State Clean Energy Finance Banks:
New Investment Facilities for Clean Energy Deployment

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"The creation of state clean energy banks represents another arena for state leadership on alternative energy finance."

Summary

Propelled by private entrepreneurship, technology gains, and public support, clean energy and energy efficiency solutions began to proliferate in recent years. However, federal policy gridlock and state budget challenges are now jeopardizing the availability of government finance, exacerbating the serious finance challenges that impede the large-scale deployment of low-carbon energy solutions.

Fortunately a number of states are now exploring a variety of ways to leverage scarce public resources with sophisticated banking and finance mechanisms. Epitomized by Connecticut's Clean Energy Finance and Investment Authority (CEFIA), the proposed new finance entities entail the creation by states of dedicated clean energy banks that leverage public money with private-sector funds and expertise.

While these banks can take different forms based on each state's unique circumstances, they essentially combine scarce public resources with private sector funds and then leverage those funds to invest in attractive clean energy and energy efficiency projects. A timely benefit of the low-cost financing that these banks will make available is that it will reduce clean energy projects' dependence on expiring federal grants, tax credits, and subsidies and lower the cost of these projects enough to make them cost-competitive with conventional technologies.

Along these lines, state leaders can choose among at least three bank models. They may:

- Establish, as in Connecticut, a quasi-public corporation into which are combined existing state clean energy and energy efficiency funds so as to permit private investment in the bank and enable the new entity to make loans and leverage its capital with private capital
- Repurpose portions of one or more existing financing authorities from a grant to a lending model and then through a partnership agreement combine the financing authority's funds with private funds
- Adjust an existing or new infrastructure bank so as to attach a clean energy finance bank to fund energy projects to a bank lending to traditional infrastructure projects

I. Introduction

Propelled by private entrepreneurship, technology gains, and critical public support, clean energy and energy efficiency solutions began to proliferate in recent years.[2]

In a word, clean energy solutions are diffusing steadily through U.S. states and regions and so are helping to create new jobs and innovative new industries even as they reduce carbon pollution and provide energy choices for households and businesses.

And yet, for all of the recent success, continued progress toward a clean energy future will require the provision of unprecedented amounts of dependable, accessible, and fully-scaled capital—financing the source of which is not yet apparent.

Plentiful financing—consistently available in varied amounts with varying tolerances of risk—will be essential if the nation is going to defray the upfront costs of further developing a low-carbon economy. However, while such support has been generally available in the form of myriad federal and state subsidies and grants, a problem now intrudes given the uncertainty that surrounds the future of government finance programs.

With numerous federal programs and policies set to expire and states still struggling with serious budget challenges, direct government grants and tax credits are not going to be as available as they have been to drive the shift to a low-carbon future. Instead, both public and private investment is going to have to be leveraged more smartly.

And so America and its states and regions are going to have to find new ways to provide the financial support needed to shift the nation's economy toward a low-carbon future.

Which is why it is so timely that numerous states are exploring a variety of ways to leverage scarce public resources with sophisticated banking and finance mechanisms even as one state continues to implement an especially bold and intriguing new model.

That model—which draws inspiration from the Overseas Private Investment Corporation (OPIC) and several international experiments (see sidebar on OPIC and the Appendix)—entails the creation by states of clean energy finance banks that can combine scarce public resources with private-sector funds and then leverage the funds to invest in the build-out of clean energy projects and metropolitan energy industries.

Such projects face major financing challenges, as is well known. Even though the cost of renewable energy projects has been dropping rapidly in recent years, the delivered cost of energy from renewable energy projects is still generally more expensive than the delivered cost of energy from conventional fossil fuel projects.[3] This is partly because conventional energy sources enjoy the advantages of built delivery systems, favorable tax policies, low marginal costs at existing generation plants, and vastly larger scale as well as fundamentally lower costs of energy relative to many, but not all, renewable projects.

As a result, it is still very difficult to finance either small- or large-scale deployment of these technologies, even ones with little technology risk, without some form of governmental or other financial support that make the projects cost competitive. This difficulty in financing the deployment of low-risk but more expensive renewable energy technologies is one of several finance gaps that these technologies must overcome for them to be deployed to scale.[4]

To date, the support needed for clean energy projects has been provided by the federal and to a lesser extent state governments in the form of tax incentives, direct grants, and other subsidies. However, with the rapid decline in federal and state spending that could materialize in the next few years, the nation is going to have to find new ways to provide financial support for energy industry development.[5]

Beyond the rapid cutbacks in federal and state spending, there are other compelling reasons for state involvement in clean energy projects including the unique role states play in electricity markets and regulation, their proximity to regional industry clusters and deep engagement in technology-based economic development, and ease of establishing public-private partnerships at the local level. Most important, as "laboratories of democracy" states have always exhibited the creativity and willingness to experiment on several fronts including in clean energy.

Most notably, states are going to need once again to lead the nation—as they have over and over in the past—in developing new and innovative ways to finance clean energy programs just as in the recent past they developed and implemented such powerful concepts as feed-in tariffs, power purchase agreements, renewable energy certificates, and clean energy funds, among others, to drive clean energy development at scale.[6] However, given their own budget restrictions, states will find it difficult to take up new clean energy finance programs with new funding programs or the usual array of subsidies and incentives. And yet, by embracing the "clean energy finance banks" concept states may be able to move forward by tailoring a flexible concept to their own specific strengths. Specifically, recent developments show that states may be able to establish clean energy finance banks that draw

on existing state funds that support clean energy and energy efficiency projects; combine them with private investment in providing debt capital to such projects; and so leverage state funds to maximize investment.

What is more, it appears possible that the availability of low-cost financial support enabled by judicious use of commonly used credit structures from a possible generation of clean energy finance banks could reduce or in some cases replace clean energy projects' reliance on expiring tax credits, grants, and subsidies.

So what are some practical models for such an institution? One model is clearly Connecticut's Clean Energy Finance and Investment Authority (CEFIA)—the nation's first state-based clean energy finance bank, established last year.[7] Created as a key component of a broader energy law that received almost complete bipartisan support, CEFIA is a quasi-public clean energy finance authority that combines several existing state clean energy and energy efficiency funds, enables the new entity to make loans, and to leverage its capital with private capital, permitting private investment in and alongside the bank with the investors receiving a reasonable rate of return on their investments.[8] As such, CEFIA holds out a flexible and attainable model for states to employ in constructing clean energy finance banks.

And yet, CEFIA is just one of several possible models for such clean energy finance banks. A second model builds on existing state financing authorities. It repurposes portions of one or more of existing financing authorities from a grant to a lending model and then, through a partnership agreement, combines the financing authority's funds with private funds. And a third model is similar to the second except that it combines a clean energy investment bank to fund energy projects with a bank lending to traditional infrastructure projects like roads, pipelines, and transmission lines. Under all these models, there is ample new market and profit opportunity for regional and commercial banks as well as community banks.

In each case, clean energy and energy efficiency investment funds would be raised from a combination of existing state funds, federal grants, repurposed regulatory charges (often called "system benefit charges"), foundation grants, private investment, and bonds issued by the clean energy finance bank, the financing authority or the infrastructure and energy bank. The banks would not seek new appropriations, but all three possible models would make existing funds go much further by converting existing programs from a one-time grant model to a lending model that establishes a revolving fund, and then combines the public funds with private funds, and leverages the combined funds in safe, but new and creative ways. In most cases, state clean energy finance banks would provide a low-cost tranche of financing that when combined with commercial bank financing would make a given project commercially viable and enable the bank to make use of the commercial bank's due diligence. If a national clean energy finance bank were established, as has been proposed, one of its key tasks could be to provide additional funding to state clean energy finance banks.[9] Details of how each of these structures would work are provided in Section III.

Connecticut's new clean energy finance bank, while welcome in itself, also points to a larger opportunity. By demonstrating one practical low-cost model as a significant response to one region's clean energy finance needs, CEFIA shows the potential for other states to again step to the forefront of problem-solving on some of the nation's thorniest clean energy financing challenges. CEFIA, in that sense, points to one set of possible outlines of the next needed generation of clean energy finance solutions. After all, a key feature of CEFIA and other possible financing authorities is that, over time, the taxpayer and ratepayer money put into projects will be paid back. This assurance will be critical to maintaining political and citizen support for clean energy undertakings in the future.

II. The Challenge

The challenge is complex. Transitioning to a cleaner economy is going to entail the deployment of hundreds of thousands of small- and large-scale clean energy projects in the coming decades.

To achieve that goal, though, several trillions of dollars will need to be invested to propel the transition to a clean energy future. One estimate, for instance, concludes that to reduce U.S. fossil fuel-based electric generation by a desirable 88 percent, among other things, by 2030 would require a net investment of $3.8 trillion in undiscounted 2008 dollars.[10] Other estimates are lower but there's little doubt that the necessary capital expenditures are large and must occur over an extended period of years.

However, multiple pricing, finance, technology, and budgetary issues complicate national as well as state clean energy markets.

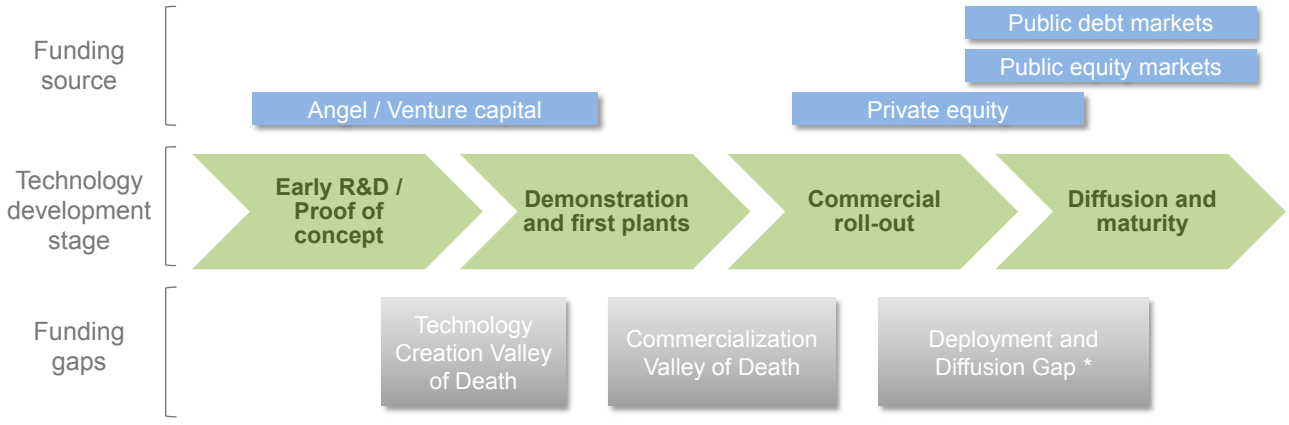
The clean energy industry faces unique challenges in that it is highly asset-based and capital-intensive. What is more, most clean energy technologies face long technology and cost curves that more often than not deter private capital from investing either in a collection of small scale or in a handful of large scale clean energy projects.[11]

As a result, despite the recent success of these new technologies in reducing their production and operating costs, in most cases the delivered cost of energy from clean energy projects remains higher than the delivered cost of energy from existing power generation facilities.[12]

In light of these broad technology and pricing challenges, clean energy projects face both high capital needs and a scarcity of reasonably priced capital at every phase of the development pipeline from the research and development phase to widespread market adoption.

Along these lines, discussions of clean energy scale-up have focused heavily to date on two well-known finance problems, or "Valleys of Death"—the first being the "technology creation" Valley of Death and the second the "commercialization" Valley of Death—that impede the scale-up of clean energy solutions.[13] The "technology creation" Valley of Death occurs at the early end of the development pipeline as a technology moves from the laboratory to the market and needs to establish its basic market viability. The later-stage "commercialization" Valley of Death, for its part, occurs when companies seek capital to fund first-of-a-kind commercial-scale projects or manufacturing plants.

Figure 1. Clean Energy Technology Development Stages and Financing Gaps



Source: Adapted from Bloomberg New Energy Finance

** Likely focus of state clean energy finance banks*

And yet there is another, pervasive challenge to the widespread diffusion of low-carbon clean technology solutions. This additional market problem complicates the large-scale deployment of even relatively mature technologies, which tend to falter in the marketplace given that neither their full social benefits nor their dirtier competitors' full social costs are priced in, which leaves new clean energy technologies relatively more expensive.[14] Given this problem, most low- or no-carbon solutions still need financial help to compete effectively with entrenched older technologies even as they continue to progress down the price curve.

It is this third financing gap that may be the broadest, and most fundamental, hurdle to the widespread deployment and diffusion of clean energy technologies in U.S. states (even though it may be the one most susceptible to state-level finance interventions).

The upshot for states is that in the absence of specific public interventions to provide low-cost financing to enable the widespread deployment of relatively mature clean energy technologies, hundreds of worthwhile renewable energy and energy efficiency projects will simply not be undertaken. States, to that extent, face substantial technology, price, and finance challenges if they wish to help scale up attractive clean energy projects.

But states face other challenges. Beyond these technical and finance issues, states that want to accelerate the development of clean energy industries must also grapple with serious budget and policy challenges. Most notably:

Federal financial support for clean energy projects will likely decline. The first and most basic challenge for states is that despite having made significant progress on cost and performance, many clean energy industries remain highly dependent on subsidies, grants, and tax credits—supports that are now set to decline. Most notably, budget limitations, "green backlash," and the end of many programs funded by the American Recovery and Reinvestment Act of 2009 (ARRA)—which has been the largest federal investment in clean energy in American history—are going to hit the sector hard in the next few years in what some observers are predicting will be a crisis for clean energy finance.[15]

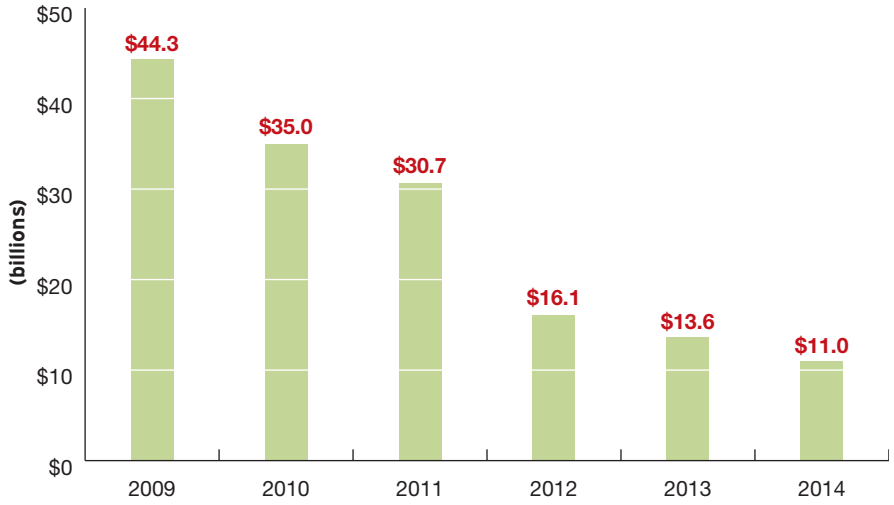
A closer look at the numbers delineates the challenge. Between 2009 and 2014, the federal government will have spent more than $150 billion in clean energy projects through direct lending, tax expenditures, and loan guarantees, according to an analysis developed by Brookings and the Breakthrough and World Resources institutes.[16] Of this support, roughly one-third ($51 billion) will have flowed from programs created or expanded by ARRA, including the Department of Energy loan guarantee programs, Section 1603 subsidy, and various federal production and investment tax credits like the Production Tax Credit for wind.

However, many ARRA-funded and other programs have either already expired or are nearing their end and appear unlikely to be replaced (Figure 2). To be specific, 63 of 92 federal clean energy finance policies in place in 2009 will have expired by the end of 2014. In dollar terms, that means that annual federal financial support for clean energy sectors is poised to decline by 75 percent from its 2009 high of $44.3 billion to $11 billion in 2014. In short, the federal government—the largest single source of financial support for U.S. clean energy innovation and project development—will be pulling way back in the next few years.

State budget constraints are also severe. At the same time, state and local governments are also facing budget problems that will likely preclude efforts to offset the federal pull-back with bold new grant and subsidy programs. For one thing, state discretionary spending remains and is projected to remain depressed given the continued revenue impacts caused by the after-effects of the Great Depression.[17] For another, states are also finding it difficult to issue new general obligation bonds. Bond issuance by states and others including cities, schools, hospitals, and other municipal entities fell to a 10-year low in 2011 after reaching a record high in 2010. Even though debt sales by states are up by 74 percent as of May 2012 compared to the same period in 2011, Moody's notes that heightened fiscal management concerns will result in less new state borrowing, and that much of the increased issuance reflects refunding issues to take advantage of lower long-term interest rates rather than new money issues for new projects. For instance, states like California, Florida, and New Jersey have all reduced borrowing and are funding some capital projects on a pay-as-you-go basis even while contending with their constitutional budget restrictions.[18]

In addition, federal fiscal austerity is likely to impose further challenges. With the direct federal aid to the states under ARRA now waning states will face increased fiscal stress that will vary depending

Figure 2. Declining Federal Clean Energy Policy Support
Total Federal Cleantech Spending by Year



Source: Jenkins and others, "Beyond Boom and Bust" (April 2012)

on their ability to raise revenue and make cuts in other programs.

The implication is that state governments that want to encourage continued clean energy investment in their states are now going to have to do it largely without major new grants, bonds, or subsidy programs.

Dedicated state investment in clean energy development and deployment—for instance through state clean energy funds—remains modest and is unlikely to increase. As to states' existing programs in the clean energy arena, they are not by themselves equal to the task of adequately catalyzing clean energy development in the next decade. To the matter of their size, the states' varied programs—despite their many successes—have been able to provide only a small fraction of the trillions of dollars needed to bring clean energy projects to scale. What is more, the ability of the states to expand their existing approaches remains limited given the realities of ever-tighter state budgets.

As to the many state programs' form and focus, the fact remains that few of the programs are optimally designed to catapult states into a new period of clean energy economic development. A case in point is the dedicated clean energy funds (CEFs) that have been established in over 20 states. In some states, these valuable funds generate a few million dollars each year, as noted an earlier paper in the present Brookings-Rockefeller State and Metropolitan Innovation series; in other states, several hundred million dollars are invested annually.[19] In terms of their focus, however, the CEFs have tended to focus mostly on individual project financing and deployment through the use of one-off rebates, grants and performance-based incentives that have directly subsidized the installation of clean energy technologies.[20] Only rarely have the funds explored more sophisticated and leveraged finance models oriented toward the wider-scale deployment of clean energy solutions.

In that sense both the scale and mission of the funds remains sub-optimal from the perspective of accelerating the scale up growth of a strong state cleantech industry.

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The challenge is clear: To accelerate the diffusion of clean energy and energy efficiency solutions states need to develop new mechanisms for intervening in flawed regional energy markets to ensure the availability of adequate deployment finance. Most notably, they will clearly need to supplement or leverage their existing array of grants, tax credits, and bond revenue to create a new generation of modern clean energy finance facilities.

III. A New State Approach

Given these challenges, states that want to realize the benefits of clean energy deployment should consider a new approach to funding clean energy programs. Specifically, they should investigate the possibility of developing state clean energy finance banks that use limited public dollars and leverage private capital to provide a combination of low-interest rate funding that makes clean energy projects competitive and low-cost 100-percent up-front loans for energy efficiency projects.

Such an approach would address the deployment and diffusion challenges faced by clean energy technologies while recognizing that federal and state appropriations, tax credits, and other incentives and subsidies will be sharply diminished in the years ahead because of the budget crisis at all levels of government. Likewise, the development of such finance entities would address the need for states to develop a new paradigm for financing strong clean energy and energy efficiency projects as part of a push to develop strong regional industries.

So-called "clean energy finance banks" or "green banks" are ideally suited to solve the present problems because they offer a practical way for states to make available leveraged, low-cost financing for project developers in their states. First, they can be developed out of existing state programs while bringing into the enterprise the equivalent of substantial new resources given their ability to leverage funds. Likewise, because the banks would provide debt financing, they would be repaid on their loans, putting them in the position to borrow funds and to establish revolving loan funds that would provide funds that could be reinvested without new sources of financing. Furthermore, clean energy finance banks, if established as independent institutions, would be able to issue revenue bonds without the full faith and credit of the state and without the restrictions facing states, which have limited borrowing capacity. Finally, clean energy finance banks could efficiently seek large investors with patient, long-term capital who are seeking a long-term, conservative rate of return, such as pension fund investors.

Clean energy finance banks, in this regard, hold great promise for financing both energy efficiency projects and the deployment of clean energy projects with low technology risks, including projects using existing wind and solar technologies. Such clean energy projects, because of their low technology risk and low financing risk (particularly when they have entered into long-term power purchase agreements for the purchase of their output) should be able to attract bond purchasers interested in long-term, safe returns and thus willing to accept rates of return at a conservative level. By providing standby purchase agreements or total return swaps, the clean energy finance bank could even increase the potential pool of tax equity investors by lowering the risk profile of such investments.

At the same time, state clean energy finance banks could also be expanded to cover innovative, riskier new technologies and manufacturing facilities, although each of these propositions presents its own risk factors and would require a different funding "window" within the bank.

Along these lines, state-organized clean energy finance banks offer a practical way for states to make available low-cost financing for project developers in their regions and keep the clean energy economy growing. Currently, a significant amount of relatively low-cost credit is available for at least large energy project developers. Studies that the Coalition for Green Capital (CGC) has conducted, however, show that lowering the cost of clean energy loans by 225 basis points and providing long-term loans to all developers would lower the cost for a clean energy project by 15 to 20 percent (See Figure 3).[21] CGC thinks that state clean energy finance banks could provide loans at this rate differential. A clean energy finance bank would establish loan loss reserves through credit subsidy fees or using bank capital that is replenished by credit subsidy fees.[22]

This would be an important gain. A 15 to 20 percent reduction in the cost of a wind or solar project would make many projects cost-competitive with conventional generation. For other projects, clean energy finance banks' offer of a low-interest rate tranche, rather than the full cost of the project, might be enough for the project to proceed. In yet other cases, the banks' financing would not replace all of the tax credits and incentives that are likely to be withdrawn for budget reasons but it would substantially reduce the need for such supports.

The need for financing of energy efficiency projects is different. When faced with a choice of spending scarce dollars on energy efficiency rather than other uses, most homeowners and small businessmen, and even many large businesses, choose projects other than energy efficiency. As a result, to

Figure 3. Comparison of Cost of Delivered Electricity through Financing by Commercial Banks vs. Clean Energy Finance Banks (CEFB)

Assumptions		Commercial Market Financing	CEFB Financing
Capex - East	[$/kW]	$1,963	$1,963
Capex - Plains	[$/kW]	$1,813	$1,813
Capex - West	[$/kW]	$1,739	$1,739
Tenor	years	10	20
Wind Case / Coverage	DSCR	P50 wind @ 1.4x free cashflow	P50 wind @ 1.3x free cashflow
Interest Rate (1)	[%]	6.75%; LIBOR + 300bps	4.5%; Treasury + 65 bps
Amortization Schedule		Equal over 10 years	Equal over 20 years
Balance at Maturity		Balance fully repaid	Balance fully repaid
Project leverage		20%	34%
IRR to Equity (leveraged)		11.0%	11.3%
Revenue Requirement = 2012 Price @ 2% annual escalation			
East - @ 35% NCF	[$/MWh]	$70/MWh	$57/MWh
Plains - @ 44% NCF	[$/MWh]	$50/MWh	$40/MWh
West - @ 38% NCF	[$/MWh]	$55/MWh	$45/MWh

Model assumes that:
- All after-tax free cashflows from the project are finance-able, net of cover ratios
- CAPEX costs do not include significant transmission system upgrades
- CAPEX is based on reported project cost data for the ARRA grant program through November 2009, with a 10 percent discount to account for reductions in equipment costs since 2009 in projects being built in 2011 and 2012
- Projects are identical but commercial banks will finan-ice a more conservative wind case (requiring 1.4x cover ratio)
- Identical quantities of elecric-ity are sold

Note: LIBOR is based on the LIBOR swap curve for the last five years; Treasurey rates are based on rates for the same period

Low-cost financing reduces the delivered electricity prices of these actual wind projects by 15 to 20 percent, making it cost-competitive with new-build conventional coal and gas-fired power plants (see highlighted sections above, where the cost of delivered electricity is reduced by $10/MWh with the low EIT financing offered in the right column compared to available bank financing in the left column).

Source: Coalition for Green Capital; prepared by an energy investment firm using public data sources

ensure adequate demand for energy efficiency projects, most energy programs subsidize the cost of energy efficiency projects, and many experts believe that 100 percent subsidies or financing of the up-front costs of energy efficiency projects is needed,[23] with repayment limited to an estimate of the expected amount of the energy savings.[24] The latter limitation becomes difficult if the cost of the project is too high since the cost of repayment at high interest rates would eventually exceed the estimated value of the energy savings. Currently there are low-cost financing programs but often the interest rates are held down by interest rate buy-downs. These types of programs will be very hard to bring to scale in an austere budget environment and in many places it is difficult to obtain 100-percent up-front financing. A clean energy finance bank should be able to provide financing at low enough rates after a loan loss reserve is established to avoid the need for interest rate buy-downs and help bring energy efficiency projects to scale.

In any event, the low-cost lending through state clean energy finance banks should be able to substantially reduce the cost of clean energy projects and so make many of them cost-competitive with traditional power generation while reducing their reliance on subsidies.

Choosing a Model

And yet, states need not hew to a single model of clean energy finance.

Each state has a different initial set of programs and institutions that provide support for clean energy and energy efficiency projects. In some states, existing sources of funds are structured in a way that enables them to be easily moved into a new quasi-public entity that could become a clean energy finance bank. In others, existing state institutions are better placed for financing or political reasons to be turned into a clean energy finance bank. In every state, if the state chooses to establish financing programs, there is a need to establish an entity that can be staffed by persons with the appropriate lending and finance expertise.

And so states should design and implement in ways that suit their unique needs and existing programs. At least three leading models for the creation of state clean energy finance banks can be discerned:

The Connecticut model. Prior to the establishment of CEFIA, Connecticut had several different clean energy funds—including a system benefit fund and revenues from the Regional Greenhouse Gas initiative (RGGI) allowances—that had been set up by state legislation, but which were disconnected from other governmental entities like the Connecticut Department of Energy and Environmental Protection or the Connecticut Department of Economic and Community Development. At the same time, Connecticut lacked an overall financing authority that could be repurposed to act as a clean energy investment bank. Instead, while several of the existing funds had reliable sources of financing—from state utility charges and in some cases from bond revenue—the funds largely worked through direct grants and loans or interest rate buy-downs. There was general consensus in Connecticut that this system could be improved substantially if an approach could be developed that let these funds be used to make loans instead of grants, better leverage their capital by combining it with private financing, and operate in a business-like way with profit and loss statements and a prudent balance sheet. CEFIA was established to achieve those goals.[25] As of the publication date of this paper, CEFIA was close to finishing a comprehensive review of lending models and consultations with solar photovoltaics stakeholders and was about to start making its first loans.

The Connecticut model reflects the following key design elements:

- ***Establishment of a quasi-public corporation, CEFIA, to act as the clean energy finance bank.***[26] In Connecticut, an existing entity, the Connecticut Clean Energy Fund (CCEF), became the clean energy finance bank, ensuring that the bank could get off the ground on its first day with existing staff. The legislation replaced the board of the CCEF with a new board appointed by the governor and political leaders in the legislature. One of the goals of the reconstitution of the board was to add individuals with clean energy financing expertise. As a quasi-public institution, CEFIA has its own budget outside of the budget of the state
- ***Consolidation of several existing funding sources into one clean energy finance bank.*** In Connecticut, the sources included a system benefit charge for clean energy, RGGI allowance revenue, and unused resources from an earlier bond offering for energy efficiency projects. Several of these sources, like the system benefit charge, will provide a yearly infusion of funds without further legislation. The legislation provides that CEFIA may seek to qualify as a community development financial institution.[27] In addition, because one of the goals of proponents of a national clean energy finance bank is to task the national bank with providing funds to state clean energy finance banks, CEFIA is given the authority to accept federal funds
- ***Authorization to issue special obligations in the form of bonds, bond anticipation notes, or other obligations.*** Supplemental legislation passed in June 2012 authorizes CEFIA to raise additional capital by issuing up to $50 million in tax advantaged bonds and anticipation notes. In doing so it must make payments to holders of bonds solely from CEFIA assets and it may not secure bonds by any capital reserve fund contributed to by the state
- ***Authorization to raise or leverage (through credit enhancements) funds from private sources of capital at an average rate of return set by the board of directors.***[28] The idea of the cap on returns is two-fold. First, one of CEFIA's goals is to provide low-cost loans that leverage private capital. The challenge is to balance the return expectations of private investors with a lower rate of return on state provided funds (i.e., enough of a return on state funds to cover costs and risk). Second, the sponsors of the legislation felt that it was important to remove from the quasi-public corporation the incentive to rush after the highest rates of return and thus undertake projects

Attracting and Deploying Capital to Finance the Clean Energy Goals of the State: Connecticut's Clean Energy Finance and Investment Authority

Established a year ago, Connecticut's Clean Energy Finance and Investment Authority (CEFIA) became the nation's first full-scale clean energy finance authority with the mandate to support the governor's and legislature's energy strategy to deliver cleaner, cheaper, and more reliable sources of energy while creating jobs and supporting economic development. Along those lines CEFIA's main thrust has been to transition Connecticut's clean energy programs away from grants, rebates, and other subsidies as well as early-stage technology investments towards attracting and deploying private capital to finance commercially available clean energy technologies.

One year later, CEFIA is developing innovative programs to leverage private sector investment in the state's residential, commercial and industrial, and institutional clean energy market.

- **Residential Sector** – Working with the Connecticut Department of Energy and Environmental Protection (DEEP), CEFIA has repurposed $8.25 million of federal economic stimulus funds to support two residential clean energy financing programs —the Clean Energy Financial Innovation program and the Residential Clean Energy Financing program—that will support the installation of solar photovoltaic systems, solar thermal systems, and energy efficiency measures through innovative lease and loan structures. Both programs will use credit enhancements, including loan loss reserves, interest rate buy-downs, and subordinated debt to attract multiples of private capital
- **Commercial and Industrial Sector** – Working with DEEP, the Connecticut Bankers Association, the Connecticut Business and Industry Association, the Connecticut Conference of Municipalities, and other key stakeholders, CEFIA advanced commercial property assessed clean energy (C-PACE) policy through Connecticut's General Assembly. The policy is unique in that it was created with the support of the banking community. CEFIA plays a key role in supporting the policy's implementation as its administrator for the first statewide C-PACE program in the country. CEFIA will work with individual municipalities, commercial and industrial companies, the utilities, Connecticut Energy Efficiency Fund, and financial institutions to implement the program throughout the state
- **Bonding Authority** – Working with Connecticut Treasurer's Office and DEEP, the same legislation that created C-PACE also clarified the bonding authority of CEFIA and provided it with access to the state's Special Capital Reserve Fund (SCRF), further solidifying its ability to leverage low-cost funds to attract private capital. CEFIA can now issue up to $50 million in bonds backed by a SCRF account—thereby establishing a pathway to low-cost secure bond financing based on the state's credit rating to support clean energy deployment in the commercial, industrial, and institutional sectors

CEFIA, in sum, embodies a significant and creative bid to bring clean energy investments to scale in Connecticut. If it succeeds, the quasi-public finance and investment authority will provide an important model for state level self-help in financing clean energy projects. In the coming year, CEFIA will endeavor to demonstrate how demand for clean energy—both renewable energy and energy efficiency—can be increased at no additional cost to taxpayers and ratepayers and how sophisticated finance tools can attract and deploy capital to help finance the clean energy goals of a progressive state.

Source: www.ctcleanenergy.com/

with a significant risk of nonpayment. The example of Fannie Mae is always in the background as a reason not to establish a quasi-independent entity, and this approach successfully quelled fears that CEFIA would take too great a risk with state funds in order to obtain the highest possible profits for its investors. At any rate, conversations between CGC, CEFIA, and investment bankers suggest that the quasi-public authority will be able to raise funds from private source if it provides a rate of return in the 8 percent range (possibly between 6 to 10 percent) for safe, long-term loans like loans to clean energy projects. (This rate of return is relative to current Treasury rates; as those change, so too the cap should change)

- ***Authorization to finance up to 80 percent of the cost to develop and deploy a clean energy project and up to 100 percent of the cost of financing an energy efficiency project.***[29] The 80 percent limit is designed to ensure that there is sufficient equity capital in each clean energy project. In general the goal will be to provide a tranche of the debt financing wherever possible and not 100 percent of the loan. Because of the conviction of the sponsors that 100 percent up front capital was needed to entice homeowners and small businessmen to conduct energy efficiency

projects, CEFIA is permitted to loan 100 percent of the cost of an energy retrofit project

- ***Authorization to utilize financing tools such as direct lending, co-lending through public-private partnerships, provision of credit enhancements, administration of commercial property assessed clean energy, and securitization to finance the deployment of clean energy.*** Such authorities provide CEFIA an ample array of standard finance tools
- ***Strong provisions on transparency, regular reporting to the legislature, and the development of standards to govern eligibility for loans.***[30] CEFIA is required to provide information regarding rates and terms and conditions for public inspection and subject to private audits. It is also required to submit an annual report to the Connecticut Department of Energy and Environmental Protection with copies to the state general assembly. Finally CEFIA is required to conduct formal annual reviews by both a private auditor and the Comptroller

In short, the Connecticut model of a clean energy finance bank consolidates into a focused, quasi-independent new clean energy financial authority an array of preexisting, disconnected state programs aiming to maximize their impact and at the same time permits the CEFIA management team—working in harmony with the state's energy plan—to transform the state's functions from grant-making and subsidies to providing low-cost financing that will result in maximum clean energy being deployed per dollar of ratepayer and taxpayer funds at risk.

The state clean energy financing authority model. Many states, such as Michigan and California, possess existing environmental and economic development authorities—some of which are housed within treasury departments or within other parts of the state administration—that could become clean energy finance banks or undertake the functions of such a bank.[31] Most of these agencies lack a defining mission aimed at maximizing the per-dollar deployment of energy efficiency and clean energy but their activities could be bent in that direction. A clean energy finance bank established under this model would have the following characteristics:

- ***The clean energy finance bank would in most cases be part of the state government, not a quasi-independent governmental entity.*** As such, it would be a not-for-profit entity and probably could not take private investments or even state pension funds seeking a rate of return in the 8 percent range. Since an existing agency would be chosen, it could be up and running on the first day. Some of these authorities are already adept at leveraging their funds; others would require a board and staff reshuffling to make them more finance oriented
- ***Where private funds cannot be brought into the entity, a separate entity could be established to raise private funds and partner with the state financing authority under a formal partnership agreement.*** This would differ from a standard public-private model where a private entity funds some of the project and a governmental entity the rest. In that case the private funds are used for a specific project and cannot be directly leveraged to cover multiple projects. Here, private funds would be co-invested with the governmental funds and this could be leveraged along with the government funds. Otherwise, the same conditions applying to private funding under the Connecticut model would obtain
- ***The ability of state authorities to issue bonds is likely to vary widely, with some subject to the limitations on the issuance of new state bonds.*** In some cases bonds would implicate the full faith and credit of the state and thus be subject to limitations on the issuance of general obligation bonds
- ***As in the Connecticut model, a state would determine whether it could consolidate other funds into the clean energy finance bank authority***. States' ability to do so is likely to vary widely
- ***Co-payment considerations, transparency and other reporting obligations and the development of standards are likely to be similar to those in the Connecticut model.*** Such transparency is essential to top-quality finance activity

This state-government model would seek to extend and optimize the activities of an existing state finance entity.

The infrastructure bank model. In this model, clean energy projects and general infrastructure projects like road projects would be financed by a combined state energy and infrastructure authority or bank that could be created out of an existing infrastructure bank. (See the companion paper Robert Puentes and Jennifer Thompson, "Banking on Infrastructure: Understanding State Revolving Funds

for Transportation.") The California Infrastructure and Economic Development Bank could be a model for this approach.[32] In most ways an energy and infrastructure authority would be identical to a state authority dedicated to clean energy.

There are, however, structural differences between clean energy and infrastructure projects that need to be kept in mind. In a state clean energy authority, the authority could develop expertise in clean energy projects and its funding would largely go to private parties since that is generally how clean energy projects are developed. In addition, energy projects, particularly energy efficiency and distributed energy projects like rooftop solar projects, are often small and an energy authority is likely to fund a large number of projects. In most cases, the clean energy finance bank can serve a useful purpose in aggregating small-scale loans or pooling demand for commercial loans.

Likewise, while in the energy sector most investment can flow into productive, revenue-producing projects, infrastructure investment often entails the provision of public goods where the benefits are widely distributed and not directly paid for by users. In this fashion, infrastructure projects are usually public, not private, and they can be very large. An infrastructure bank could fund a significant number of small projects (such as road repair), but it could also fund only large projects. In the Kerry-Hutchison infrastructure bill introduced in Congress in 2011, for example, financing was limited to projects in excess of $100 million ($25 million for rural projects).[34]

In view of these differences, then, clean energy and infrastructure banking activities are best addressed by establishing two separate divisions, balance sheets, and management teams in the bank—one for energy and one for infrastructure. Persons with different expertise would have to be hired for each area. Guidelines would have to be established to determine how funding is divided between energy and infrastructure projects.

* * *

The innovation window. Across all of these models the new state clean energy investment banks probably should start by funding projects that create relatively low risk for investors. The technologies involved raise low technology risk and in the case of power projects will usually have long-term power purchase agreements. Various risk reduction models have been developed for energy efficiency projects that also reduce the risk of those projects. However, some states will want to attack the critical need to provide financing solutions for scaling up newer emerging technologies such as the manufacturing of solar photovoltaics and other solar technologies, advanced battery manufacturing, second-generation biofuel, and enhanced geothermal generation with higher degrees of technological risk. Such a worthy undertaking will require a different model or "window" in the clean energy investment bank.

New technology projects often fail. Nevertheless, such projects attract investors when models are developed that reduce the risk and protect the investors by enabling them to recover losses in one project through loan loss reserves and/or through gains in another project. Such high-risk projects have generally been funded using venture capital models. Similar models can be developed that are based on public funds. The key is to understand the risk; candidly admit that some projects will fail; provide for the certainty of losses through loan loss reserves and or gains in other projects; and agree that the success of the venture will be measured by the success of the overall portfolio of projects, not by the success of each individual one.

And so the question is whether a venture capital-type funding model can be incorporated into a clean energy investment bank. The answer is yes, but with several caveats. First, the lending will have to be accompanied by significant loan loss reserves and probably by the bank taking an ownership (stock) interest in the projects to which it lends money so that it can make a profit on successful projects that enable it to recover the losses on failed projects.

To further protect the safer deployment portion of the bank from failures in the innovation portion, moreover, the innovation window should be established in the form of a separate subsidiary. It is important that profits generated from lower-risk and low-return funds are not used to subsidize a high risk, high return fund. The bankers working in the innovation subsidiary would also need different skills from those in the deployment part of the bank, but it is not unusual for investment funds to include both high- and low-risk investment entities.

Mobilizing Private Capital to Support Clean Energy in Emerging Markets: The Overseas Private Investment Corporation

The Overseas Private Investment Corporation (OPIC)—an independent U.S. government agency created in 1969 that provides international development finance—offers a useful model for thinking through how a clean energy finance bank can operate. While the OPIC has achieved a successful track record for financing overseas investments in clean energy projects, among other projects, its operations provide valuable tips on financing clean energy projects within the U.S. through the creation of an entity that will lend money to commercially viable projects that have trouble attracting conventional financing.

OPIC helps make U.S. firms make qualified investments overseas through a combination of financial products—direct financing, loan guarantees, political risk insurance, and support for private equity investments. To obtain OPIC financing, projects have to be commercially and financially sound and have a degree of U.S. ownership.

Since its inception, OPIC has supported over 4,000 projects providing $200 billion of investment in 150 countries and, in the process, generated $74 billion in U.S. exports and supported more than 275,000 jobs. Each dollar of OPIC support has catalyzed, on average, more than $2.50 in additional investment.

OPIC has recently begun to place more emphasis on clean energy investments reflecting the vast scale of opportunity in this sector as more developing countries invite investment in clean energy and more investors respond positively. In 2011, clean energy investment made up almost 40 percent of OPIC portfolio.

Structured like a private corporation, OPIC budget is fully self-sustaining from its own revenues (e.g. charging interest and premium from its products) and the agency operates at no net cost to U.S. taxpayers. In fact it has recorded a positive net income for every year of operation. The discipline of being self-sustaining has served OPIC well, both because it requires the agency to be very well run and also because it insulates it from the appropriations and political process.

More importantly, the emphasis on being self-sustaining has influenced the types of projects that OPIC finances—commercially viable projects that have a high likelihood of pay-back but are not able to access market financing for one reason or another. As such OPIC holds valuable lessons for the creation of state clean energy finance banks that can mobilize and facilitate private sector capital deployment in clean energy on a large-scale basis.

Source: www.opic.gov/

Choosing the Loans and Credit Enhancements

In designing their banks states can choose among a variety of financing strategies. Particular situations will require particular approaches. For instance, direct lending may be necessary where no commercial lenders will step in. In other cases, securitization is likely to be a desired goal after an adequate portfolio is created. In any event, states will need to examine all possible financing choices in designing their clean energy finance banks. At least five finance approaches will be of particular use:

Direct lending. Clean energy finance banks could lend directly to renewable energy projects and residential and commercial retrofit programs, including specialized commercial projects such as those in the MUSH (municipal, university, school, hospital) markets. For each of the above, this lending could be done either directly using existing funding sources or through auction financing.

Similarly, for each of the above, loans could be made either directly or to other institutions, including energy distribution companies doing the retrofits or project developers responsible for renewable energy installations. Repayment of these loans could be made directly or through an "on-bill" repayment mechanism. On-bill refinancing would reduce risk effectively if the repayment liability ran with the rental property, not the renter at the time of the lease, or the owned property, not the owner. Use of on-bill financing would generally need legislative and regulatory approval and may extend the timeframe before these projects can be implemented.

Financing could also be secured with a Property-Assessed Clean Energy (PACE) program for commercial projects (currently there is little prospect for residential PACE programs), with loans repaid through the property taxes under the program. Many variations of commercial PACE programs have been proposed, with the most effective ones giving the retrofit loans backed by PACE priority over other noteholders. Seeking legislative approval for commercial PACE programs that give PACE loans priority over existing loans, however, could run into substantial resistance from other noteholders.

Nevertheless, effective PACE programs can be an important tool in the arsenal of financing means to a clean energy future.

Participation in a direct lending deal with one or more outside lenders. Perhaps the most straightforward way to leverage a clean energy finance bank capital from public and private funding sources would be to partner with one or more outside private lenders in providing direct financing to end-users. This sort of financing would have many of the characteristics of the direct lending opportunities described above, but instead of the clean energy finance bank being responsible for the full amount being financed, the financing would be allocated between the clean energy finance bank and the outside private lenders.

In addition to the results that direct lending can provide, loan participation offers at least three additional significant advantages. First, the involvement of outside lenders provides leveraging opportunities that simply do not exist when the clean energy finance bank is responsible for providing the full loan amount. Even in instances where outside lenders limit their investment to 50 percent of the total, with the clean energy finance bank providing the other 50 percent, the funding available for the state bank's direct lending programs is doubled. Second, participation by outside lenders allows the clean energy finance bank to "piggy back" on the diligence performed by these lenders. Because these lenders are making a significant investment of their own, the clean energy finance bank—even while conducting its own due diligence—can rely to some extent on the private lender's expertise, ensuring that loans are carefully vetted in accordance with traditional banking standards. Finally, the clean energy finance bank could also use the outside lender as the loan administrator, saving the bank from having to perform loan processing functions for which its lending partner may be substantially better placed to perform.

Each of the direct lending programs described above in the direct lending section could also be undertaken in partnership with one or more outside lenders.

Credit enhancements to reduce the cost of capital. Clean energy finance banks could provide a range of credit enhancements, including loan loss reserve funds and loan guarantees. These credit enhancements could be used to lower the cost of capital for projects fully financed using outside capital; direct lending projects in which the clean energy finance bank is participating with outside lenders; and pooling and securitization arrangements (described below) in which the credit enhancements reduce the risk profile of the investment products being offered in the markets for rated debt. In the case of credit enhancement, it is important to find mechanisms by which, in future years, to refund to the state financing authority the cash paid out for credit enhancement so as to maintain the commitment to taxpayers and ratepayers to hold them at least harmless over time.

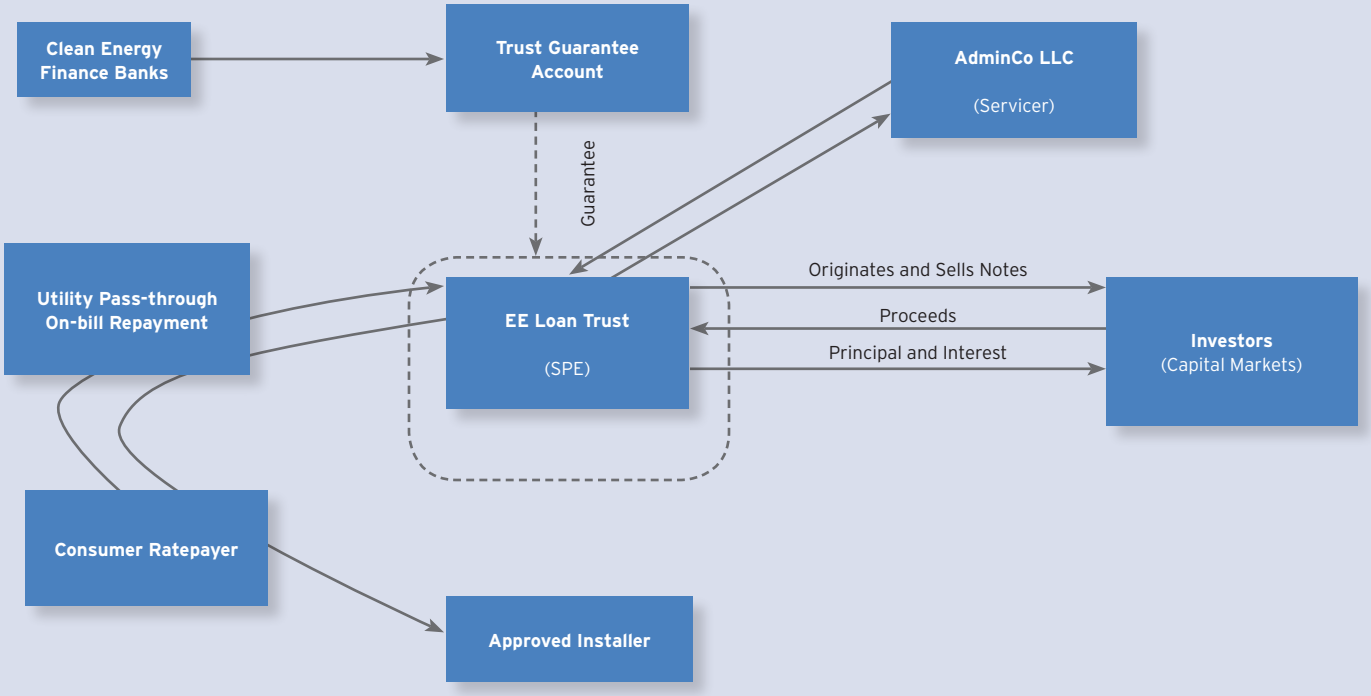
Pooling and securitization of project loans. In addition to direct and indirect lending, clean energy finance banks could create funding structures to pool and securitize project loans, allowing for the involvement of substantial amounts of outside investment capital. Any such securitization, including any issuance of bonds to underwrite the pooled costs of clean energy projects, would require the formation of a bankruptcy-remote special purpose entity ("SPE") in the form of a trust. A clean energy finance bank's role in such financing, therefore, would be the development of the funding structure and the creation of the trust mechanism and any other entities necessary for the funding structure's operation. An example of such a structure focusing on financing energy efficiency projects is set forth below.

While more complicated than direct lending, this type of financing structure is not new. In Connecticut, for example, a similar structure to that proposed below (including loan loss reserve support) is currently being used for an energy efficiency financing program administered by the Connecticut Energy Efficiency Fund (CEEF) (which is not under CEFIA), though there are some factors which limit the impact of the CEEF program, including its scale, its income eligibility restrictions and its reliance on debt capital provided by utilities (and repaid at the utilities cost of capital).

The primary advantages of this type of financing structure are its ability to raise potentially significant amounts of capital in the markets for rated debt and the fact that an existing financial institution would be responsible for actual program administration, minimizing a clean energy investment bank's responsibility to actually run the day-to-day mechanics of the program.

The Energy Efficiency Lending Trust. The potential promise of pursuing a financing path is most easily illustrated with energy efficiency financing examples. Energy efficiency is widely recognized as the lowest-cost option for providing energy services over the long term when compared with other

Figure 4. Energy Efficiency Lending Trust Model



resources, yet deploying energy efficiency measures at scale has so far proven to be an insurmountable challenge because of, among other things, large up-front costs and limited capital resources available to the consumer or the public financing entity. As described above, many of the key barriers to large-scale deployment of energy efficiency could be overcome by a clean energy finance bank if it took advantage of its flexibility to develop public-private partnership financing vehicles that induce significant participation by private capital investors in providing 100 percent up-front project loans. Such vehicles should enable clean energy finance banks to supplant existing financing programs that have little or no private capital participation on the debt side, such as direct loans and grants/rebates and interest rate buy-downs. Such public-private partnership vehicles also should enable clean energy finance banks to succeed in their mission without having to develop significant staffing and a large internal infrastructure to engage banking-type functions.

At least initially, clean energy finance banks would likely need to partner with other financial institutions in order to scale up quickly and best use their resources by tapping the capital and expertise of others in the private sector. A clean energy finance bank developing a comprehensive plan and lending standards should collaborate on such planning and standard-setting with partners with solid financing histories and experience and apply commercially reasonable practices.

One potential model (See Figure 4) would have a clean energy finance bank use some of its limited capital resources to provide the credit enhancement, such as a loan loss reserve, necessary to support the securitization of large numbers efficiency loans pooled together through a special purpose trust (e.g., a master trust cycling through individual loans) that issues bonds sold to private investors. This investment vehicle should be particularly attractive to private investors, would lessen any risk borne by the clean energy finance bank (giving it greater leverage), and should result in a lower cost to borrowers, if the loans underlying the trust can be repaid through utility bills, as the unmitigated risk of default might be determined by a rating agency to be at or below the default rate for utility bills payments. At the same time, the trust and its loans would be serviced by a private financial institution avoiding the need for the clean energy finance bank to develop internal infrastructure and expertise

to perform loan servicing, traditional back office banking-type functions, or loan trust administration services (e.g., communications with trust investment participants).

In all these models it is important to focus on payback. Grant programs by another name, with financial institutions as the beneficiaries, may be expected to receive tepid or declining support from voters.

Moving into Implementation

In terms of moving into clean energy finance bank design, states need to carefully assess their current portfolio of existing clean energy programs; assess the constraints offered by relevant government and private-sector conditions; and seek indigenous (rather than "off-the-rack") solutions. To establish clean energy finance banks, then, states should:

- Review all of their current programs that support clean energy and energy efficiency projects as well as their general economic development and infrastructure programs and determine whether these programs are providing subsidies, grants, interest rate buy-downs or loans and other instruments that have to be repaid; whether these funds are being leveraged and combined to the maximum degree with private funding; whether some or all of those programs could be combined into a clean energy finance bank; and whether such a bank should have separate authority to issue bonds with or without the full faith and credit of the state
- Review any statutory or constitutional impediments to the state providing loans, working with equity capital or leveraging funds
- Meet with state businesses and financial institutions to determine whether it appears feasible to raise private capital and to place it in the bank with a capped, reasonable rate of return
- Determine the best structure for a clean energy finance bank in the state, including analysis of job impact within the state, possible coupling with federal financing programs, and impact of renewable energy standards and other related tax and regulatory programs
- Maximize private investment in the clean energy market. There are at least five ways for state clean energy finance banks to provide new profitable opportunities for private banks, lenders, and investors to participate in the market: (1) Banks and other investors can provide capital to state clean energy finance banks, such as by buying preferred stock carrying a fixed interest rate; (2) Banks can loan money, alongside the state clean energy finance bank, at reasonably higher commercial rates; (3) Banks can perform outsourced state clean energy finance bank services for a fee; (4) Banks can loan for equipment, buy and sell state clean energy finance bank loans, and securitize them; and finally (5) Investors can make equity investments into projects supported by state clean energy finance bank loans
- Establish metrics for achieving goals. It is particularly important to establish metrics that create accountability to legislatures and also can be used in constructive continued dialogue with state regulators

Ultimately for states to design these new finance entities and run them successfully, they will need to engage key stakeholders (e.g., capital providers, contractors, customers, utilities) early on in the planning process and clearly define the mission and goals of the new entity. Stakeholders will each have their own views on where the initial effort should be focused and sometimes competing views will have to be reconciled.

Most important of all, the new banks will need to be staffed by specialists who have backgrounds in finance and who can understand complex deal structures, new product development, and can successfully retool the organization.[33] Only with such personnel running the new organizations will the entities possess the expertise and sophistication needed to move their states beyond conventional clean energy project support and into true clean energy finance.

IV. Conclusion

In sum, governors, legislators, NGOs, and regional private-sector leaders need not abandon all optimism as they survey the coming energy policy pull-back in Washington. Instead, state leaders should consider working to develop state-side clean energy finance banks as a source of low-cost, stabile finance for the deployment of clean energy projects in their regions.

In this respect, the new banks represent a sound new strategy for continuing to widen the decarbonization of regional economies and the scale-up of fledgling clean energy and energy efficiency industries.

Clean energy finance banks will apply proven financial techniques to a recognized market problem at a time of federal retrenchment.

Clean energy finance banks can be financed from existing state funds and in the current fiscally strapped climate furnish an attractive tool for leveraging scarce public dollars with private capital. And for that matter clean energy finance banks—with their proximity to regional industries and deal flow—can bring important resources to bear in states wishing to foster local clean energy, energy efficiency, and energy technology clusters.

What is more, state clean energy finance banks hold out the promise of serving as effective vehicles for leveraging and tuning to local needs such federal funding or finance programs as may emerge in the future. In this respect, the new entities could well contribute to the construction of an enduring platform on which to ground the delivery of tangible benefits to society with a guaranteed payback to taxpayers and ratepayers.

In short, entrepreneurial states should innovate again. By employing their characteristic creativity and sophistication, enterprising states should begin now to stand up the next generation of needed clean energy finance solutions.

Appendix. International and National Examples of Clean Energy Financing Entities

	Source of funding	Initial capitalization	Project approval process	Eligible projects, technologies	Target rate of return	Types of credit support	Oversight	Reporting	Audits	Application review time period
NATIONAL										
Clean Energy Finance Corporation (Australia) (as proposed)	Budget appropriation	$10 billion over five years starting 2013-2014	Review by investment committee prior to final Board consideration; risk committee provides ongoing monitoring and of projects and portfolio diversification	Renewable energy, low-emissions and energy efficiency technology, as well as manufacturing companies that produce the required inputs	Government bond rate	Broad - direct investments (debt or equity) and indirect investments (pooled fund)	Government will set the direction and broad mandate of the CEFC but does not direct the CEFC in relation to specific investments; Board will be appointed by the Government and be responsible for making management, operational and investment decisions	CEFC will publish guidelines and annual reports that will include audited financial statements	CEFC's annual reports will include audited financial statements.	None specified
Kreditanstalt fur Wiederaufbau ("KfW") (Germany) (Energy-Efficient Construction and Energy-Efficient Rehabilitation Programs)	Federal and regional government appropriations	DM 1 million (in 1948); annual appropriations of $1.4 billion per year between 2008-2011	Borrower's bank submits application to KfW; KfW confirms application meets specified criteria; borrower's bank becomes legally responsible for the loan, drafts loan contract with borrower, and then calls down funds from KfW; a secondary lien is placed on the borrower's property	Loan application must have confirmation of CO2 reductions and employ energy efficiency measures to meet certain energy efficiency standards set by legislation	Below market rate (e.g., as low as 1.00% fixed for ten years for certain improvements as of September 2011 and as low as 1.3% (20-year fixed) in 2008 when market rate was 4%)	Loans and subsidies (financing authority generally limited to each program's specific rules)	Owned by federal (80%) and regional (20%) governments; all members of the Board of Supervisory Directors (BSD) are appointed by the federal government; the BSD appoints the Board of Managing Directors, which is in charge of the operations; the Federal Ministry of Finance supervises KfW and is empowered to adopt measures to ensure conformity with the law, KfW's by-laws and other regulations	KfW must prepare financial statements and a management report annually	The financial statements and management report must be audited.	None specified
Green Investment Bank (United Kingdom) (as proposed)	Asset sales	£3 billion over the period to 2015	Decisions made by investment committee except Board approval for cases above a defined threshold	Not yet specified; first priority sectors will be offshore wind power generation, commercial and industrial waste processing and recycling, energy from waste generation, non-domestic energy efficiency	None specified	Broad - examples include first loss debt in the construction phase, equity co-investment, pari passu senior debt, upfront refinancing commitment, and subordinated debt during the operationl phase; all through direct or indirect investment	Governance model with five components: (i) The Department for Business, Innovation and Skills is the sole shareholder; (ii) the GIB Policy Group; (iii) the Board; (iv) Board Committees; and (v) Executive Management	GIB will publish an annual report and shareholder reports as agreed upon	None specified	None specified
Clean Energy Deployment Administration (United States) (as proposed in HR 2454)	Green Bonds issued by U.S. Treasury	$7.5 billion	Criteria established by the Energy Technology Advisory Council; decisions made by the Board	Project must be a "clean energy technology"	According to commercial rates; minimum amount for breakthrough technologies	Broad - direct support (i.e., direct loans, letters of credit, and loan guarantees) and indirect support (e.g., portfolios and tax equity markets)	CEDA Administrator appointed by the President; Nine-member Board of Directors; Energy Technology Advisory Council	CEDA must file annual and quarterly reports; funding recipients must report on a quarterly basis	Subject to audit by Comptroller General; CEDA must also have an annual independent audit conducted	180 days

DOE Loan Guarantee Program (United States) (Section 1703)	U.S. Treasury appropriations	None specified	Pre-applications in response to a solicitation are accepted and reviewed, followed by a full application and another review period	Project must be located in the U.S. and employ a new or significantly improved technology that is not a commercial technology and that avoids, reduces or sequesters air pollutants or anthropogenic emissions	Determined as reasonable by DOE	Loan guarantees	None specified	Recipient must provide annual or more frequent financial and other reports on the status and condition of the project	Recipient must maintain records to facilitate an effective audit; Secretary of Energy and Comptroller General may audit	None specified
Export-Import Bank	Ex-Im Bank is self-funded and is able to cover all operation costs and potential losses by charging fees and interest on loan-related transactions	Initial not specified. The current capital stock is $1 billion subscribed by the US government	Applicants must submit a Letter of Interest or a Preliminary Commitment/ Final Commitment Application	All projects must uphold environmental standards, support US jobs, and recipients must demonstrate that competition is supported by foreign export credit agencies or that private sector financing is unavailable at terms sufficiently favorable to win the export sale	The fees and premiums are must cover the risks associated by the liability that the Bank incurs for guarantees, insurance, coinsurance, and reinsurance against political and credit risks of loss	Ex-Im Bank provides working capital guarantees (pre-export financing); export credit insurance; and loan guarantees and direct loans (buyer financing). No transaction is too large or too small	The Board of Directors consists of the President of the Ex-Im Bank who serves as Chairman, the First Vice-President who serves as Vice Chairman, and three additional persons appointed by the President of the United States	Ex-Im Bank must submit to Congress annually a complete and detailed report of its operations	The Ex-Im Bank Office of Inspector General appointed by the President conducts internal audits and investigations	Varies depending on financial product and amount
Overseas Private Investment Corporation	OPIC is self-sustaining and is able to cover all operation costs and potential losses by its offsetting collections, which are derived from the premiums, interest, and fees from its financial services	None specified	Following preliminary review and approval, the sponsors usually provide additional economic, financial and technical information	The four main criteria are that projects must have positive environmental and social impact, support worker and human rights, advance US economic interests, and develop the host country. Also, to obtain financing the venture must be financially sound and have some portion of U.S. ownership	Upfront fees range from 1-2 percent, commitment fees, maintenance fees and cancellation fees may be charged, and reimbursement is required for related out-of-pocket expenses. Interest rates and loan guarantee fees are based on cost of capital plus a risk premium of between 2-6 percent, depending on commercial and political risks	OPIC provides financing either through direct loans or through loan guarantees, which are typically used for larger projects. OPIC can offer loans as small as $350,000 and can lend up to $250 million per project. All loans or guarantees over $50 million must be approved by the OPIC Board of Directors	Congress does not approve individual OPIC projects, but has authorization, appropriations, and oversight responsibilities related to the agency and its activities. Congress authorizes OPIC's ability to conduct its credit and insurance programs for a period of time chosen by Congress	OPIC's Office of Accountability assesses and reviews complaints about OPIC-supported project	The Office of Inspector General of the United States Agency for International Development provides internal audit and investigative services to OPIC	Varied depending on financial product and amount. Typically between 2-6 months
SUB-NATIONAL										
Clean Energy Finance and Investment Authority (Connecticut)	Repurposed funds from existing clean energy programs (e.g., surcharge); certain federal funds; gifts; earnings from CEFIA's activities; contracts with private entities subject to rate of return limitations	$48 million	Process varies by RFP, but there are three general processes: (i) competitive selection award; (ii) programmatic selection award; and (iii) strategic selection award	Programs must (i) finance clean energy investment in small projects and larger commercial projects; (ii) support financing and other expenditures that promote investment in clean energy; and (iii) stimulate demand for clean energy within the state	TBD by Board	Broad - none specified and only limited restrictions on funding (e.g., funding for clean energy projects cannot exceed 80% of the cost of the project)	Governed by Board of Directors appointed by government officials (e.g., the Governor)	CEFIA must publish an annual report, as do funding recipients	CEFIA must conduct formal annual reviews by both a private auditor and the Comptroller	None specified

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Endnotes

1. Ken Berlin is a senior vice president for policy and planning and general counsel at the Coalition for Green Capital. Reed Hundt is the CEO of the Coalition for Green Capital. Mark Muro is a senior fellow and the director of policy for the Metropolitan Policy Program at Brookings. Devashree Saha is a senior policy analyst and associate fellow at the Brookings Metropolitan Policy Program.

   Through the Coalition for Green Capital, Berlin and Hundt worked with Daniel Esty, commissioner of the Connecticut Department of Energy and Environmental Protection, and Gov. Daniel Malloy soon after his November 2010 election to craft a comprehensive reform of the state's energy and environmental laws. Berlin spent most of the first half of 2011 working with Esty and the legislature on the reform, which passed with broad bipartisan support. Hundt later became a board member of Connecticut's Clean Energy Finance and Investment Authority (CEFIA).

2. The diffusion of clean energy and energy efficiency solutions can be measured in many ways but progress may be best seen in the growing share of the nation's electricity now generated from renewable sources, the declining cost of clean energy, and in the expansion of energy efficiency activities. To the first measure, the share of electricity generation from renewables has increased from 9.25 percent in 2008 to 12.67 percent in 2011. Even discounting hydroelectric sourcing, the share of electricity generation from renewables is up in many states with wind being the largest driver of this increase across all states. For more information see Energy Information Administration, "Electric Power Monthly" (July 2012). Turning to price declines, the unsubsidized levelized cost of electricity from utility scale-solar photovoltaic (PV) installations fell between $111 and $181 per MWh in late 2011 (a broad range based on regional solar resources). It is expected that unsubsidized utility scale solar PV costs will further decline into the $90–$150 per MWh range by 2014 and the $40–$66 per MWh range by 2020. The unsubsidized cost of new wind power projects ranges between $60–$90 per

MWh and with the federal production tax credit the levelized cost drops down to an estimated range of $33–$65 per MWh, depending on the quality of wind resource. See Jesse Jenkins and others, "Beyond Boom and Bust: Putting Clean Tech on a Path to Subsidy Independence" (Washington and Oakland: Brookings Institution, Breakthrough Institute, and World Resources Institute, 2012). As to energy efficiency advances further gains have been made as ratepayer-funded energy efficiency programs climbed to $6.8 billion last year—a 25 percent increase over 2010 levels. See Adam Cooper and Lisa Wood, "Summary of Ratepayer-Funded Electric Efficiency Impacts, Budgets, and Expenditures," (Washington: Institute for Electric Efficiency, January 2012). Electric utilities are the largest provider of energy efficiency programs with utility budgets comprising 84 percent of the total ratepayer-funded energy efficiency budget nationwide.

3. The "levelized" costs of new renewable electricity technologies remain substantially higher than conventional coal and natural gas-fired fossil power plants. The Department of Energy's Energy Information Administration has estimated the cost of electricity by source for plants entering service in 2016. EIA estimates suggest that while the costs of conventional coal-fired plants going online in 2016 would come in at about $95 per megawatt hour (MWh), those for onshore wind generation clock in at $97, for geothermal at $101, and for advanced nuclear at $113. Solar PV generation will run to $211, off shore wind $243, and solar thermal to $312. No federal and state tax credits or incentives are incorporated in the analysis. See Energy Information Administration, "2016 Levelized Cost of New Generation Resources in the Annual Energy Outlook 2011" (December 16, 2010).

   More recent analysis has also noted that renewable energy technologies such as wind and solar are not able to compete with conventional power generation technologies without subsidies. Declining federal incentives and low natural gas prices are further exacerbating the difference. For instance, the current unsubsidized cost for wind generated electricity is $60-$90 per MWh, depending on available wind resource at different locations. In comparison, the prices for natural gas-fired generation fall in the $52-$72 range. See Alex Trembath and Jesse Jenkins, "Gas Boom Poses Challenges for Renewables and Nuclear" (Oakland: Breakthrough Institute, April 2012).

   It should also be noted that the perceived "cost disadvantage" of new clean energy technologies exists in part because it is hard to put a value on some of the benefits of the clean technologies. For instance, underinvestment in distributed generation such as roof-top solar exists in part because the benefits of grid security and load reduction are not internalized in market prices. Also skewing pricing against the adoption of clean energy technologies are the externalities associated with greenhouse gas emissions which are but some of the costs not included in the price of incumbent energy technologies and products. For more detailed analysis of the social cost of carbon see Frank Ackerman and Elizabeth Stanton, "Climate Risks and Carbon Prices: Revising the Social Cost of Carbon," *Economics* No. 2012-10 (April 4, 2012).

4. As with clean energy projects, energy efficiency programs face significant financing challenges. The cost of energy efficiency retrofits for all commercial and residential buildings is likely to approach $1.5 trillion dollars. Only a relatively small percentage of these funds are likely to be provided by homeowners and businesses. The government funding on which these programs rely is threatened as well.

5. The decline in federal support for the U.S. cleantech sector has been extensively discussed in Jesse Jenkins and others, "Beyond Boom and Bust: Putting Clean Tech on a Path to Subsidy Independence." Among the major findings of that report are that federal cleantech funding is poised to decline by 75 percent from a high of $44.3 billion in 2009 to $11 billion by 2014.

6. The sophistication and effectiveness of states' creativity in catalyzing clean energy and energy efficiency has been impressive. Initiatives in California, Massachusetts, and elsewhere make the point. With a mandate to obtain 33 percent of its power from renewables by 2020, California is using a wide range of coordinated procurement, feed-in tariff, and power purchase agreements (PPAs) to accelerate clean energy development. In this vein, the state increased its total installed kilowatts of renewable energy from 42,933 kilowatts installed in the first five months of 2011 to 77,473 in the same period in 2012. While kilowatts installed with cash went down from 23,360 to 21,223, kilowatts installed using PPAs and third-party financing tripled from 19,572 to 56,250. California utilities such as PG&E and San Diego Gas & Electric have entered into several PPAs to meet the state renewable portfolio standard and renewable energy represented 20.6 percent of the electricity mix from the state's three biggest utilities at the end of 2011, up from 17 percent in 2010. For more information see Silvio Marcacci, "California Renewable Energy Forecast Just Keeps Getting Better," *Clean Technica* (July 29, 2012), and Herman Trabish, "How Solar's ITC Tax Credit is a Money-Maker," *Greentech Media* (July 30, 2012). In Massachusetts, the Massachusetts

Clean Energy Center (MassCEC) has employed rebates through its Commonwealth Solar rebate program to create a booming solar market. Thanks in part to the rebate program, the number of installed megawatts of solar power in Massachusetts has increased more than 20-fold from 3.5 MW in 2007 to 118 MW installed or in process as of early 2012. An aggressive Solar Renewable Energy Certificate (SREC) program has also helped accelerate the state's solar growth. Looking more widely, more than 20 states have created clean energy funds (CEFs) to accelerate the development of clean energy projects. The state CEFs generate about $500 million per year in dedicated support from utility surcharges, making them significant public investors in thousands of clean energy projects. For more information see Lew Milford and others, "Leveraging State Clean Energy Funds for Economic Development" (Washington: Brookings Institution, January 2012). See also Devashree Saha, Sue Gander, and Greg Dierkers, "State Clean Energy Financing Guidebook," (Washington: National Governors Association, January 2011) on the variety of clean energy financing options states are using to maximize their resources including revolving loan funds to recycle funds within the state's economy, utility on-bill financing programs that marry repayment with the source of savings, linked deposit programs that help leverage private capital, among others.

7. Section 99 of Public Act No. 11-80, An Act Concerning the Establishment of the Department of Energy and Environmental Protection and Planning for Connecticut's Energy Future. For more information, see: www.cga.ct.gov/2011/act/pa/pdf/2011PA-00080-R00SB-01243-PA.pdf.

8. Senate Bill No. 1243. The legislation creating CEFIA had overwhelming bipartisan support, passing the Connecticut Senate 36-0 and the House by 139-8.

9. Debates persist about the exact design of such a new national entity. However, several models appear promising, including the proposed Clean Energy Deployment Administration (CEDA) and the so-called Energy Independence Trust (EIT) concept developed by the Coalition for Green Capital. For background on CEDA, see Jesse Jenkins and Sara Mansur, "A Clean Energy Deployment Administration: Unlocking Advanced Energy Innovation and Commercialization" (Oakland: Breakthrough Institute, November 2011). For discussion of Energy Independence Trust model, see Bracken Hendricks and others, "Cutting the Cost of Clean Energy 1.0." (Washington: Center for American Progress, Coalition for Green Capital, November 2010).

10. Google's clean energy team released its analysis in October 2008 suggesting a potential path to weaning the U.S. off of coal and oil for electricity generation by 2030. Switching to aggressive reliance on renewable energy—where wind power would grow to 29 percent of U.S. electricity production, geothermal to 15 percent, and solar to 12 percent—and natural gas, assuming electricity consumption remains flat, can cut fossil fuel use by 88 percent from 2003 projections. In addition, Google's analysis estimated the following reductions in energy and emissions level compared to 2003 projections: vehicle oil consumption by 44 percent; dependence on imported oil by 37 percent; electricity sector CO2 emissions by 95 percent; personal vehicle sector CO2 emissions by 44 percent; and U.S. CO2 emissions overall by 49 percent. Although the cost of Google's Clean Energy 2030 proposal is about $3.86 trillion in undiscounted 2008 dollars, the savings are even greater at $4.68 trillion, returning a net savings of $820 billion over the 22-year life of the plan. For more details see Google, "Clean Energy 2030" (October 2008).

11. Jesse Jenkins, Devon Swezey, and Alex Trembath, "Solyndra's Failure Is No Reason to Abandon Federal Energy Innovation Policy," *Forbes* (September 2, 2011).

12. See Energy Information Administration, "Levelized Cost of New Generation Resources in the Annual Energy Outlook 2011" and Trembath and Jenkins, "Gas Boom Poses Challenges for Renewables and Nuclear."

13. For useful descriptions of the two "Valleys of Death" that complicate the scale up of new and emerging technologies see: Bloomberg New Energy Finance (BNEF), "Crossing the Valley of Death" (New York, 2010); Eliot Jamison, "From Innovation to Infrastructure; Financing First Commercial Clean Energy Projects" (San Francisco: CalCEF, 2010); Jesse Jenkins and Sara Mansur, "Bridging the Clean Energy Valleys of Death" (Oakland: Breakthrough Institute, November 2011); Mark Muro, Jonathan Rothwell, and Devashree Saha, "Sizing the Clean Economy: A National and Regional Green Jobs Assessment" (Washington: Brookings Institution, July 2011). In general most accounts notice an early-stage "technology creation" Valley of Death—arising from dearth of financing available to take a bench-scale model and create a commercial-scale demonstration—and also a later-stage "commercialization" (or deployment) Valley of Death that involves the difficulty of obtaining financing to scale-up manufacturing and put more projects on the ground.

14. For rich discussions of the social cost of carbon (i.e., the economic cost imposed on society by the emission of an additional ton of carbon dioxide emission or its equivalent), see Frank Ackerman and Elizabeth Stanton, "Climate Risks and Carbon Prices: Revising the Social Cost of Carbon;" Robert Kopp and Bryan Mignone, "The U.S. Government's Social Cost of Carbon Estimates after Their First Two Years: Pathways for Improvement," Economics No. 2012-15 (May 4, 2012); and William Nordhaus, "Estimates of the Social Cost of Carbon: Background and Results from the RICE-2011 Model," NBER Working Paper Series 17540 (October 2011). Estimates of the social cost of carbon are highly uncertain. Estimates by a federal government working group have placed this cost at $21 in 2010 or the equivalent of $0.21 for every gallon of gasoline. Those estimates have been questioned by analysts who say they omit many of the biggest risks associated with climate change. In response, estimates put forth by Ackerman and Stanton place the social cost of carbon as high as $900 in 2010 and $1,500 by 2050.

15. Victor and Yanosek in an article published in July/August 2011 predicted a crisis for the clean energy industry. They argued that the 25 percent annual growth in clean energy in Western countries has been achieved with the help of public subsidies, which are now unsustainable. As predicted in their article, the popularity of these subsidies has already declined in the U.S. and Europe where a host of countries including Italy, Spain, Germany, and the U.K. have cut back on subsidies, See David Victor and Kassia Yanosek, "The Crisis in Clean Energy" *Foreign Affairs*, July/August 2011. In more recent work, Yanosek has argued that U.S. tax credits, as they have been applied, have contributed to an inefficient boom and bust approach to clean energy. Smarter government policies are needed to help renewable technologies overcome the commercialization gap. See Kassia Yanosek, "Policies for Financing the Energy Transition" *Daedalus, The Alternative Energy Future* Vol. 1, Spring 2012.

16. Jesse Jenkins and others, "Beyond Boom & Bust: Putting Clean Tech on a Path to Subsidy Independence" (Oakland: Breakthrough Institute, April 2012).

17. See Elizabeth McNichol, Phil Oliff, and Nicholas Johnson, "States Continue to Feel Recession's Impact" (Washington: Center on Budget and Policy Priorities, February 2012).

18. *Chicago Tribune*, "US State Debt to be Subdued Again in 2012 – Moody's." May 22, 2012.

19. Lew Milford and others, "Leveraging State Clean Energy Funds for Economic Development."

20. For additional discussion of state CEF activity see Milford and others, "Leveraging State Clean Energy Funds for Economic Development." State CEFs' emphasis on a project finance model—which directly promotes clean energy project installation by providing rebates (e.g., Hawaii's Energy Efficiency Program offering solar water heater rebates to residential utility customers), grants (e.g., Delaware's Green Energy Fund providing cash grants for renewable energy installation), and performance-based incentives (e.g., California Solar Initiative offering PBI for solar PV systems between 50kW and 1 MW in size)—is by itself not enough to build a statewide clean energy industry. To do that state CEFs will need to pay attention to other critical aspects of building a robust clean energy industry, including cleantech innovation support through research and development funding, financial support for early-stage cleantech companies and emerging technologies, and various other industry development efforts.

21. Coalition for Green Capital, "Energy Economy Strategy: The Way Forward" January 2012 PowerPoint Presentation available at www.coalitionforgreencapital.com/downloads.html.

22. The latter might be necessary if federal funding were involved and the federal government did not allow project developers to finance credit subsidy fees. The federal government took this position for some ARRA funding. In that case the loan loss reserve would be established first out of existing bank capital and the credit subsidy fees would be used to replenish that capital.

23. For example, the PACE program spreads the cost of energy improvements through an assessment on a homeowner's property taxes. The program currently works in 27 states and has been considered on the federal level. "PACE Now," available at www.pacenow.org/blog/ (July 2011). Other innovative and successful programs for financing energy efficiency include on-bill financing and managed energy-services agreements. With on-bill financing, the borrower repays the utility directly on the energy bill, which is still lower than it would be without the improvement. Another alternative is managed energy-services agreements where a company pays for the retrofit and recoups the benefits from the energy savings. Liam Pleven, "Buy Now, Pay Later," *The Wall Street Journal*, February 28, 2011.

24. Energy Service Companies (ESCOs) offer up front funding and some sort of performance guarantees to large industrial and government users, but these programs have been mostly limited to government buildings and single owner industrial buildings owned by large, credit worthy

businesses. See J, Freeling. "Energy Efficiency Finance 101: Understanding the Marketplace." American Council for an Energy Efficient Economy 2011.

25. In March 2012, the Hawaii State House passed legislation to establish the Clean Economy Bank of the state of Hawaii. The Clean Economy Bank resembles the Connecticut model in most respects, but, if enacted would also allow other states and U.S. territories to "opt-in" to the bank by helping to capitalize one or more of its funds. An opt-in model may hold particular appeal to smaller states that can realize economies of scale by partnering with other states. The Hawaii State Legislature is expected to reconsider the clean economy bank in 2013.

26. Conn. Gen. Stat. §16-245n(d)(1).

27. Conn. Gen. Stat. §16-245n(d)(2)(A).

28. Ibid.

29. Conn. Gen. Stat. §16-245n(d)(2)(D).

30. Conn. Gen. Stat. §16-245n(d)(2)(B.) and Conn. Gen. Stat. §16-245n(d)(2) (F)).

31. Examples include the California Pollution Control Financing Authority, the California Alternative Energy & Advanced Transportation Financing Authority (CAEATFA), the Michigan Economic Development Corporation, and the Illinois Finance Authority.

32. The California Infrastructure and Economic Development Bank (I-Bank) finances public infrastructure and private development projects. The I-Bank has the power to issue revenue bonds, and provide credit enhancements for a wide variety of infrastructure and economic development projects. For more information, see www.ibank.ca.gov/. According to the FHA, 32 states and Puerto Rico have state-run infrastructure banks, which have distributed over $6.5 billion to 712 projects as of December 2010. Most cover transportation projects but some include energy and water also.

33. Building and Upgrading Infrastructure for Long-Term Development Act (BUILD Act) was introduced in March 2011 to create an American Infrastructure Financing Authority at an initial cost of about $10 billion. Its objective was to provide loans and loans guarantees to large infrastructure projects. Chances of the bill being passed in this Congress are very slim.

34. In a 2010 article on the Clean Energy Deployment Administration, Clements and Sims argued that such entities should make it a priority to get experienced bankers and other seasoned financial experts. Such staff should come from the investment banking, private equity, and insurance industries, be qualified to assess the specific barriers to commercialization and deployment faced by different technologies, and be able to design products targeted at removing those barriers. See Allison Clements and Douglass Sims, "A Clean Energy Deployment Administration: The Right Policy for Emerging Renewable Technologies," *Energy Law Journal* Vol. 3, 2010.

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