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BIPARTISAN POLICY CENTER

The U.S. Clean Energy Deployment Administration: A Business-Driven Approach to Leveraging Private Sector Investment in Clean Energy Innovation and Commercialization

By Dan Reicher | June 2020

The AEIC Scaling Innovation Project

This paper is one in a series of case studies examining the role of demonstration projects in the commercialization of new clean energy technologies.

In the first AEIC report, *A Business Plan for America's Energy Future (2010)*, a New Energy Challenge Program was proposed as a way for the U.S. government to support the demonstration and eventual commercialization of new energy technologies. For the United States to meet aggressive mid-century decarbonization commitments, a technology-inclusive portfolio of clean and innovative technologies, including advanced nuclear and renewable energy systems, zero-carbon fuels, long-duration electricity storage, and carbon capture and storage, must be deployed commercially at scale. The initial demonstration of complex technologies is a well-recognized challenge in the energy sector where first-of-kind risks are difficult to manage and projects must operate in highly regulated commodity markets, many of which may not yet appropriately value their advanced attributes. Because of this, the AEIC and many other experts have concluded the federal government has a role to play in overcoming this so-called demonstration "valley of death."

The AEIC believes there is an opportunity – and a need – to strengthen federal policy frameworks in support of scaling innovation to more effectively accelerate the commercialization of new energy technologies. The case studies in this series look back to notable policy efforts in the past to help inform a new policy agenda for the future.

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Introduction

For decades – through Democratic and Republican administrations alike – the federal government has played a significant role in the innovation, commercialization, and deployment of energy technology. The challenge has been that federal support has often been unreliable and inadequate, particularly in the area of new technology deployment. Frequently, it has also failed to leverage substantial private sector investment. With the rising threat of climate change, increasing Chinese dominance of clean energy technologies, and a domestic manufacturing base in serious need of a jumpstart, a smarter, more business-driven federal approach is in order that will leverage vastly greater private sector investment.

To that end, this paper considers a proposal to create a federal Clean Energy Deployment Administration (CEDA), as originally developed in a bipartisan bill introduced by then-Senate Energy and Natural Resources Committee Chair Jeff Bingaman (D-NM) and Ranking Member (and now Chair) Lisa Murkowski (R-AK).[1] CEDA, as proposed, would create an independent and business-driven federal financing agency with a diverse set of financing tools to leverage private investment in accelerating U.S. clean energy deployment. CEDA would have two financial focus areas. Under one section of the bill, CEDA would provide "direct support," such as loans, loan guarantees, letters of credit, insurance products, or other credit enhancements or debt instruments, to projects employing innovative clean energy technologies that help achieve the deployment goals developed pursuant to the bill. CEDA would also provide "indirect support" through securitization or other means of secondary market credit enhancement. Importantly, indirect support could be provided to some technologies that are commercially proven, but that are being held back by a lack of access to the financial products necessary to allow widespread adoption.

CEDA's business-driven approach is not unique in the federal government. Other government entities, such as the U.S. International Development Finance Corporation (formerly the Overseas Private Investment Corporation) have authority to provide a range of financial support and, like CEDA, to be compensated in the process and reinvest the proceeds in additional projects (unlike the current U.S. Department of Energy loan program).

This paper sets the stage with three brief examples of federal government support of energy technology, describes CEDA's background and structure, highlights the key functions of the agency (and how they address the challenges of energy technology innovation, commercialization, and deployment), and concludes with a brief discussion of alternatives to CEDA and political prospects for renewed efforts to enact CEDA legislation.

Government Support for Energy Technology Innovation and Commercialization: Three Historic Examples

Several prominent examples of U.S. federal government support of energy technology innovation and commercialization belie the frequently heard argument that the government does not have an appropriate role in advancing energy technology, beyond early-stage R&D.

In 1951, during the Eisenhower administration, the federal government financed the commercialization of civilian nuclear power, investing $550 million (in current dollars) on an Idaho reactor (EBR-I) that generated the first usable electricity from nuclear energy.[2] Further government-funded civilian reactors followed, including, six years later, the federally financed Shippingport reactor in Pennsylvania, "the world's first full-scale atomic electric power plant devoted exclusively to peacetime uses."[3] It was not until 1960 that the nation saw "the first U.S. nuclear power plant built without government

funding."[4] The federal government has stayed in the nuclear power innovation and commercialization business since, helping to finance the scale-up of various technologies – some successful and some not. This includes federal funding of breeder reactors[5] and, in recent years, significant Department of Energy (DOE) investment in the development of small modular reactors. Recently, the DOE loan program has backed the construction of the first new reactors in the United States in decades.

A second example is the federal government's significant role in the innovation and commercialization of wind energy technology over five decades. DOE grants under the Carter administration backed the development of utility-scale wind turbines under the "MOD" program,[6] including multi-megawatt units developed by Westinghouse, General Electric, Boeing, and United Technologies. These included a 2.5-megawatt Boeing turbine ("MOD 2") "designed for quantity production" with a predicted "cost-of-energy less than four cents per kWh…"[7] A Carter-era tax credit also provided a financial incentive for the initial deployment of wind turbines. The end of the energy crises of the 1970s saw, in the Reagan administration, the decline of government grants for wind and the elimination of the wind tax credit. New wind R&D programs emerged in the 1990s, along with a new federal tax credit, substantially driving down technology costs. Under the Obama administration, there was increased support for new categories of wind technology, including federal funding of offshore wind demonstration projects, but these programs lacked a strong policy foundation for broader commercialization. Support for wind technology has waned under President Trump. The wind tax credit, reauthorized in 2015, was scheduled to phase out completely at the end of 2019, but, just a few weeks before its end date, Congress reauthorized the credit for an additional year.[8]

In a third example of past federal support for energy technology, DOE launched a program to develop and commercialize carbon capture and storage (CCS) technology in 1997 under the Clinton administration. Over the past 20 years, a variety of federal support mechanisms and incentives – R&D funding, grants, federal tax credits, private activity bonds, and loan guarantees – have been used to advance CCS technology. This array of federal support has helped fund first-time applications of CCS at a number of different types of facilities in the United States: a coal-fired power plant in Texas, an ethanol plant in Illinois, a Texas oil refinery, and, most recently, a project that will help demonstrate CCS technology with natural gas-fired power generation. Additionally, a revised CCS-related tax credit was adopted in 2018. However, the credit will expire in 2023 and a delay in the publication of IRS tax credit guidance until 2020 (with several issues still outstanding) has slowed private sector development and financing of CCS projects.[9]

Thus, the federal government has a multi-decade track record of backing a variety of innovation and commercialization efforts across a range of energy technologies. The challenge is that the approach has been haphazard, dependent on the ups and downs of congressional appropriations and tax credits, and subject to changing presidential administrations and their comfort with grant-making and other incentives. Most importantly, the federal approach to date has failed to dependably leverage substantial and consistent private sector investment.

Given the massive, trillion-dollar scale of annual global investment required to respond to climate change, private sector investment in energy technology innovation, commercialization, and deployment must be radically increased – and soon. A smarter approach to the federal government's role in advancing energy technology would use a broad array of tools to tap a much larger vein of private sector investment and would be built around a reliable and business-driven partnership between the government and the finance community.

CEDA: The First Time Around

A compelling approach of this sort was proposed about a decade ago in a bipartisan bill, introduced in 2008 by then-Senate Energy and Natural Resources Committee Chair Jeff Bingaman (D-NM) and cosponsored by the Committee's then Ranking Member (and current Chair), Senator Lisa Murkowski (R-AK). Titled the "21st Century Energy Technology Deployment Act," the bill would have created CEDA.[10] Similar legislation was introduced as an amendment to the Waxman–Markey bill, a major piece of climate legislation, via an amendment introduced by then-Emeritus House Energy and Commerce Committee Chair John Dingell. The amendment was adopted in the House Energy and Commerce Committee by a 51–6 vote; it was the only amendment to the Waxman-Markey bill that garnered Republican support.[a]

While the Waxman–Markey bill, with CEDA included, passed the House, and while CEDA was in the first title of an energy package adopted by the Senate Energy and Natural Resources Committee on a 15–6 vote, no action was taken on the Senate floor for the remainder of that Congress. However, CEDA advocacy continued and the idea of a new federal financing entity focused on energy technology innovation and deployment remained a major focus for the Senate Energy and Natural Resources Committee. At a committee hearing in 2011, Chairman Bingaman[11] and Ranking Member Murkowski expressed strong support for CEDA.[12] Responding to pressure for spending restraint from within her caucus, however, Senator Murkowski stressed that the cost of the program would need to be offset by spending reductions elsewhere in the federal budget.[13]

With Senator Bingaman's retirement in 2015 and with Republicans taking control of the Senate that year, CEDA foundered – not on the basis of its inherent logic or compelling function, but rather as a result of shifting political conditions that held up clean energy and climate legislation advanced by the Obama administration more broadly. Five years later, with the reemergence of bipartisan support for clean energy technology, greater awareness of accelerating climate challenge, increasing Chinese dominance of American-born clean energy technologies, and a recent major economic crisis, CEDA's day in the sun has returned.

CEDA: A Business-Driven Structure Whose Time Has Come (Again)

CEDA was introduced in a bipartisan Senate bill called the "21st Century Energy Technology Deployment Act." The purpose of this legislation was to promote the domestic development and deployment of clean energy technologies required for the 21st century by improving existing programs and establishing a self-sustaining Clean Energy Deployment Administration. In contrast with prior technology-specific innovation and commercialization efforts undertaken by the federal government, the idea behind CEDA was to establish a stable, long-term, well-funded, and business-driven entity with a range of tools to improve federal support and leverage vastly greater private sector investment in clean energy on a technology-neutral basis.

a According to a *New York Times* story at the time, one of the handful of Republicans who voted against the amendment, Representative Joe Barton (R-TX), actually supported CEDA, but wanted more detail in the bill. Skepticism toward the bill also came from some parts of the environmental community. For example, the Union of Concerned Scientists (UCS) expressed concern that CEDA's tools could be used to expand the construction of new nuclear power plants. Interestingly, UCS has recently modified its position on nuclear power in light of the climate crisis.
Ben Geman, "House panel approves 'clean energy' bank," *The New York Times*, May 19, 2009. Available at: https://archive.nytimes.com/www.nytimes.com/gwire/2009/05/19/19greenwire-house-panel-approves-clean-energy-bank-10572.html.
Union of Concerned Scientists, "Nuclear Power." Available at: https://www.ucsusa.org/energy/nuclear-power.

The CEDA legislation aimed to create an attractive investment environment through partnership with and support from private capital markets. The key objective was to promote access to affordable financing for the accelerated and widespread deployment of:

(1) clean energy technologies

(2) advanced or enabling energy infrastructure technologies

(3) energy efficiency technologies in residential, commercial, and industrial applications

(4) advanced manufacturing technologies for any of the technologies or applications covered by the legislation

The legislation defined the "clean energy technologies" that CEDA would support as any clean energy technology related to the production, use, transmission, storage, control, or conservation of energy that will:

(1) reduce the need for additional energy supplies by using existing energy supplies with greater efficiency or by transmitting, distributing, or transporting energy with greater effectiveness through the infrastructure of the United States

(2) diversify the sources of energy supply of the United States to strengthen energy security and to increase supplies that are environmentally sustainable

(3) contribute to a stabilization of atmospheric greenhouse gas concentrations through reduction, avoidance, or sequestration of energy-related emission

The legislation also defined a subset of technologies that would be eligible for CEDA support, called "breakthrough" technologies – i.e., technologies that have high potential to help meet national goals, but that are stuck in the so-called "valley of death" due to perceived technical risk or other similar factors.

The bill required the secretary of energy, after consultation with an Energy Technology Advisory Council established under the legislation, to (1) develop goals for the deployment of clean energy technologies and (2) translate the goals into short- and long-term numerical targets for energy technology deployment in a wide variety of areas. These would include electric generating capacity, vehicle and fuel technology, energy technology manufacturing capacity, energy-related infrastructure, energy-efficient building stock, industrial energy, electricity transmission, demand response, distributed generation, and financial products to improve the payback periods of energy efficiency and distributed generation. CEDA's performance would be judged against these numerical targets.

CEDA was to be established as an independent agency within DOE and under the direction of an administrator and a nine-member board of directors selected by the president, with the secretary of energy serving as an ex-officio member. The CEDA administrator would chair the board of directors. Five members of the Energy Technology Advisory Council would be selected by the secretary of energy and three members would be selected by the board of directors. The Advisory Council would develop a methodology for assessing technologies, so that CEDA investments could be prioritized based on how well they advance, on a per-dollar basis, the key attributes of a "clean energy technology," as defined above. The Advisory Council would also advise CEDA on promising technologies to pursue.

Although established as an agency within DOE, CEDA would enjoy an important degree of independence: it would not be included in departmental line reporting and would not fall under the energy secretary's reorganization authority. The best analogy to this structure is the Federal Energy Regulatory Commission (FERC), which is a "dotted line" arm of the DOE with significant independence.

In terms of capitalization, the CEDA legislation provided for an initial investment of $10 billion in direct appropriations to a CEDA-directed Clean Energy Investment Fund. Importantly, the legislation also transferred to CEDA the DOE Title 17 Innovative Energy Loan Guarantee Program[14] and associated authorities, upon a joint finding by the secretary of energy and the CEDA administrator that CEDA is ready to operate the program and current loan guarantee applicants will not be harmed. The bill also directed that fee payments made for loans (above principle and interest) would be deposited in the Clean Energy Investment Fund to be reinvested in new projects, instead of being directed back to the U.S. Treasury (as is currently required for existing DOE loan programs). Currently, there is approximately $40 billion in existing loan-making authority in the DOE loan program.[15]

As proposed, CEDA would have two financial focus areas. Under one section of the authorizing legislation, CEDA would provide "direct support," i.e. loans, loan guarantees, letters of credit, insurance products, or other credit enhancements or debt instruments to support projects that employ clean energy technologies with the greatest potential to achieve the goals developed pursuant to the bill. The CEDA administrator would establish a loan loss reserve "to account for estimated losses attributable to activities" undertaken to advance these goals and to provide for administration and risk assessment of the portfolio as a whole.

Under a different section of the authorizing legislation, CEDA would also provide "indirect support" by developing "financial products and arrangements to both promote the widespread deployment of and mobilize private sector support of credit and investment institutions for, clean energy technologies through securitization, indirect credit support, or other similar means of credit enhancement." Importantly, indirect support could be provided to some technologies that were commercially proven, but that lacked access to the financial products necessary to allow widespread adoption.

Thus, CEDA would have authority to develop "debt instruments that provide for the aggregation of, or directly aggregate, projects for clean energy technology deployments on a scale appropriate for residential or commercial applications." This authority would, for example, allow CEDA to create financial tools that would enable secondary markets, unlocking the substantial private capital needed to stimulate the broader adoption of energy efficiency or distributed energy technologies.

CEDA: A Business-Driven Function that Meets Today's Clean Energy Imperatives

As designed, CEDA would have a number of compelling business-driven functions that would make it particularly attractive to today's clean energy technology innovation, commercialization, and deployment projects and companies. A key feature would be its significant but not exclusive focus on "breakthrough" technologies that have significant potential to advance critical national energy goals, but that have "generally not been considered a commercially ready technology as a result of high perceived technology risk or other similar factors." These breakthrough technologies, with their significant risk profile, often face difficulties raising capital for the first few commercial-scale plants. This gives rise to the oft-cited "valley of death" between demonstration and commercialization – for both innovative energy-generation projects and manufacturing facilities.

CEDA, if adopted today, could play an important additional role: creating a more seamless connection with the earlier-stage work of the Advanced Research Projects Agency–Energy (ARPA–E). ARPA–E was funded in 2009 and has had a decade of success in advancing innovative energy technologies. Under its enabling legislation ARPA–E prepares a technology-to-market (T2M) plan for technologies the agency supports. ARPA–E's T2M program assists teams in constructing and carrying out these plans, the goal

being to help project teams develop the knowledge and skills they need to prepare for and expedite private sector deployment of their technologies.[16] CEDA, with its broad set of commercialization tools, is exactly the entity that could help implement these T2M plans for particularly promising ARPA–E-supported clean energy technologies. In addition to connecting with ARPA–E, CEDA could also pursue a similar T2M hand-off from the full range of DOE applied technology offices, e.g. the Offices of Energy Efficiency and Renewable Energy, Fossil Energy, and Nuclear Energy.

CEDA could also provide support for energy technologies, including an array of energy efficiency and distributed generation technologies that are already proven technically at commercial scale, but lack access to the financial products, such as secondary markets or debt aggregation to create secure bonds, needed to stimulate their widespread adoption.

The $10 billion CEDA revolving fund would be authorized to hold fees collected for financial services rendered and could reuse those fees for further investment. To this end, CEDA would be authorized to enter into "alternative fee arrangements," such as "profit participation" and "contingent fees." This authority is important for two reasons. First, allowing CEDA to have a financial stake in successful energy projects and companies provides a way to compensate CEDA for the funding risks it takes. Second, this authority helps CEDA meet the critical goal of making its revolving fund self-sustaining and more able to accommodate truly innovative technologies. The CEDA legislation also allows for securitization of debt, establishes a line of credit necessary to back that securitization, and provides for the issuance of bonds, notes, and debentures based on that securitization.

With these broad authorities, CEDA could develop a comprehensive tool kit to advance clean energy investment and, in the process, leverage substantial private sector debt and equity. Beyond loans and loan guarantees, for example, CEDA could:

(1) use *convertible debt* to target the parts of the "capital stack" that lack private investment and give CEDA potential upside in a project

(2) extend a *letter of credit* to provide security for a project's power purchase agreement (PPA) in the event of a default

(3) provide *interest rate hedges* to lock in rates on long-duration loans;

(4) receive *warrants* (e.g. equity upside) in a project

(5) develop *insurance products* to reduce the risk of a project

CEDA would need to develop and correctly price these and other financial instruments, but the instruments themselves are long-standing and standard-issue tools in the investment world that could be adapted to CEDA's innovation, commercialization, and deployment projects.

How CEDA Differs from Current Federal Energy Investment Support Mechanisms

CEDA's tools would differ in important respects from the current array of grants, loans, and tax credits the government provides for energy technology projects. Grants are one-time, out-the-door expenditures of government funds, with no repayment of fees or interest. As such, they do not provide leverage beyond a specific project and there is no potential to recapture the funds so they can be plowed back into follow-on projects.

Loans currently made by DOE's Loan Programs Office (LPO), do involve interest payments, however the principal, interest, and fees are paid to the U.S. Treasury and do not enable more lending. In contrast, fee payments made for loans

arranged by CEDA (above principle and interest) would be deposited in the Clean Energy Investment Fund where they could seed new projects, instead of being directed back to the U.S. Treasury.

Government tax credits have stimulated substantial private sector investment – called "tax equity" – in clean energy projects, but they tend to benefit commercially-proven technologies where investors are confident a project will operate at an expected performance level. In the case of wind projects, for example, the production tax credit (PTC) is typically paid to a "tax equity" investor per kilowatt-hour of electricity generated. If an innovative project underperforms in terms of generation, payment of the wind tax credit is reduced – thus, it is often not an attractive incentive for projects deploying earlier-stage technologies.

The federal investment tax credit (ITC), for solar and other technologies, does tend to be more helpful to innovative energy projects than the PTC, because access to the credit is based on dollars invested rather than energy produced. However, the ITC does not address the larger challenge for innovative energy projects: raising debt, either through bank loans or bond issuances. Bank lenders and bond issuers must have strong confidence they will be repaid before they will issue a loan or float a bond for an energy project. Projects that aim to commercialize a new technology, by definition, don't have a long track record to establish confidence with debt providers, so a public–private partnership lending structure is necessary. This type of structure is also used extensively by global competitors of the U.S. CEDA, with its array of tools to help higher-risk projects raise debt, could fill this gap in a way that tax equity typically can't.

Federal Precedents for CEDA

CEDA's business-driven approach is not unique in the federal government. Other U.S. government entities, such as the U.S. International Development Finance Corporation (DFC), have authority to provide a range of financial support and be compensated in the process. The DFC, for example, provides debt financing, equity financing, risk insurance, and various technical services to overseas projects involving U.S. companies.[17] Congress enacted legislation to establish the DFC on a bipartisan basis and President Trump signed it in 2018. This new entity consolidates the functions of the Overseas Private Investment Corporation (OPIC) and Development Credit Authority (DCA) of the U.S. Agency for International Development (USAID). In addition to OPIC and DCA's existing capabilities, Congress authorized a more-than-doubled investment cap of $60 billion for the DFC, as well as new financial tools. This bipartisan and business-driven approach to supporting U.S. companies abroad ought to be equally applicable to U.S. companies seeking to advance critical energy technologies – many initially funded by American taxpayers – at home.

A Portfolio Investment Approach: A Key Strength of CEDA

CEDA would use a portfolio investment approach to mitigate risk and diversify investments across technologies. The current DOE loan guarantee program is limited in applying a portfolio approach. At present, each deal is separately reviewed by a loan program manager for the individual risk it entails, then a separate review is conducted by the Office of Management and Budget (OMB). In the wake of the failed Solyndra loan, the LPO has become highly risk averse, which has crippled its ability to issue loans and loan guarantees. In fact, no loans or loan guarantees have been issued by the office since 2017, with the exception of follow-on funding for two Georgia nuclear reactors.[18] Meanwhile, $40 billion-worth of loan-making authority sits unused at a moment when the imperative for U.S. energy technology innovation and commercialization grows by the day – to accelerate

the response to climate change, address rising Chinese dominance in an array of clean energy technologies, and, in the process, help an economy weakened in the wake of COVID-19.[19]

CEDA, in contrast, would have authority to consider risk across a portfolio of investments. This would enable it to balance a lower-risk but innovative energy efficiency aggregation investment with an investment in a higher-risk, first-time scale-up of a new manufacturing facility or generating project. CEDA's board of directors, together with the agency's Technical Advisory Council, would have the background and skills to ensure that the financial and technical risks of the agency's clean energy project investments are appropriately considered.

CEDA would also have the authority to set its loan loss reserve against its portfolio (the loan loss reserve is the percentage of capital the agency should keep as a buffer against potential losses). This authority is important because the level of the loan loss reserve would determine the total amount CEDA could loan for a given level of appropriations. For example, the initial $10 billion appropriation proposed in the original CEDA legislation would back about $100 billion in financing with a 10% reserve (this was the initial reserve level assumed in the bill). Reducing the reserve percentage to 5% would mean that CEDA could provide about $200 billion in financing for the same $10 billion appropriation. The appropriate level of the loan loss reserve depends on a number of factors, including the quality of the deals selected and the structuring of transactions. Under the direction of its administrator and with input from its board of directors and Technical Advisory Council, CEDA would be in a strong position to set an appropriate loan loss reserve and balance its portfolio to maximize its impact on technology development. OMB, which today undertakes a second, detailed review of each planned LPO transaction, would instead, under the CEDA construct, focus primarily on whether CEDA is appropriately setting the loan loss reserve and managing risk across its portfolio.

To put the loan loss reserve in perspective, as of 2016, losses in the current DOE loan program portfolio totaled approximately $810 million, or a little over 2% of the program's loans, loan guarantees, and commitments. This is roughly half the approximately $1.79 billion in interest payments the program has earned to date (and paid to the U.S. Treasury). A roughly 2% loss ratio is less than the loss ratio in the loan portfolios of most U.S. money center banks – and these banks are generally not making loans to energy projects deploying advanced technologies and certainly not to projects that involve technologies in the riskier commercialization stage. Importantly, this $810 million in loan losses is a small fraction of the $10 billion set aside by Congress to cover failed loans in the DOE program.[20]

Alternatives to CEDA

There have been alternative congressional proposals for the creation, at the federal level, of a financing entity focused on clean energy. One of the first was made by the then-Ranking Member of the Senate Energy and Natural Resources Committee, Senator Pete Domenici (R-NM). In 2008, Senator Domenici introduced legislation that would have created a Clean Energy Investment Bank of the United States (CEIBUS).[21] The purpose of this bank would have been "[t]o facilitate the participation of private capital and skills in the strategic, economic, and environmental development of a diverse portfolio of clean energy and energy efficiency technologies within the United States, to facilitate the commercialization and market penetration of the technologies, and for other purposes."[22] "Eligible projects" under the bill were defined as "related to the production or use of energy that uses a commercial technology that the Bank determines avoids, reduces, or sequesters air

pollutants or anthropogenic emissions of greenhouse gases more effectively than other technology options available to the project developer." CEIBUS, as "an agency of the United States," would have been authorized to make both equity and debt investments.[23]

At the time, concerns were raised about whether CEIBUS would duplicate investment and lending activities that were the province of the private sector and if, as structured, this new entity would be able to leverage private sector funds sufficiently to make a sizable impact. With these concerns in mind, Senator Domenici did not press for consideration of the CEIBUS bill, but instead worked with Senator Bingaman to merge concepts in his bill with Bingaman's CEDA proposal. This eventually yielded the legislation the Senate Energy and Natural Resources Committee adopted, and Senator Murkowski cosponsored.

Another approach is reflected in a recent bill[24] that proposes to create a "National Climate Bank" (NCB) "to make the United States a world leader in combating the causes and effects of climate change and reducing emissions in the United States for every dollar spent by the Bank, through the rapid deployment of mature technologies and the commercialization and scaling of new technologies." This proposal, which builds on the CEIBUS bill, aims to "accelerate and rapidly expand the deployment of clean energy technologies by creating a dedicated financial institution that can support the work of existing green banks and provide greater capital for efforts to reduce emissions, increasing the overall scale of clean energy investment and the pace of substitution of clean energy technologies for fossil-fuel based technologies." Unlike CEDA and CEIBUS, the NCB would be established as "an independent, nonprofit entity outside of the Federal Government." As a result, the NCB legislation explicitly states that "[t]he full faith and credit of the United States shall not extend to the Bank." At the same time, the NCB would be subject to the oversight of the U.S. comptroller of the currency.

As proposed, the NCB would be overseen by a board of directors whose members would include, among others, the secretary of the treasury, the secretary of energy, and the director of the Consumer Financial Protection Board. The bank would receive an initial capitalization of $10 billion and another $5 billion annually for five years. Among its duties, the new institution would support the creation of additional state-level "green banks."

The NCB concept faces a number of challenges. Primary among them is lack of access to the full faith and credit of the U.S. government. This means that the NCB, as a non-governmental entity, could not make loans to clean energy projects using the low-cost, long-term capital of the U.S. Treasury. At the same time, the NCB, having been capitalized with federal funds, would be subject to the oversight of the U.S. comptroller of the currency. In a fundamental way, the NCB would thus have the worst of both worlds: serious federal scrutiny of its investment decisions, but no access to the highly attractive, low-cost, long-term federal lending that comes with being a federal entity. Since it would not have access to the full faith and credit of the federal government, the NCB's investment capacity would be limited to the amounts it receives through congressional appropriations. CEDA, in contrast, with its access to the U.S. Treasury, would have no limit on its investment capacity, other than that dictated by the appropriate management of its portfolio, as determined by its leadership and OMB portfolio-level reviews.

Another potential challenge is opposition from the investment and banking communities, who may see the NCB not as a complementary entity, like CEDA, but as a competitor. The CEDA concept received strong support from the investment and banking community because

of its significant focus on commercializing innovative technologies, along with its "indirect" authority and ability to seed secondary markets, as described above. Thus, in 2009, a coalition of U.S. investment banks and financiers, called the U.S. Partnership for Renewable Energy Finance, compared the CEDA approach with an investment focus on more conventional technologies, which would be the primary role of the more recently proposed NCB. The Partnership concluded that a focus on "breakthrough technologies would aid in the commercialization phase of clean energy, an investment stage which lacks sufficient financing in even a robust credit environment. This persistent financing challenge demonstrates a clear need for longer-term federal assistance and provides a justification for the creation of a new and permanent agency. . .Support for breakthrough technologies could [also] strengthen U.S. clean technology leadership and lay the groundwork for a competitive U.S. export market."[25]

Support for state green banks, one of the proposed functions of the NCB, is a useful goal but it should be noted that CEDA would also have a clear ability to support the creation and operation of state green banks under its "indirect authority" to develop "financial products and arrangements to both promote the widespread deployment of and mobilize private sector support of credit and investment institutions for, clean energy technologies through securitization, indirect credit support, or other similar means of credit enhancement." As an example, CEDA could provide credit enhancement to a state green bank, so that the bank can lend to clean energy projects at a lower rate. Furthermore, it is likely that the NCB, because it would lack access to low-cost federal debt, would actually be in a worse position than CEDA to fulfill this primary NCB role.

A final alternative to CEDA that has been proposed involves reforming the current DOE loan program. A quick response to this idea is that the original CEDA legislation would have addressed this issue by incorporating the existing DOE loan program and related funding into CEDA itself. As discussed above, the DOE Title 17 Innovative Energy Loan Guarantee Program and associated authorities would be transferred to CEDA upon a joint finding by the secretary of energy and the CEDA administrator that CEDA is ready and current loan guarantee applicants would not be harmed. Transferring DOE's other large loan program, the Advanced Technology Vehicles Manufacturing Loan Program, to CEDA would likewise make sense.[26] The two programs together currently have about $40 billion in existing loan-making authority. Two other loan programs that could be considered for incorporation into CEDA are DOE's Tribal Energy Loan Guarantee Program[27] and the Transmission Infrastructure Program of DOE's Western Area Power Administration.[28]

Reforms to the current DOE loan program to address some of its shortcomings could also be included in a newly introduced CEDA bill. One package of DOE loan program reforms was recently introduced in Section 502 of the House CLEAN Future Act.

CEDA's Political Prospects

One of the most attractive aspects of CEDA is the significant bipartisan support this idea received in both the Senate and House when enabling legislation was originally introduced, including a 51–6 vote of support in the House Energy and Commerce Committee. There are several reasons to think that CEDA could be launched again with strong bipartisan support and good prospects for enactment. First, there is rising (and renewed) Republican support for energy technology innovation and commercialization as an element of the U.S. approach to climate change, just as there was when CEDA legislation was introduced over a decade ago. A bipartisan pair of House Energy and Commerce Committee members announced in a recent *USA Today* op-ed they are working on a bill that would combine federal funding for U.S. energy

technology innovation with a clean energy deployment mandate in the form of a federal clean energy standard (CES).[29] A key issue in this bipartisan "innovation + regulation" (I+R) bill is how to significantly accelerate energy technology development and commercialization. CEDA, with its broad and well-organized tool set and heavy focus on leveraging private investment, would be an obvious approach.

A second factor that favors revival of the CEDA proposal is the fact that Senator Murkowski, who cosponsored the original legislation when it was considered by the Senate Energy and Natural Resources Committee, is now chair of the committee and well positioned to advance a CEDA bill in the Senate. Third, there is a good likelihood that the investment banking and clean tech venture capital communities would, for reasons discussed previously, see CEDA as a helpful complement rather than a competitor, as may be the case with the NCB proposal. Finally, and perhaps most importantly, with the recent focus in the wake of the COVID-19 crisis, CEDA offers a compelling way to put federal funds to work on shovel-ready projects including, critically, a way to leverage these projects with much larger amounts of private capital and create a substantial number of new jobs.

Conclusion

A Clean Energy Deployment Administration, as detailed in the Bingaman-Murkowski bill of 2008, would have a broad range of tools, access to low-cost, long-term government capital, and the right mix of independence from and access to DOE through a "dotted-line" relationship with the Department. With this design, CEDA could leverage significant private capital in support of clean energy technology innovation, commercialization, and deployment, while taking advantage of the significant technology expertise of the DOE and its national labs. In the process, CEDA could help address the global climate challenge, strengthen U.S. competitiveness, and leverage large amounts of private capital in responding to the current economic crisis. Proposed more than a decade ago with strong bipartisan support in both the House and Senate, the time is right for another bipartisan push to finally put CEDA's business-driven approach to work.

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About the Author

Dan Reicher is an entrepreneur, investor, policymaker, lawyer, and educator focused on clean energy and climate change. Reicher has served three U.S. presidents, testified before the U.S. Congress more than 50 times, led the launch of Google's pathbreaking climate and clean energy work, oversaw a $1.2 billion annual clean energy R&D budget as U.S. Assistant Secretary of Energy, and co-founded the nation's first investment firm focused exclusively on renewable energy project finance.

Reicher served from 2011 to 2018 as founding executive director of the Steyer-Taylor Center for Energy Policy and Finance, a joint center of the Stanford Law School and Stanford Graduate School of Business. He is currently a Stanford lecturer and senior research scholar, clean energy entrepreneur, and business and policy consultant. Reicher came to Stanford from Google, where he served since 2007 as Director of Climate Change and Energy Initiatives.

Reicher's federal roles include: Assistant Secretary of Energy for Energy Efficiency and Renewable Energy; Department of Energy Chief of Staff and Deputy Chief of Staff; Acting Assistant Secretary of Energy for Policy; a member of the Secretary of Energy Advisory Board; a member of the National Academy of Sciences Board on Energy and

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Before his position at Google, Reicher was President and Co-founder of New Energy Capital, the nation's first investment firm focused exclusively on renewable energy project finance, and Executive Vice President of Northern Power Systems, a wind energy company. Earlier in his career Reicher was an Assistant Attorney General in Massachusetts and an attorney with the Natural Resources Defense Council.

Reicher holds a BA in biology from Dartmouth College and a JD from Stanford Law School. He also studied at Harvard's Kennedy School of Government and MIT.

Endnotes

1 U.S. Senate Committee on Energy and Natural Resources, *Senate Bill 3233, 21st Century Energy Technology Deployment Act*, July 8, 2008. Available at: https://www.congress.gov/bill/110th-congress/senate-bill/3233/text.

2 Idaho National Laboratory, "Experimental Breeder Reactor-I (EBR-I)." Available at: https://www.energy.gov/ne/articles/9-notable-facts-about-world-s-first-nuclear-power-plant-ebr-i.

3 U.S. Nuclear Regulatory Commission, "History of Emergency Preparedness," 2018. Available at: https://www.nrc.gov/about-nrc/emerg-preparedness/history.html.

4 Ibid.

5 Wikipedia, "Clinch River Breeder Reactor Project," 2019. Available at: https://en.wikipedia.org/wiki/Clinch_River_Breeder_Reactor_Project.

6 Robert W. Righter, *Wind Energy in America* (Norman: University of Oklahoma Press, 1996), 158.

7 Ibid., 159

8 Maxx Chatsko, "2 Renewable Energy Winners and 2 Losers in the Latest Federal Budget," The Motley Fool, December 18, 2019. Available at: https://www.fool.com/investing/2019/12/18/4-renewable-energy-winners-and-losers-in-the-lates.aspx.

9 Brad Plumer, "A Rare Trump-Era Climate Policy Hits an Obstacle: The Tax Man," *The New York Times*, February 11, 2020. Available at: https://www.nytimes.com/2020/02/11/climate/carbon-capture-tax.html.
The guidance was finally issued in late February 2020: Crowell & Moring, LLP, "IRS Issues Welcomed Guidance on Carbon Capture Tax Credit," March 2, 2020. Available at: https://www.crowell.com/NewsEvents/AlertsNewsletters/all/IRS-Issues-Welcomed-Guidance-on-Carbon-Capture-Tax-Credit.

10 U.S. Senate Committee on Energy and Natural Resources, *Senate Bill 3233, 21st Century Energy Technology Deployment Act*, July 8, 2008.

11 U.S. Senate Committee on Energy and Natural Resources, "Clean Energy Deployment Administration," *Democratic News*, May 3, 2011. Available at: https://www.energy.senate.gov/public/index.cfm/2011/5/press-16bf8a50-1af3-4806-a31e-b6b7282fda1b.

12 U.S. Senate Committee on Energy and Natural Resources, "Murkowski: Clean Energy Deployment Administration Needs Offsets," *Republican News*, May 3, 2011. Available at: https://www.energy.senate.gov/public/index.cfm/2011/5/press-77e3a383-e3b8-48c8-972b-22ecd32cfa8f.

13 Ibid.

14 U.S. Department of Energy Loan Programs Office, "Products & Services: Innovative Energy Projects." Available at: https://www.energy.gov/lpo/title-xvii/products-services#innovativeenergy.

15 U.S. Department of Energy Loan Programs Office, "Products & Services." Available at: https://www.energy.gov/lpo/title-xvii/products-services.

16 U.S. Department of Energy Advanced Research Projects Agency – Energy, "Engage: Tech to Market (T2M)." Available at: https://arpa-e.energy.gov/?q=site-page/tech-market-t2m.

17 U.S. International Development Finance Corporation homepage. Available at: https://www.dfc.gov/.

18 U.S. Department of Energy, "Secretary Perry Announces Financial Close on Additional Loan Guarantees During Trip to Vogtle Advanced Nuclear Energy Project," March 22, 2019. Available at: https://www.energy.gov/articles/secretary-perry-announces-financial-close-additional-loan-guarantees-during-trip-vogtle.

19 Lisa Friedman, "Billions in Clean Energy Loans Go Unused as Coronavirus Ravages Economy," *The New York Times*, April 30, 2020. Available at: https://www.nytimes.com/2020/04/30/climate/clean-energy-loans-coronavirus-trump.html

20 Statement of Dan W. Reicher to the House Committee on Science, Space, and Technology; Subcommittee on Energy; and Subcommittee on Oversight, Hearing on the Department of Energy Loan Guarantee Program, February 15, 2017, 8. Available at: https://republicans-science.house.gov/sites/republicans.science.house.gov/files/documents/House%20Committe%20on%20Science%2C%20Space%20and%20Technology%20Loan%20Program%20Hearing%20REICHER%20Testimony%202.15.17%20Final%20.pdf.

21 U.S. Senate Committee on Energy and Natural Resources, *Senate Bill 2730: Clean Energy Investment Bank Act of 2008*, March 6, 2008. Available at: https://www.congress.gov/bill/110th-congress/senate-bill/2730/text.

22 Ibid.

23 Ibid

24 U.S. Senate, *Senate Bill 2057: To Establish a National Climate Bank*, July 8, 2019. Available at: https://www.congress.gov/116/bills/s2057/BILLS-116s2057is.pdf

25 Kassia Yanosek, U.S. Partnership for Renewable Energy Finance, *The Clean Energy Deployment Administration (CEDA): A Comparison of the Senate, House and Green Bank Proposals*. Available at: https://members.e2.org/ext/doc/US%20Pref%20CEDA.pdf.

26 U.S. Department of Energy Loan Programs Office, "Advanced Technology Vehicles Manufacturing Loan Program." Available at: https://www.energy.gov/lpo/title-xvii/products-services/advanced-technology-vehicles-manufacturing-loan-program.

27 U.S. Department of Energy Loan Programs Office, "Tribal Energy Loan Guarantee Program." Available at: https://www.energy.gov/lpo/tribal-energy-loan-guarantee-program.

28 Western Area Power Administration, "Transmission Infrastructure Program." Available at: https://www.wapa.gov/transmission/TIP/Pages/tip.aspx.

29 Kurt Schrader and David B. McKinley, "Innovation and regulation can curb climate change. We need bipartisan support for both," *USA TODAY*, January 30, 2020. Available at: https://www.usatoday.com/story/opinion/2020/01/30/how-fight-climate-change-congress-needs-fuel-innovation-column/4601332002/.

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