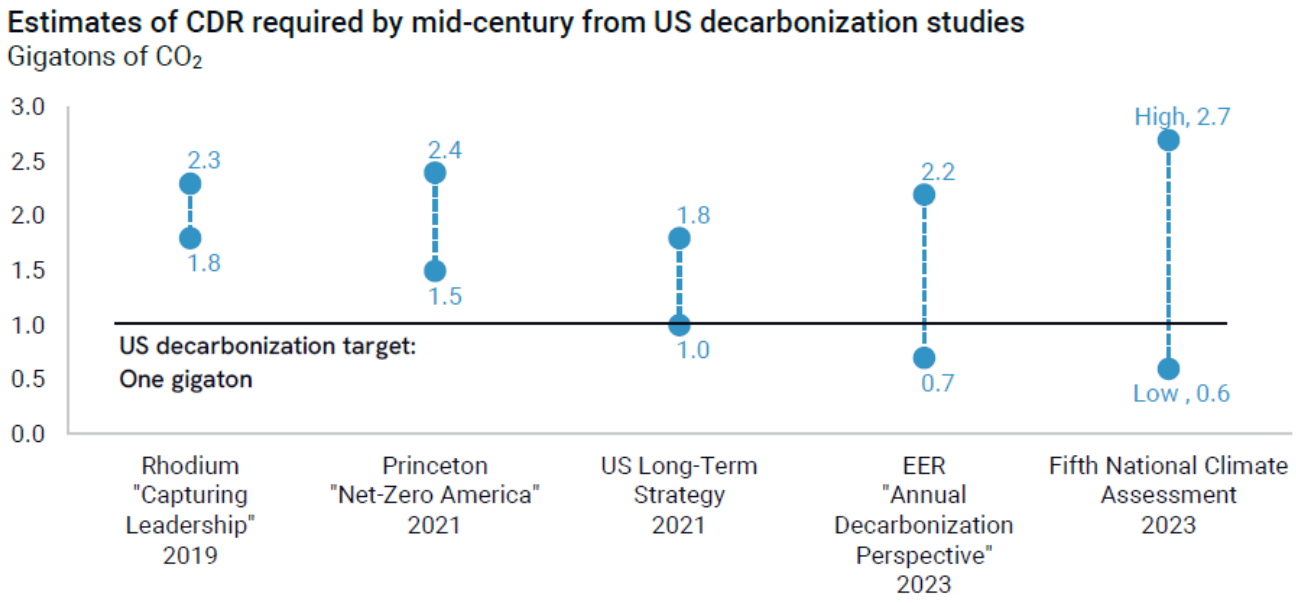


Figure 6: *UNEP 2017*



Source: Rhodium Group; Princeton University Net-Zero America: Potential Pathways, Infrastructure, and Impacts; The Long-Term Strategy of the United States: Pathways to Net-Zero Greenhouse Gas Emissions by 2050; Evolved Energy Annual Decarbonization Perspective 2023: Carbon-Neutral Pathways for the United States; The Fifth National Climate Assessment

Figure 7: *Rhodium Group Landscape of CDR and U.S. policies to Scale Solutions*

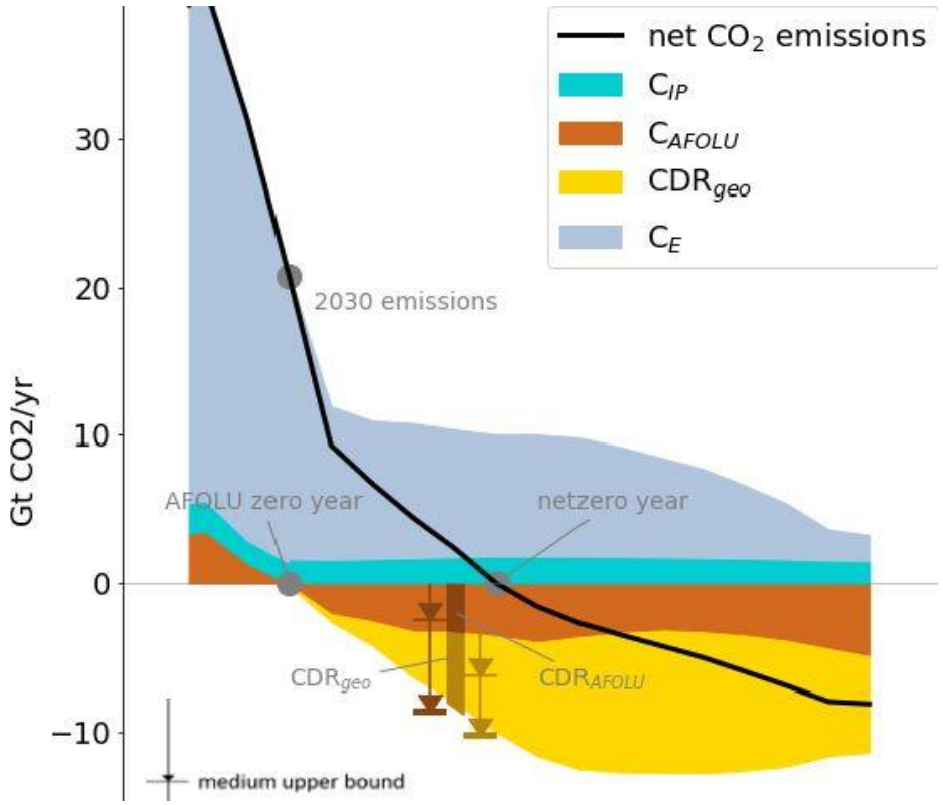


Figure 8: *Greenhouse gas emissions reduction pathways to achieve net zero. Cutout from fig.1a, Warszawski et al (2021)*

The CDR industry will need to scale up to remove gigatons of carbon from the atmosphere in the near and long term. As figure 7 shows CDR could be responsible for removing between .6-2.7 gigatons annually, just in the United States. Currently the U.S. has removed less than .01% of that total.[25]

To put all these numbers in perspective, a male African elephant weighs, at most, 6.8 metric tons, according to the San Diego Zoo. So, a gigaton is well over a hundred million African elephants. As for sea life, the blue whale can weigh as much as 146 metric tons, according to NOAA. So, a gigaton is more than 6 million blue whales[26]. And the world will need multiple gigatons of CDR, every year.

State of Play for Carbon Removal

CDR encompasses a wide swath of technologies and pathways including but not limited to afforestation, reforestation, soil carbon management, ocean alkalinity enhancement, enhanced rock weathering, biomass energy CCS, biomass burial, bio oil injection, biochar, ex-situ mineralization, in-situ mineralization and DAC paired with geologic storage of CO2.

Each of these pathways is at a different technological readiness level, which correlates to their ability to deploy at scale. Many biomass pathways are actively deploying projects across the US, from California, to Colorado, to Arkansas. Enhanced Rock Weathering (ERW)[27] is the process of taking minerals like olivine and spreading them on agricultural lands. Over time these minerals interact with water and bind CO2 from the atmosphere in the form of carbonates. This effectively removes the CO2 permanently as the carbon is now back in a solid form. ERW is undergoing trials in places like Illinois which will not only remove carbon, but could also increase crop yields, and decrease the need for fertilizer across the Midwest and Great Plains.

Each CDR pathway that is deploying projects, and selling carbon credits should be held to rigorous standards. For nearly all CDR pathways (except for DAC) there is not an overarching regulatory regime enforceable by the government.

These challenges are currently being addressed both by governments, with the EU and its carbon removal certification framework, the U.S. Department of the Treasury Released a Joint Policy Statement and Principles on Voluntary Carbon Markets[28], and the work of NGOs like the Carbon Removal Standards Initiative[29] which ensures rigor and accountability in the CDR sector through the uniquely powerful mechanism of regulatory standards.

[25] https://www.cdr.fyi/
[26] https://www.washingtonpost.com/news/energy-environment/wp/2015/07/01/meet-the-gigaton-the-huge-unit-that-scientists-use-to-track-planetary-change/
[27] https://climate.mit.edu/explainers/enhanced-rock-weathering
[28] https://home.treasury.gov/news/press-releases/jy2372
[29] https://www.carbonremovalstandards.org/

Regardless of the stage of development of each technology we must ensure that carbon removal has some key characteristics as outlined by the Carbon Removal Alliance[30]:

1. Permanent – The carbon that is removed must stay securely removed for as long as possible, ideally on a geologic time scale.
2. Net-negative – All carbon removal technologies will result in some emissions throughout their value chain. We must ensure accurate life cycle analysis are done to enumerate the net amount of carbon that is removed.
3. Additional – Each project must demonstrably result in carbon removal that would not have otherwise occurred without the project existing, ensuring an actualized impact on the climate.
4. Verifiable – Projects must be able to clearly monitor, measure, report and verify all claims they are making relative to the carbon being removed. This verification should be audited by disinterested third parties both before, during and after the project.
5. Co-benefits – Carbon removal can deliver a wide range of benefits to local communities and ecosystems. Projects should strive to provide clear benefits to communities, and minimize risks.

The Committee should work across federal agencies to ensure that no matter the CDR pathway, all projects done in the United States are held to the highest standards and best practices outlined above. This is already taking place with DAC.

DAC stands out, especially in the United States[31]. Due to legislation in the Bipartisan Infrastructure Law, billions were made available to DAC to build out large scale, one-million-ton-per-year facilities, across the country. This program coupled with the 45Q tax credit has made the United States the preeminent location to build DAC. Companies and investment from across the globe are coming to the United States to build DAC. Due to the strong public/private bipartisan partnerships, the DAC industry has grown from an idea on a piece of paper, more than a decade ago, to billions in investments from major financial institutions, venture capital and project financing.

A straightforward example of this is the Cypress Project in Louisiana. Climeworks, one of the original DAC companies from Switzerland, has partnered with Breakthrough Energy Ventures portfolio company Heirloom, a DAC company born out of research at University of Pennsylvania and developed in San Francisco, to build a DAC hub facility. They have partnered with Battelle to build a first-of-a-kind integrated project, that will bring up to 1,000 jobs and economic development[32] to the community, and carbon out of the air.

DAC also creates a pathway for existing expertise in the oil and gas industry. Oil and gas workers and companies have deep technical knowledge on fluid dynamic systems both surface and subsurface, alongside their project development capacity. Given that DAC is a large, complex fluid dynamic system from capture to storage, it is a natural complement to the oil and gas skill set and presents a compelling strategic opportunity for the industry. Further, it presents competitive

[30] https://www.carbonremovalalliance.org/
[31] https://www.breakthroughenergy.org/newsroom/articles/direct-air-capture/
[32] https://www.heirloomcarbon.com/news/two-direct-air-capture-facilities-in-northwest-louisiana

advantages to oil and gas companies operating within global markets to offer energy products with lower carbon intensity.

This is no better exemplified than the purchase of Carbon Engineering[33], one of the first DAC companies, by Occidental Petroleum. This commitment from Oxy, and the subsequent investment by Blackrock into their Stratos facility[34] in West Texas shows that the technology not only has pollution implications, but also economic ones. The movement of multinational corporations into the space signifies the maturity of the technology, and the long-term opportunity it holds.

Direct Air Capture and the Underground Injection Control Program

DAC is unique in the carbon removal space, in that every ton of CO2 removed from the air, wouldn't have been removed otherwise, meaning it is, by definition, additional. Once removed, CO2 is pumped thousands of feet underground and regulations under the Environmental Protection Agency's (EPA's) Underground Injection Control Program. That program, which governs Class VI and Class II wells, must ensure the CO2 remains underground permanently, and that the success of the capture is verifiable.

Class VI wells

The Class VI program was introduced in 2010 as a permanent solution for carbon storage. It was developed to protect drinking water under the Safe Drinking Water Act and is managed by the EPA. The U.S. has world class CO2 storage resources due to decades of research at the Department of Energy, state Geologic Surveys and educational institutions, and oil and gas exploration. Early pioneers in carbon storage like Dr. Julio Friedman, Dr. Sally Benson, Dr. Sallie Greenberg, Dr. Sue Hovorka, John Rupp, Dr. Sarah Forbes, Dr. George Guthrie and Dr. Roger Aines carried out these research programs before the 45Q tax credit, and created the bedrock of knowledge that culminated in the Class VI program and underpins the incredible safety record of CO2 storage. Carbon storage is safe, proven and effective, we have stored over 300 million tons of carbon underground since the 1990s with no major leaks or contamination of groundwater.

Prior to 2023, only two federal Class VI permits had ever been issued, both to a first-of-a-kind storage project in Illinois at the Archer Daniels Midland facility. The Class VI program has recently received a large influx of applications due to the programs in the Bipartisan Infrastructure Law and amendments to 45Q. The EPA has a number of tools they can use to hasten the review period of Class VI permits, first being the granting of Class VI primacy to states.

Most states have "primacy" over one of the six well classes in the UIC. Primacy simply means that the state carries out the responsibilities and regulations required for a well class, rather than the

[33] https://www.oxy.com/news/news-releases/occidental-enters-into-agreement-to-acquire-direct-air-capture-technology-innovator-carbon-engineering/
[34] https://www.oxy.com/news/news-releases/occidental-and-blackrock-form-joint-venture-to-develop-stratos-the-worlds-largest-direct-air-capture-plant/

regional or federal EPA. North Dakota (April 24, 2018), Wyoming (September 3, 2020) and more recently Louisiana (February 5, 2024) have received primacy over their Class VI wells, and West Virginia has received conditional approval.

Though EPA has accelerated both the pace of its own Class VI permitting and approved more state primacy applications, the agency could do more to make sure the program moves forward efficiently.

For states submitting primacy applications, EPA should create a pre-application checklist of required information with a pre-application meeting to ensure that once an application is submitted, it is complete. This can shorten review times and decrease the use of federal resources. In addition, upon acceptance, the federal government should provide resources like technical assistance and training, initial funding to help staffing, access to the national labs and their staff, and data transparency related to the proper creation, maintenance, and on-going administration of their Class VI program to ensure the Class VI state program maintains the safety of drinking water and prevents re-release to the atmosphere.

For those wells where EPA remains the regulatory agency and issues the permit, the agency should seek to allocate resources like technical expertise, funding, and use of geophysical sensing/monitoring equipment to the regions with the most Class VI applications and storage potential.

Class VI wells can also be deployed on federal lands and waters. While these programs are not in the direct jurisdiction of the EPW Committee, the Department of the Interior and the Bureau of Ocean Energy Management should issue regulations governing the injection of carbon dioxide into federally owned pore space and allow for the pre-permitting of reservoirs.

Although carbon storage is safe, proven, and effective, the Class VI program remains a major choke point for carbon management. Class VI permits have been a mitigating factor in the country's ability to deploy CCS, as companies wait for the permits to be issued. We can change this within the current legal and regulatory framework.

USE IT Act and Recommendations for Addressing Infrastructure Challenges

The USE IT Act is a valuable tool to help foster and coordinate the deployment of CCS and CDR at scale, decrease permitting times and provide the best recommendations on best practices to the entire carbon management sector.

The White House Task Force was fully appointed in the spring of 2024, and last met in December. As the Task Force has not yet finalized its recommendations, I cannot speak to specific content, but we are focused on the duties outlined in the Act. Our recommendations are intended to address real-world challenges associated with permitting on federal lands, based on practical experience. We are focused on actionable recommendations that can be executed immediately. And the Committee should wait to receive and review them thoroughly.

There are a few suggestions I would make to the Committee regarding the USE IT Act based on my own personal work on the Task Force and the conversations I have had with industry, communities, NGOs, and people in the carbon management policy area.

First, the Committee should direct the Council on Environmental Quality (CEQ) to establish guidance to assist project developers and operators of CCUS facilities and CO2 pipelines. The statute required the issuance of such guidance. This guidance should be informed by the Task Force on CCUS, as well as consultation with broader industry, NGO, and the public. This guidance should provide information to all parties on the best practices to deploy CCUS, including CO2 pipelines, efficiently and with concern for the local environment.

Second, the Committee should work with the Administration to ensure that Task Force work at the relevant agencies is funded, the Task Force is regularly convened and remains a priority, its work concludes on a timely basis and is disseminated and adopted.

Third, the Committee should authorize additional federal support for research and development across the carbon management portfolio. Priorities should include the continued advancement and development of our geologic storage resources, both in sedimentary basins and mineral reservoirs. The Committee should also prioritize funds for research on all forms of carbon removal including, enhanced rock weathering, ocean and biomass pathways. These pathways do not receive the same amount of policy support as DAC (45Q), but critical to achieving gigaton scale carbon removal. These additional authorized funds should also be used to continue driving down the cost of carbon capture, on both power sector and industrial applications with a priority given to the highest and most valuable use cases (i.e. cement, ammonia). Finally, these funds should also go to decreasing the energy usage and efficiency of DAC, focusing on the material development of solvents and sorbents used in the removal process.

Finally, we need permitting clarity on a number of key carbon management technologies. CO2 pipelines currently do not have a federal siting or permitting authority. This is causing critical infrastructure delays in its deployment as inter-state pipelines are difficult to build[35] without a federal authority. The Committee should act on the USE IT Act to clarify which CCUS projects and pipelines are eligible for permitting via the FAST Act, and designate pipeline corridors and/or critical pathway pipelines projects that are of the highest value for the decarbonization of industry/power and to drive down commercial costs associated with the deployment of CCS. The Committee should work across the government and agencies to create permitting regimes for forms of CDR that do not include geologic storage. These permitting regimes currently do not exist, or were not intended to be used for CDR. This will provide clarity to project developers and the industry as a whole, and increase deployment times.

[35] https://www.spglobal.com/commodity-insights/en/news-research/blog/energy-transition/102523-navigator-co2-carbon-capture-heartland-greenway-pipeline-cancellation

Conclusion

Today, America is leading the world in advancing carbon management and removal technologies. We have done it with quality research and development programs spanning across the federal agencies, to the national labs, research institutions and private actors. We have done it with bipartisan support for incentivizing the deployment of that research to scale up the technology. We have done it through the work of thousands of brilliant entrepreneurs. And we are seeing the early benefits of that work, as hundreds of thousands of new jobs[36] are to be expected as the CDR industry grows.

But we cannot rest on our laurels, we cannot be complacent in our leadership, and we cannot allow others to take the lead on this valuable set of technologies. If companies cannot make it work in the United States, they will go elsewhere, and the investments, economic development, and jobs will go with them. We are building it here. We can scale it here. And we should deploy it across the world. We can lead. We can, and we must.

[36] https://rhg.com/research/the-benefits-of-innovation-an-assessment-of-the-economic-opportunities-of-highly-durable-carbon-dioxide-removal/