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The Bipartisan Infrastructure Bill Could Reshape DOE's RD&D Portfolio Over the Next 5 Years – in a Good Way

BY: LINH NGUYEN AND DAVID HART | SEPTEMBER 2021

The Infrastructure Investment and Jobs Act (IIJA), bipartisan legislation that passed the Senate in August and is slated to be voted on by the House of Representatives in late September, presents a major opportunity to accelerate clean energy and climate innovation. It would go far toward rebalancing the research, development, and demonstration (RD&D) portfolio of the U.S. Department of Energy (DOE), so that it tackles deep decarbonization challenges that have largely been neglected in the past.

This rebalancing would be consistent with the recommendations of *Energizing America: A Roadmap to Launch a National Energy Innovation Mission*, which the Information Technology and Innovation Foundation (ITIF) and Columbia University's Center for Global Energy Policy co-published a year ago.[1] IIJA would do much more in this regard than is likely to be done through the regular appropriations process. Indeed, in some areas it even goes beyond *Energizing America's (EA)* ambitious recommendations. (The Democrats' budget reconciliation package, which is still in flux at the time of this writing, would contribute further to energy innovation, primarily by expanding tax incentives for low-carbon technologies, an approach that lies outside the scope of *EA.*)

In this blog post, we briefly describe progress to date to advance the goals of *EA* before highlighting the opportunities that passage of IIJA would create in three areas:

1. Carbon dioxide removal (CDR),
2. Carbon capture, utilization, and storage (CCUS), and
3. Industrial decarbonization.

However, even if IIJA is enacted, much will still remain to be done, not only executing the massive effort the law will trigger but building further on it.

PROGRESS TO DATE

A few months after the publication of *EA*, Congress came together in a bipartisan manner to pass the Energy Act of 2020, the first comprehensive national energy policy update in over a decade. The Act incorporates the Clean Industrial Technologies Act and the Better Energy Storage Technology Act, which were included among *EA*'s recommendations.[2]

The election of President Biden brought further progress consistent with *EA*. The National Climate Advisor, Gina McCarthy, convened the first-ever Climate Innovation Working Group as

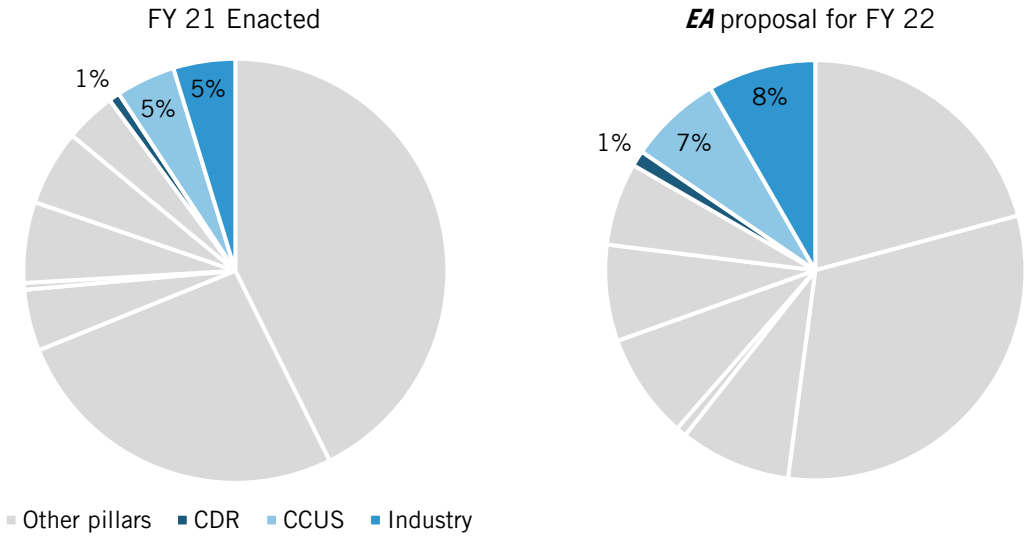
part of the National Climate Task Force, which include 21 federal agencies. Its purpose is to develop and implement a whole-of-government approach to the climate innovation challenge, which will be vital to tackling all sources of U.S. greenhouse gas emissions.[3]

The United States also restarted its diplomatic effort to accelerate climate innovation globally, beginning with the Leaders Climate Summit in April. In June, Secretary of Energy Granholm joined counterparts from around the world to launch Mission Innovation 2.0, which will seek to dramatically advance novel technologies that would address emissions that are particularly hard to abate.[4]

IIJA'S IMPACT ON DOE'S ENERGY RD&D PORTFOLIO

This progress is extremely encouraging. But the climate challenge grows deeper by the day, and the urgency of accelerating innovation to avert its worst effects does as well. DOE's budget still underfunds three critical technology pillars that *EA* urged policymakers to prioritize: CDR, CCUS, and industrial decarbonization. Figure 1 shows the share of DOE's energy RD&D funding devoted to these areas in fiscal year 2021 beside *EA's* proposals for fiscal year 2022. *EA* recommends that the budget for these pillars increase as a share of the total, from 11 percent to 16 percent by fiscal year 2022.

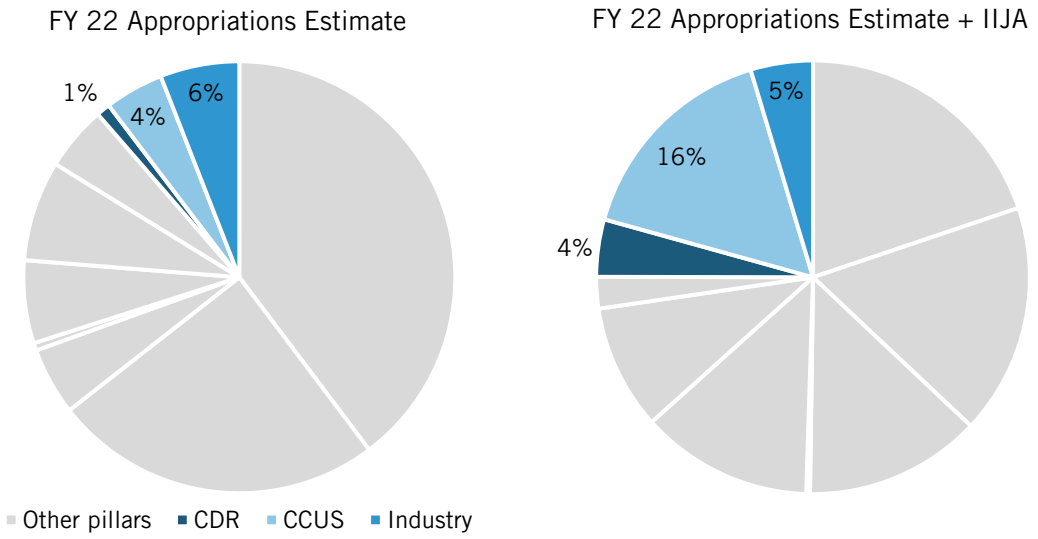
Figure 1: DOE's FY 21 RD&D portfolio as a percentage share across technology pillars and *EA's* FY 22 proposal[5]



** EA analysis for the Clean Agriculture Systems pillar includes RD&D funding from non-DOE programs. This analysis only tracks RD&D at DOE. Therefore, the Clean Agriculture Systems pillar is not considered a pillar underrepresented as clean agriculture RD&D activities are not a focus at DOE.*

Neither the president's budget proposal nor the House and Senate appropriations bills for fiscal year 2022 would shift the portfolio to this degree. But IIJA would do so and go further. Most notably, when the spending included in IIJA is added to our fiscal year 2022 appropriations estimate, the percentage share for the CDR pillar would increase from 1 percent to 4 percent, and the CCUS pillar would increase from 4 percent to 16 percent (as shown in figure 2). The percentage share of the industrial decarbonization pillar would decrease by 1 percent with IIJA, but this shortfall could be addressed if funding for CCUS technologies and clean fuels were directed towards industrial applications.

Figure 2: DOE's FY 22 RD&D portfolio as a percentage share across technology pillars with and without IIJA



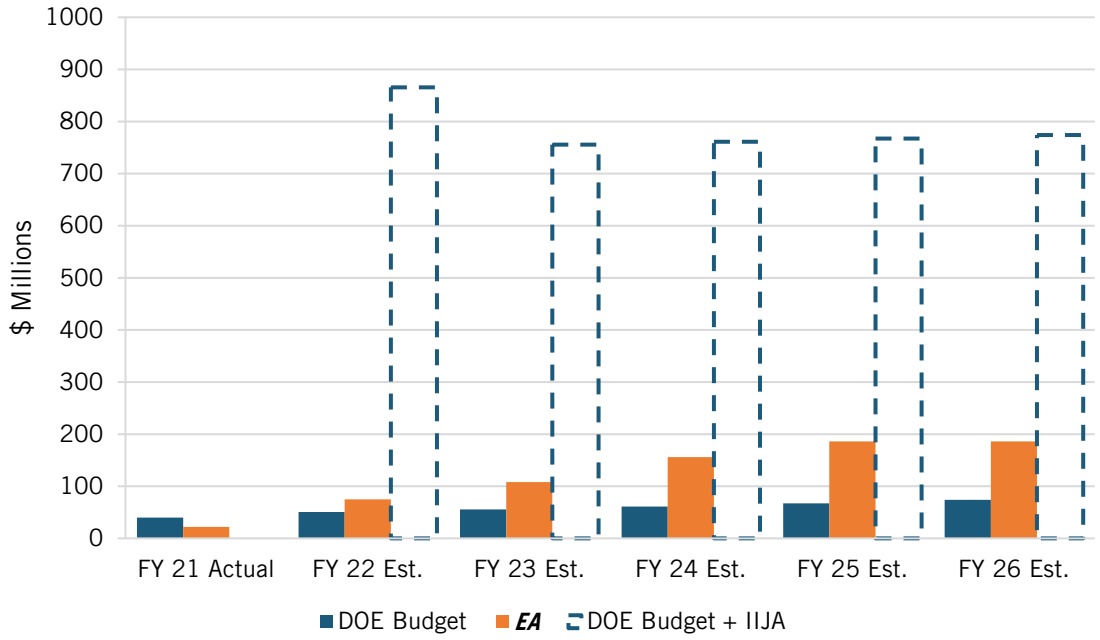
**FY 22 estimates are an average of the House and Senate appropriations full committee bills, and FY 2023 to 2026 estimates assume a 10 percent increase in funding each year.*

CARBON DIOXIDE REMOVAL

Until recently, CDR RD&D received almost no federal support. CDR refers to a suite of technologies that remove carbon dioxide (CO_2) directly from the atmosphere for use or storage. The Intergovernmental Panel on Climate Change's *Sixth Assessment Report* finds with high confidence that CDR is essential to compensate for residual emissions that are impossible or prohibitively expensive to eliminate.[6] No CDR technologies have been deployed at scale anywhere in the world, making an aggressive RD&D program essential.

Congress recognized the need for carbon removal solutions in the Energy Act of 2020 and allocated $20 million and $40 million for CDR RD&D activities for fiscal years 2020 and 2021 respectively within the Office of Fossil Energy and Carbon Management.[7] Furthermore, President Biden's fiscal year 2022 budget request calls for a brand-new CDR program that would focus on direct air capture (DAC) materials and components, bioenergy with carbon capture and storage, and enhanced carbon mineralization concepts to permanently remove large amounts of atmospheric CO_2.[8] But these steps are modest. The proposed CDR program for fiscal year 2022 is way below *EA* recommendations, as shown in figure 3.

Figure 3: DOE budget for CDR RD&D activities from FY 21 to FY 26



IIJA would drastically change the situation. It authorizes $700 million annually for fiscal years 2022 through 2026 for CDR RD&D activities and directs DOE to establish four regional DAC hubs. It also authorizes $100 million for a commercial DAC technologies prize competition for fiscal year 2022, and $15 million for a pre-commercial DAC technologies prize competition.[9] Indeed, the United States has made notable progress on this pillar over the past few years.[10] But CDR technologies have a long way to go before reaching maturity.

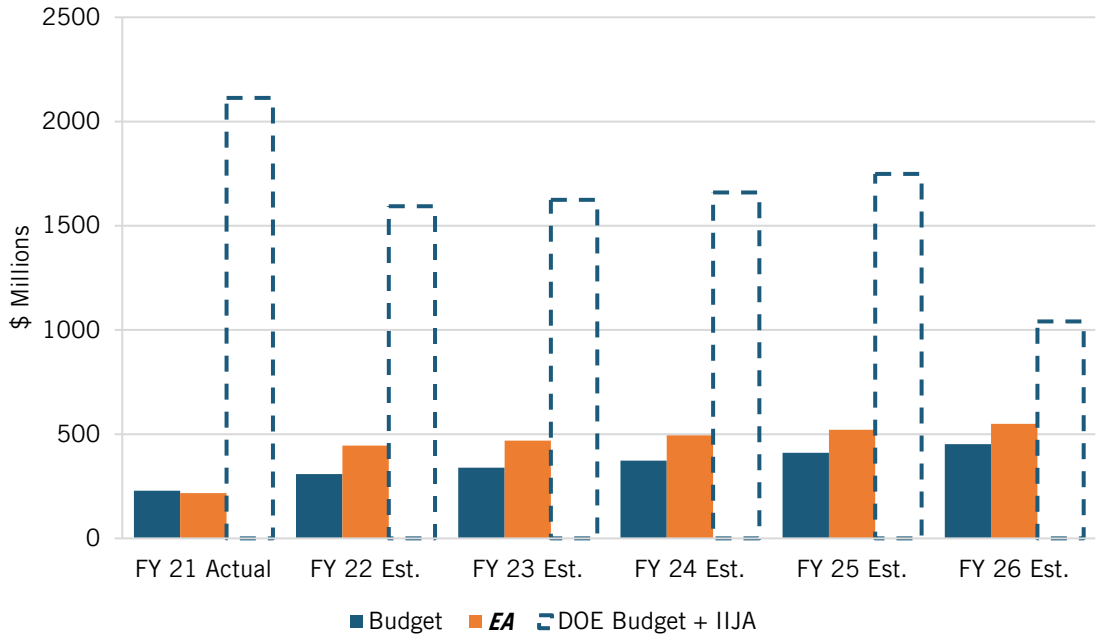
Looking forward, U.S. policymakers should consider the following recommendations from *EA* to accelerate the development of CDR technologies:

- Congress should establish a comprehensive interagency RD&D initiative that implements the recommendations of the National Academies' *Negative Emissions Technologies and Reliable Sequestration: A Research Agenda* report and the Energy Futures Initiative's "Clearing the Air: A Federal RD&D Initiative and Management Plan for Carbon Dioxide Removal Technologies" report.[11]
- The White House should establish an interagency working group (IWG) to coordinate research between DOE, the National Science Foundation, the U.S. Geological Survey, the U.S. Department of Agriculture, and other relevant agencies.

CARBON CAPTURE, UTILIZATION, AND STORAGE

CCUS technologies have also been represented inadequately in DOE's RD&D portfolio. These technologies will be needed to prevent CO_2 from power plants and industrial facilities from reaching the atmosphere in the first place. However, current state-of-the-art technologies for doing so are still too expensive. The fiscal year 2022 budget estimate for CCUS RD&D activities at DOE is far below what *EA* deems necessary to reduce costs and spur widespread deployment of these critical technologies.

Figure 4: DOE budget for CCUS RD&D activities from FY 21 to FY 26



But IIJA would change the course of CCUS RD&D activities at DOE over the next five years. It authorizes $2.9 billion for carbon utilization, carbon capture, and carbon storage validation and testing for fiscal years 2022 to 2026. In addition, it authorizes $3.4 billion for large-scale pilot and demonstration for fiscal years 2022 to 2025 through the newly established Office of Clean Energy Demonstration.[12]

To continue to accelerate CCUS innovation, Congress and DOE should consider these recommendations:

- Congress should pay special attention to industrial carbon capture demonstration projects, including steel and cement manufacturing, where investments now could help the United States reclaim leadership in carbon capture technologies.[13]
- DOE should increase the ambition of its current carbon storage goal of 50 million metric tons of storage capacity characterized by 2026 and adopt the National Academies target of 250 million metric tons by 2030.[14]

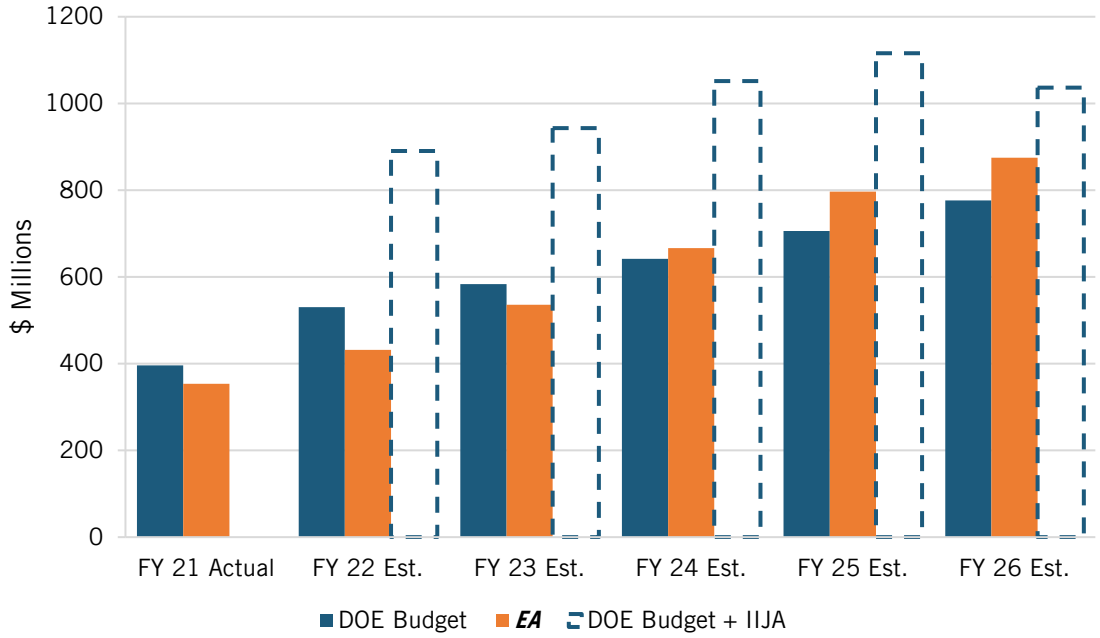
INDUSTRIAL DECARBONIZATION

The industrial sector emits the third largest share of greenhouse gases, but industrial decarbonization has had a modest place in DOE's RD&D portfolio. Heavy industry—including cement, iron and steel, and chemicals production—is challenging to decarbonize because emissions from chemical processes are hard to abate, and electrification is often difficult. ITIF's 2021 "Clean and Competitive: Opportunities for U.S. Manufacturing Leadership in the Global Low-Carbon Economy" report finds that manufacturing policies that fail to radically trigger emissions reduction could not only undermine global progress toward net-zero emissions, but also worsen U.S. competitiveness.[15]

Fiscal year 2022 appropriations for DOE's Advanced Manufacturing Office (AMO) are estimated to be around $530 million, up 16 percent from 2021 enacted levels. Recognizing the need to

address industrial decarbonization and boost manufacturing innovation, DOE has proposed a complete restructuring of subprograms within AMO across four technical areas: 1) materials, 2) manufacturing innovations, 3) energy systems, and 4) manufacturing enterprise.

Figure 5: DOE budget for industrial decarbonization RD&D activities from FY 21 to FY 26



While estimated funding for industrial decarbonization exceeds *EA* recommendations for fiscal years 2022 and 2023, it fails to meet the mark in fiscal year 2024 and beyond (see figure 5). IIJA includes much-needed authorizations and funding for industrial decarbonization RD&D, including $750 million for fiscal years 2022 to 2026 for an advanced energy manufacturing and recycling grant, and $500 million for fiscal years 2022 to 2025 for industrial emissions demonstration projects.[16]

Accelerating manufacturing technology innovation is essential to strengthen U.S. manufacturing and hasten reductions in greenhouse gas emissions. *EA* provides several recommendations for advanced manufacturing technologies that Congress and DOE should consider:

- DOE should expand programs in clean fuels—which currently focus on transportation fuels—to include applications in the industrial sector. It should also expand programs in carbon capture technologies—which currently focus on power plant applications—to include their use in heavy industries.[17]
- DOE should establish additional Clean Energy Manufacturing Institutes—collaborative partnerships with manufacturers to develop clean manufacturing processes—that focus on other high-priority advanced manufacturing technologies as identified in the 2015 Quadrennial Technology Review.[18] In July 2021, DOE announced a request for information to inform the creation of a new Institute focused on electrification of industrial processes and decarbonizing the metal manufacturing industry.

MOVING TOWARD BALANCE

Since the release of *EA*, Congress and the Administration have shown increasing support for more ambitious public investment in clean energy innovation through the passage of the Energy Act of 2020, and the fiscal year 2022 budget proposal. But if DOE's energy RD&D budget continues to increase at modest rates over the next five years, especially for currently underfunded areas like CDR, CCUS, and industrial decarbonization, the nation and the world will not meet their climate goals. IIJA, under consideration in the House, provides historic funding authorizations that could reshape DOE's energy RD&D portfolio.

The passage of IIJA would begin a new chapter in U.S. energy innovation policy and bring with it a new set of challenges. The scale of the effort and the necessity to collaborate more closely with the private sector will challenge DOE management. RD&D findings as well as changes in the global energy and climate systems will inevitably require further adjustments to the portfolio in the coming years. The National Energy Innovation Mission called for by *EA* will never be an easy one to devise and execute, but the sooner this new set of challenges comes, the better.

FURTHER READING

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About the Authors

Linh Nguyen (@linhknguyen) is a research assistant for clean energy innovation with ITIF. She previously worked for Climate Advisers and Resource Energy. She holds a master's degree in energy policy from Johns Hopkins University.

David M. Hart (@ProfDavidHart) is a senior fellow at ITIF, where he directs the clean energy innovation policy program, and professor of public policy at George Mason University's Schar School of Policy and Government. Hart is the author of numerous ITIF reports, academic journal articles, and books, including *Energizing America* (Columbia University Center for Global Energy Policy, coauthored with Varun Sivaram, Colin Cunliff, Julio Friedmann, and David Sandalow) and *Unlocking Energy Innovation* (MIT Press, coauthored with Richard K. Lester).

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The Information Technology and Innovation Foundation (ITIF) is an independent, nonprofit, nonpartisan research and educational institute focusing on the intersection of technological innovation and public policy. Recognized by its peers in the think tank community as the global center of excellence for science and technology policy, ITIF's mission is to formulate and promote policy solutions that accelerate innovation and boost productivity to spur growth, opportunity, and progress.

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ENDNOTES

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