BIPARTISAN POLICY CENTER

Written Testimony

Sasha Mackler

Director of the Energy Project, Bipartisan Policy Center

Before the United States House of Representatives Committee on Energy and Commerce Subcommittee on Environment and Climate Change

February 6, 2020

Chairman Tonko, Ranking Member Shimkus, and members of the subcommittee, thank you for the opportunity to discuss the crucial topic of carbon capture, utilization, and storage (CCUS) and H.R. 1166, the Utilizing Significant Emissions with Innovative Technologies (USE IT) Act. Thank you as well to Reps. Peters, McKinley, Veasey, and Schweikert for your bipartisan leadership on this legislation, which has already garnered 57 co-sponsors, from both parties.

I appreciate the chance to share some specific thoughts on the importance of CCUS – both in terms of our nation's ability to address the climate challenges we face in the decades ahead, and in terms of strengthening the economy and preserving American leadership in energy innovation. We strongly support the USE IT Act because of its potential to accelerate the development and deployment of technologies for capturing, transporting, utilizing, and sequestering carbon dioxide, a key contributor to climate change. This includes both technologies that can capture and remove carbon dioxide from the exhaust gases of large emissions sources, such as power plants and factories, as well as technologies that can capture and remove carbon dioxide from the ambient air. Investment in multiple types of carbon capture technology will be critical to achieve climate goals, reduce the costs of climate mitigation, and enable U.S. companies to maintain and improve their economic competitiveness.

My testimony can be summarized in four main points:

1) Past federal investments in innovation, particularly energy innovation, have delivered significant benefits in terms of sustained U.S. economic growth and international competitiveness. Legislation that supports energy innovation R&D, such as the USE IT Act, will be especially crucial to U.S. economic and technological leadership as the world transitions to a net-zero-carbon future.

2) CCUS technologies and infrastructure, and R&D for carbon utilization, can ensure that we have the tools to address emissions from difficult-to-decarbonize sectors, such as energy-intensive industry and long-haul aviation. With access to these tools, companies in these sectors will have cost-effective options for reducing their emissions profiles.

3) Among emerging carbon dioxide removal technologies, direct air capture, which removes carbon dioxide from the ambient air, could play a potentially important role in America's climate change mitigation portfolio because of the specific advantages it offers in terms of scalability and siting flexibility.

4) Leveraging opportunities to utilize carbon dioxide, as the USE IT Act proposes, is important as a way to create pathways to commercialization for new carbon capture technologies. Among these opportunities, enhanced oil recovery (EOR) presents the largest near-term market for carbon dioxide and offers other

potential synergies in terms of engaging a major industry partner, accessing capital to develop supporting infrastructure, and developing the regulatory frameworks required for broad CCUS deployment.

Introduction

The Bipartisan Policy Center (BPC) is a Washington, DC-based think tank that actively fosters bipartisan solutions to critical public policy challenges by combining the best ideas from both parties. BPC's Energy Project is focused on advancing policies and technology innovations that will facilitate America's transition to a competitive, net-zero-carbon economy. In 2019, BPC established the Advisory Council on Direct Air Capture of Carbon Dioxide because we recognized that direct air capture and other CCUS technologies have a critical role to play in achieving our energy and climate goals, alongside other key technologies such as renewables, low-carbon fuels, advanced nuclear, and energy efficiency.

Given that CCUS technologies have historically received less attention than other climate mitigation options, we welcome the introduction of the USE IT Act as an important addition to the nation's energy innovation investment portfolio. The economic and environmental rationales for supporting this legislation are compelling in light of the findings of multiple international and domestic expert scientific organizations, including the Intergovernmental Panel on Climate Change (IPCC) and our own National Academy of Sciences, which have concluded that CCUS will be integral to achieving ambitious climate mitigation goals[1] and in light of expected growth in the global market for low-carbon technologies. The remainder of this testimony details the benefits CCUS technologies could provide and the need for greater federal investment in R&D to maintain a leadership position in this critical domain.

Innovation

An effective, efficient strategy for decarbonization requires a combination of ambitious clean energy innovation programs and complementary deployment policies that systematically drive markets for low-carbon energy technologies across the economy. Innovation is absolutely required to achieve net-zero emissions by mid-century given that global energy demand is projected to increase 25% to 30% by 2040.

For decades, the U.S. has been a global leader in innovative and disruptive technologies—and has reaped considerable economic benefits as a result. Researchers have estimated that at least 50% of U.S. annual GDP growth can be traced back to investments in innovation.[2] Despite these positive impacts, however, U.S. investments in energy research have not kept pace with economic growth in recent years. As a result, U.S. overall research intensity (measured as the ratio of investments in R&D relative to overall GDP) has stagnated.[3] Meanwhile, China's overall research intensity tripled between 1995 and 2019 and is still

[1] IPCC, 2018: Summary for Policymakers. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press. Available at: https://www.ipcc.ch/sr15/ and https://www.nap.edu/resource/25259/Negative%20Emissions%20Technologies.pdf.

[2] U.S. Chamber of Commerce Foundation. "Enterprising States 2015 - Executive Summary." 2015. Available at: https://www.uschamberfoundation.org/enterprising-states-and-cities

[3] National Science Foundation. 2018 Science and Engineering Indicators. 2018. Available at: https://www.nsf.gov/statistics/2018/nsb20181/assets/nsb20181.pdf

growing at a faster pace than U.S. research intensity. In addition to increasing their overall research intensity, other nations, particularly China, Germany, Japan, and South Korea, have maintained or increased their support for energy R&D and innovation specifically.

Since 2010, BPC's American Energy Innovation Council, which is composed of prominent business leaders, has pushed for increased investment in energy innovation—not only as a way to maintain U.S. competitiveness but also as a way to help fight climate change. One of the Council's specific recommendations has been to triple the federal government's investments in energy innovation.

Innovation-related legislation introduced this Congress has consistently reaffirmed members' support for energy R&D and signaled a strong willingness to support innovative and environmentally impactful energy technologies. The USE IT Act continues this trend and makes a valuable contribution by specifically authorizing new R&D funding to advance climate-friendly technologies that are currently less developed, but that have enormous upside potential and future market value.

Carbon Capture, Utilization, and Storage

CCUS is an essential complement to other strategies for reducing and avoiding carbon dioxide emissions for the simple reason that we are unlikely to have practical, cost-effective options for zeroing out all anthropogenic sources of greenhouse gases within the mid-century timeframe that scientists have identified as critical for averting major climate risks. Certain industrial processes, for example, such as steel or cement production, are very difficult to decarbonize. Similarly, non-fossil fuel alternatives don't yet exist or remain prohibitively expensive in some transportation applications, such as long-haul air travel and marine shipping. And lastly, there are anthropogenic sources of greenhouse gases, from chemical reactions, agriculture, and land-use practices, to name a few, that lie outside the energy sector altogether.

Given this diversity of sources, achieving net zero carbon emissions by 2050 will necessitate the use of CCUS to compensate for remaining emissions that can't be avoided in the mid-century timeframe. This is true, *even with* very rapid progress to implement those low- and zero-carbon options that are already available—itself no small challenge. And CCUS may prove even more indispensable later in the century, when, according to several expert organizations, net emissions will likely need to be driven *below* zero (in other words, the quantity of carbon dioxide being removed from the atmosphere each year will have to exceed the quantity being added from anthropogenic sources).[4] Meanwhile, besides achieving broader climate goals, CCUS will be important as a way to allow companies that would otherwise have few options for improving their emissions profile to either avoid adding new carbon dioxide to the atmosphere (in the case of carbon capture technology) or to effectively "cancel out" their emissions by removing carbon dioxide from the atmosphere (in the case of direct air capture technology). This could become increasingly important as other nations begin considering policies that favor companies with lower emissions profiles.

Critically, CCUS technologies can also reduce the cost of achieving climate targets by offering a larger and more diverse set of mitigation options. In fact, the IPCC concluded that meeting current international climate targets could be more than twice as expensive without these technologies. Similarly, a 2017 report

[4] Technologies that remove carbon dioxide from the atmosphere are sometimes called "negative emissions technologies."

from the International Energy Agency concluded that CCUS is a necessary part of a clean energy plan that mitigates climate change while protecting U.S. energy security.

Meanwhile, as a business opportunity, captured carbon dioxide can be expected to become increasingly valuable as climate policies create growing domestic and international demand for low-carbon technologies and emissions reductions in the coming decades. In 2018, the global market for carbon dioxide was estimated to be $7.4 billion and growing.[5] The USE IT Act's carbon utilization provisions represent an important step toward positioning the United States for competitive advantage in that market.

To seize these opportunities, and to position U.S. companies to continue to thrive in a carbon-constrained global economy, investment is needed now to develop CCUS technologies. (It is worth noting that additional R&D is also needed to develop and deploy cost-effective low-carbon fuels and process innovations that would enable large-scale emissions reductions in the industrial sector. That sector is a particular point of focus because a January 2019 study from the Rhodium Group found that increased emissions from the industrial sector were the largest contributor to U.S. emissions growth in 2018.[6])

Direct Air Capture

A particularly important feature of the USE IT Act is that it sets up a competition, with a prize, to spur efforts to develop and demonstrate cost-effective direct air capture (DAC) technology. Working DAC systems have already been demonstrated at a handful of small plants in the United States, Canada, and Europe. But a targeted RD&D push is needed to jump this nascent technology to the next stage of commercialization and to address remaining cost barriers and other design challenges (energy and sorbent use, for example, are areas for further improvement).

DAC is worthy of focused incentives because it offers a way to address emissions from small, dispersed emissions sources that can't be individually retrofitted with carbon capture technology, and a way to eventually achieve net negative emissions by removing more carbon from the atmosphere than is being added in from anthropogenic sources. There are other ways to remove carbon dioxide that is already present in the atmosphere, of course—notably through increased soil and biomass sequestration (growing trees is the most familiar example). But most land and forestry-based strategies face important constraints, including competition with food crops and biodiversity concerns, at very large scales of deployment. By contrast, DAC offers virtually unlimited carbon dioxide removal potential if cost and other barriers can be overcome, and it also has important advantages in terms of siting flexibility and scalability. DAC plants can be large or small and need not be located near emissions sources; indeed, the fact that they can be located in a range of geographic settings reduces the potential for conflicts with other land uses and opens the door to synergistic siting opportunities—for example, placing a DAC plant near a suitable geologic repository for storing captured carbon dioxide or where a low-cost, low-carbon energy source is available. Finally, the ability to add DAC capacity in increments would allow for flexible expansion as the need or opportunity arises—a potentially important feature given uncertainty about future mitigation costs and needs.

---

[5] Grand View Research. Market Research Report. Carbon Dioxide Market Size, Share & Trends Analysis Report by Source (Hydrogen, Ethyl Alcohol, Ethylene Oxide, Substitute Natural Gas), by Application (Food & Beverages, Oil & Gas, Medical), and Segment Forecasts, 2019-2025. July 2019. Available at: https://www.grandviewresearch.com/industry-analysis/carbon-dioxide-market

[6] Energy & Climate Staff. "Preliminary US Emissions Estimates for 2018." Rhodium Group. Jan. 8, 2019. Available at: https://rhg.com/research/preliminary-us-emissions-estimates-for-2018/

Enhanced Oil Recovery

As we noted at the outset, the focus on carbon dioxide *utilization* in the USE IT Act is an important feature, given the challenge of commercializing carbon capture technologies absent a market for the carbon dioxide they produce. Although a number of potential markets could emerge in the future, for synthetic fuels production or concrete manufacture, for example, the main near-term opportunity is in enhanced oil recovery (EOR). The oil industry already uses carbon dioxide to flush additional oil from mature wells, but this carbon dioxide is typically sourced from natural underground reservoirs so the practice provides little climate benefit. Since the carbon dioxide remains sealed underground after EOR operations are complete, using carbon dioxide that has been taken out of the atmosphere—or captured from industrial sources that would otherwise release new emissions—offers a means of achieving some climate benefit while taking advantage of a large existing carbon dioxide market. A recently announced plan from Occidental Petroleum to use DAC technology for its EOR operations in Texas suggests that this is an area that holds promise in terms of industry interest and potential for future public-private partnerships.[7]

BPC is aware, of course, that pairing DAC with EOR is controversial because of the concern that EOR, by expanding the supply of economically recoverable oil, promotes continued reliance on oil. On the other hand, in a context where oil use in large sectors of the global economy can be expected to continue for some years to come, and where oil companies will continue to implement EOR as market conditions justify, an argument can be made—and in fact has been made by some environmental advocates[8]—that DAC with EOR provides near- and long-term benefits and should be explored. The near-term benefit is that DAC offers a means to effectively cancel out at least some of the new emissions generated by using EOR-produced oil, insofar as it leads to carbon dioxide being removed from the atmosphere and sealed in depleted underground oil reservoirs. The longer-term benefit rests on the potential to use EOR to leverage the investments needed to improve and scale up DAC technology for expanded use in future mitigation efforts. Estimates of the net impacts of EOR with DAC vary, but at least one recent analysis from a non-industry source found that EOR with DAC could reduce net CO_2 emissions by about one-third compared to conventional oil production, subject to a number of input assumptions.[9] Under other assumptions, including with respect to the DAC energy source and with respect to how much of the oil would have been produced anyway absent EOR, the benefit could be more or less.[10]

[7] James Mulligan and Dan Lashof. "A CO_2 Direct Air Capture Plant Will Help Extract Oil in Texas. Could This Actually Be Good for the Climate?" World Resources Institute. July 31, 2019. Available at: https://www.wri.org/blog/2019/07/co2-direct-air-capture-plant-will-help-extract-oil-texas-could-actually-be-good-climate.

[8] *Ibid*

[9] *Ibid*.

[10] The International Energy Agency has estimated that for every ten barrels of oil produced using CO_2-based EOR, eight barrels would have been produced anyway. https://nachhaltigwirtschaften.at/resources/iea_pdf/reports/iea_ghg_storing_co2_trough_enhanced_oil_recovery.pdf

Infrastructure and Permitting

Other valuable provisions of the USE IT Act focus on improvements to permitting and siting for CCUS plants and infrastructure, including carbon dioxide pipeline networks. Addressing permitting and siting issues will be critical to supporting a national market for carbon capture and storage and for promoting the continued development and improvement of related technologies. The U.S. currently has 4,500 miles of carbon dioxide pipelines, but this network would have to be expanded substantially to deploy CCUS on the scale needed to contribute to climate mitigation goals.

Conclusion

Passage of the USE IT Act would be an important step toward advancing technologies that will be integral to a cost-effective and successful climate change mitigation strategy. Given expected growth in market demand for low-carbon technologies and carbon dioxide reductions, federal support will complement and bolster emerging trends in the private sector. The U.S. government has a long record of supporting technological innovations that have helped our economy navigate the major industrial transitions of past eras—and come out stronger in the process. The 116th Congress has made significant strides in producing thoughtful bills and discussion drafts that could provide the foundation for another such shift—this time to a low-carbon economy. The USE IT Act represents an important building block in that foundation, and we urge its prompt adoption by the full Congress.