



Growing Clean Energy Markets with Green Bank Financing

White Paper

Coalition for Green Capital

Executive Summary

Green Banks are public finance authorities that use limited public dollars to leverage greater private investment in clean energy. Their goal is to accelerate clean energy market growth while making energy cheaper and cleaner for consumers, driving job creation, and preserving taxpayer dollars. Green Banks deploy public capital efficiently through financing to maximize private investment, and lower the costs of clean energy to spark consumer demand. Rather than rely strictly on grants that cannot bring markets to scale, Green Banks use limited public funds to offer financing that attracts private investment. This way each public dollar goes further and can be recycled. Green Banks also facilitate market development by working with originators and lenders, and offering the information consumers and businesses need to confidently purchase clean energy. By connecting capital supply and customer demand, Green Banks grow markets.

Green Banks produce a number of benefits for states beyond just growing clean energy markets:

- Low-Cost Market Growth – Green Banks aim to make energy cleaner *and* cheaper, and do it by using public dollars for financing, rather than grants, which is less costly for taxpayers
- Private Sector Leverage – Green Banks seek to “crowd-in” private investment currently on the sidelines, and can leverage \$10 of private capital for each public dollar used
- More Efficient Government – Green Banks preserve and recycle public dollars through financing, allowing government to get greater “bang for the buck”
- Job Creation & Economic Development – 100% financing reduces barriers to demand, so investment in energy efficiency and in-state renewables means more jobs and growing businesses to meet that demand
- More Money Back in Citizens’ Pockets – Green Bank financing allows more citizens to lower energy bills through deep efficiency retrofits, and offers a way for government to lower reliance on expensive grants

Connecticut created the first Green Bank in the country in 2011, and has already achieved tremendous growth. In FY15, the Green Bank facilitated \$365 million in total clean energy investment. This is 10x greater than total investment in the state only 4 years earlier under the prior grant-making policy regime. And this investment flowed simultaneous to reducing solar grants by more than 50%. The Green Bank has created thousands of jobs, and expects to stimulate over \$600 million of investment next year alone. New York, Hawaii, California and Rhode Island also have Green Banks. And Maryland, Washington, DC, Delaware, Virginia, Colorado, Nevada and others are currently exploring Green Bank creation.

Green Banks are a win-win-win situation: consumers save money by choosing clean energy; businesses and investors have new growth opportunities; and governments can replace expensive grants with value-generating loans. And because Green Banks enable clean energy deployment at low cost to customers and the public, a Green Bank is an ideal tool for enabling low-cost compliance with the Clean Power Plan.



Introduction

This paper provides an overview of the concept of Green Banks and the benefits they produce. Green Banks are designed to accelerate the growth of clean energy markets in a cost-effective manner that focuses on reducing energy costs for citizens. This paper will specifically answer the following questions:

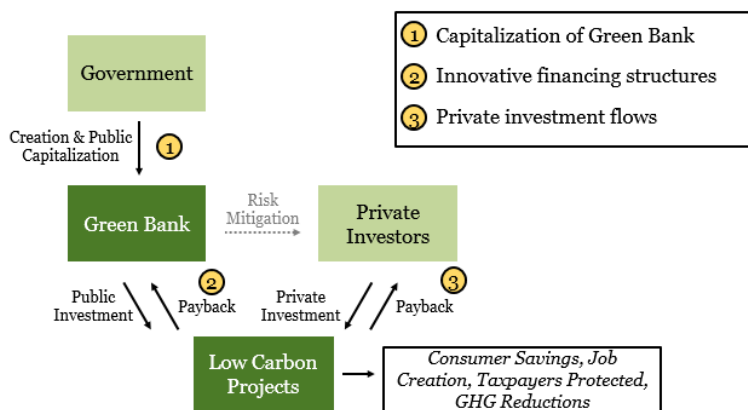
- What is a Green Bank & Why is it Necessary?
- What are the Benefits of a Green Bank?
- What do Green Banks Do?
- What Green Banks Already Exist?
- What Have Green Banks Accomplished?
- What States are Exploring Green Banks?

This paper was prepared by the Coalition for Green Capital (CGC), a 501(c)(3) non-profit based in Washington, DC that is the nation's leading expert on Green Banks. CGC is an advocate, advisor and consultant for policymakers, helping them understand how a Green Bank could work and be created in a given state. CGC drove the creation of the Connecticut and New York Green Banks, and supported development and operation of similar institutions in California, Hawaii and Rhode Island. Today, CGC is working in Vermont, Massachusetts, Maryland, Washington, DC, Colorado, Illinois and Nevada, all of whom are at various stages of Green Bank exploration and development.

What is a Green Bank & Why is One Necessary?

A Green Bank is a public or quasi-public institution that finances the deployment of renewable energy, energy efficiency, and other clean energy projects in partnership with private lenders. Green Banks are capitalized with public funds, which are then used to offer loans, leases, credit enhancements and other financing services to close gaps in the private capital markets for clean energy projects. Green Banks invest in the project deployment of mature, commercially viable technologies – not in early stage tech or in clean energy companies. The goal of a Green Bank is to accelerate the deployment of clean energy by removing the upfront cost of adoption, leveraging greater private investment in clean energy, and increasing the efficiency of public dollars. Through Green Banks, consumers and businesses can install clean energy technologies with no upfront cost while reducing energy costs. And because public dollars are used for financing, rather than grants, all public dollars are preserved through loan repayment.

Figure 1: Green Bank Structure





For a number of reasons, economically viable, low-risk clean energy projects are often unable to access affordable private financing. Green Bank financing methods “crowd-in” private capital to fill financing gaps by reducing real and perceived risk, and allowing private investors the chance to learn about a new market opportunity with the security of government partnership. As private lenders gain experience and information about the processes, risks and addressable market size in clean energy, they can become increasingly comfortable and confident lending into these markets. Green Banks have shown that with experience and data, private investors are more eager to enter clean energy markets at scale, ultimately without any Green Bank support.

Green Banks and public clean energy financing programs are increasingly common across the U.S., as governments recognize the importance of financing in addition to traditional grant models. Historically, many governments have supported the adoption of mature clean energy technologies by offering incentives, rebates, tax credits and other forms of subsidies. These programs have been generally effective in improving the economics of clean energy installation (primarily for renewables) and stimulating demand among consumers. However, rebate programs have two primary weaknesses that financing can address. The first is that rebates traditionally only cover a small portion of a project’s cost. If a rebate covers \$2,000 of a \$15,000 efficiency project, for example, then the customer still must find \$13,000 in cash. This requirement for upfront, out-of-pocket cash stands as a significant barrier to adoption. The second problem with grants is that they are expensive, as they are permanent expenditures of taxpayer dollars. To bring clean energy markets to meaningful scale using grants would require more public expenditure than is available or politically viable. Therefore new program solutions are needed that address upfront costs for consumers and the expense of public capital.

Ideally, private lenders would step in to this market today to cover the remaining upfront cost of clean energy adoption beyond what is covered by rebates. However, there are capital market inefficiencies and inherent challenges to financing clean energy that have resulted in inadequate investment by private lenders. And those private lenders that do offer capital typically charge interest rates that are relatively high and terms that are short. This erodes the economics of a clean energy project, which ideally will be cash flow positive from day one. In this context, “cash flow positive” means that the energy cost savings achieved on a monthly basis as a result of the clean energy installation exceed the monthly financing charge. Under a cash flow positive project, the borrower is able to, on net, save money every month without paying any upfront costs, making the project highly attractive. This kind of cash flow structure is only possible with loan terms that match the expected lifetime of the projects savings, and with rates that are commensurate with the risk. Therefore private capital offered at unfavorable terms (if it is available at all) undercuts the economic attractiveness of the project for the customer.

Private financing gaps exist for several reasons. The first is that there is a relatively short track record for clean energy financing, and therefore there is little data for lenders to rely on. Without data, banks are left with high amounts of uncertainty over how well different types of projects perform and how often borrowers repay their loans. This uncertainty leads to either hesitation to enter the market or unfavorable lending terms. The second cause of financing gaps is that many clean energy projects are small and fragmented. Building efficiency upgrades and rooftop solar projects are inherently small investments that are geographically disperse, with varying credit among project off-takers. These types of investments are relatively expensive to underwrite for a private lender, making the loan potentially uneconomical to offer.

A third cause of financing gaps is the lack of capital market liquidity and maturity. If a commercial bank provides an energy efficiency loan, it is unknown to the bank if it will be able to sell that loan to another lender or if it will have to hold that loan on its balance sheet, tying up capital. Mortgage and auto lenders don’t have this difficulty, because there



are highly liquid secondary markets for home and car loans. These kinds of secondary markets are just now forming for clean energy technologies. And the final cause of private underinvestment relates to human and organizational behavior. In order to begin lending into a new market, a bank has to hire new staff, learn about the risks and processes of a new market, and determine a precise “box” of what kind of project and credit they are willing to lend to. This process takes time, commitment and money, all of which will only come with a greater understanding of market potential and risks.

What are the Benefits of a Green Bank?

Green Banks produce many benefits for government, for consumers and for businesses, and are a win-win-win approach to clean energy market growth. These key benefits include:

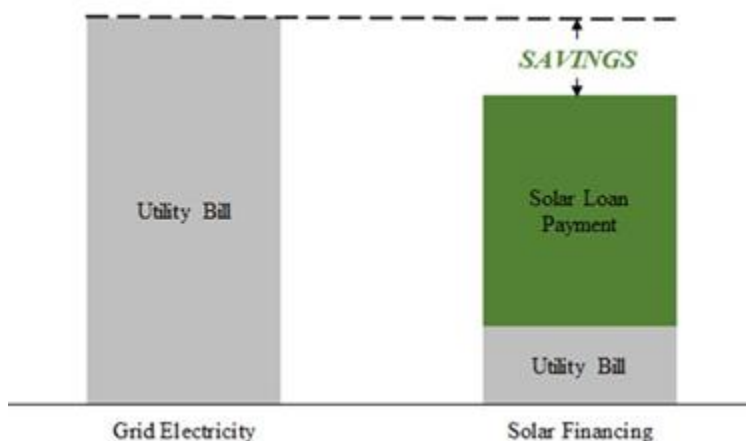
- Low-cost market growth;
- Greater leverage of public capital with private co-investment;
- More efficient government;
- Job growth & economic development; and
- More money back in citizens’ pockets.

These benefits are explained in greater detail below.

Low-Cost Market Growth

Green Banks aim to bring clean energy market to scale by focusing in price – the only way to stimulate broad demand for clean energy is by offering consumers a way to save money on energy. The combination of rapidly falling technology costs and financing at affordable terms mean that consumers and businesses can now use clean electricity and/or lower overall usage with no upfront cost and lower overall energy spending. Financing that is appropriately structured can be net-cash flow positive, meaning a customer can save more money each month than they owe for financing repayment. Grants are a helpful tool for lowering the technology cost, but not cover all upfront costs and do not enable cash-flow positive clean energy. By offering financing, Green Banks unlock demand and give customers an attractive means to save money on energy.

Figure 2: Green Bank Positive Cash Flow Structure



This is a low-cost method for market growth because, by using financing, the government preserves its capital and reduces overall expenditure. The amount of grant dollars needed can be reduced when it is paired with 100% financing, and the overall cost the government of supporting clean energy markets can be reduced. And because the Green Bank focuses on products and solutions that ensure reduced energy costs, there is no increased cost of energy pushed either on participants or citizens.

Please see the attached *Appendix A* for a detailed discussion on how Green Banks can lower the price of clean energy by transitioning from grants to loans.

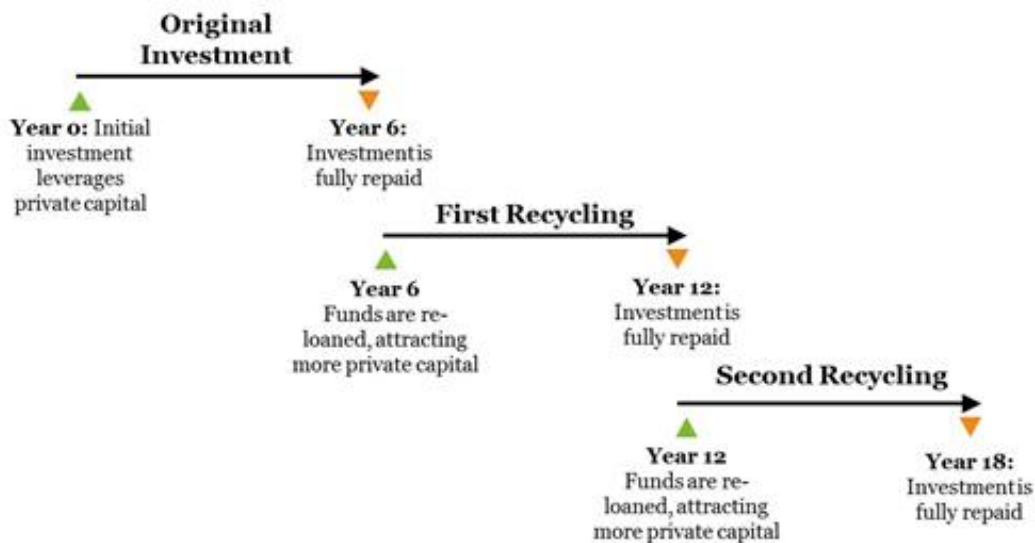
Private Sector Leverage

Green Banks leverage public dollars with private investment through public-private partnerships. Green Banks use a range of financial techniques and structures to achieve this leverage (described below), but across products, Green Banks can draw in multiple private dollars of investment per public dollar. For example, a loan loss reserve credit enhancement may enable \$10 of private lending per \$1 of public investment put in reserve. This 10:1 ratio stands in stark contrast to typical grant programs. Through Green Bank structures, public dollars go farther, getting more “bang for the buck” on public investment. And because public dollars are lent and repaid, the same public dollar can be recycled and used to draw in more private dollars again in the future.

More Efficient Government

Green Bank financing makes government more efficient in a number of ways. The first is that by offering financing, rather than grants, Green Banks preserve public capital and reduce total public expenditure while still driving positive market outcomes. Financing is critical to achieving broad market uptake, yet public dollars used for financing are far more valuable to the public sector because they do not represent an expense. For example, \$10 million in public funds put toward a grant program are spent in a given year. This becomes a recurring expense that requires more public funding every year. However, the same \$10 million invested in a Green Bank would still be worth \$10 million in the future because the funds are preserved through financing.

Figure 3: Green Bank Recycling





Green Banks represent more efficient government because they use public dollars in a way that is able to achieve greater market outcomes. Specifically, a public dollar put towards financing rather than grants will enable deeper energy efficiency retrofits to occur. Deep, multi-measure efficiency or clean energy projects have long payback periods, and therefore are only viable with 100% upfront financing at long terms. A public dollar used for a grant cannot facilitate this kind of project unless grants will pay for the most of or the entire cost of the project, which is an extremely expensive approach to market growth. However, that same public dollar used to financing can achieve greater energy savings and dollar savings for energy users because financing is the key to unlocking deeper retrofit projects.

Green Banks can also help government operate more efficiently by helping to coordinate cross-agency efforts to engage with and stimulate clean energy markets. By offering technical assistance to potential clean energy adopters, providing easy and clear information, and guiding customers to the appropriate state program, whether housed in the Green Bank or not, a Green Bank can ensure that government support is effectively reaching market actors. Presently the wide range of government programs offered can create market confusion, with customers unsure how to access government support, or which agencies to reach out to. A Green Bank can spur greater coordination among government programs in order to present a more unified and simple face for customers to interact with.

Job Creation & Economic Development

A Green Bank would also be an engine for economic growth and job creation, spurring direct investment in the state. The availability of financing removes barriers to adoption and helps increase demand for clean energy technologies and installations. This in turn drives new businesses to develop and existing businesses to grow to meet this demand. A growing clean energy economy means more contractors, more installers, more engineers and more employees in other related services. Through its first three years of activity, the Connecticut Green Bank created nearly 4,000 direct and indirect jobs.¹ And because clean energy projects are typically located at buildings or other local sites, jobs created through Green Bank investment cannot, by definition, be outsourced. Installing new technologies will require local jobs with boots on the ground at the point of installation. And because Green Banks leverage public dollars with greater private investment, each public dollar can cause more clean energy deployment and, therefore, more job creation than under current grant programs.

A Green Bank can stimulate economic activity in another way, by opening up new and profitable investment opportunity for the lending community. Presently, cost-effective, low-risk and profitable clean energy investment lay fallow for lack of capital. By working with local lenders, Green Banks draw in more market participation and increased market understanding for credit unions, community banks and other local lenders. Green Banks allow lenders to learn about the risks and processes of clean energy investment while operating with a safety net that comes with a credit enhancement or government co-investment. As demonstrated in other states, initial Green Bank investments can quickly lead to huge in-flows of private capital. For example, the Connecticut Green Bank seeded a \$5 million solar loan fund in 2013 to demonstrate market potential. Within a year, that pool of dollars had been expended, and the private origination partner had been able to source its own private capital. Because the Green Bank shined a light on the market opportunity, the Digital Federal Credit Union created a new \$100 million warehouse for solar loan investment, allowing the Green Bank to pull back its capital and let the private sector take over.² This is a perfect example of how Green Bank activity can increase business opportunities for the state's lenders.

¹ Connecticut Green Bank Comprehensive Annual Financial Report Fiscal Year Ended June 30, 2014.

² Reporter's Notebook, "Green Bank partner lands \$100M solar investment," Hartford Business Journal, November 10, 2014.

More Money Back in Citizen’s Pockets

The bottom line benefit of a Green Bank is that it can save money for taxpayers and ratepayers, putting more money back in their pockets. A Green Bank can do this in two ways. The first is that by using dollars for financing, rather than grants, Green Banks can preserve public dollars and reduce the amount of annual expenditure that must be used to stimulate market growth. Where grants are collected, expended, and lost every single year, a Green Bank retains its value, preserving dollars through financing. Those dollars could conceivably be return to taxpayers at some point in the future, or repurposed for other government needs. And because the public dollars used for financing are also able to leverage far greater private investment, the public sector burden for clean energy market growth can be reduced.

The second way that Green Banks can return dollars to taxpayers is by achieving deeper energy savings and expanding cheap, clean energy opportunities. Financing is critical to penetrating deep energy efficiency retrofit markets. So a Green Bank can extract more energy bill savings for businesses and residents by allowing more comprehensive energy retrofits. And more broadly, financing creates access to all sorts of clean energy projects that otherwise were inaccessible to those without the ability to pay large upfront costs. A customer who can pay a lower price for rooftop solar electricity than for grid electricity can only access those savings with upfront financing. Today private lenders are serving that market, but only a portion, specifically those with high credit scores. A Green Bank can democratize access to cheaper clean energy and energy savings.

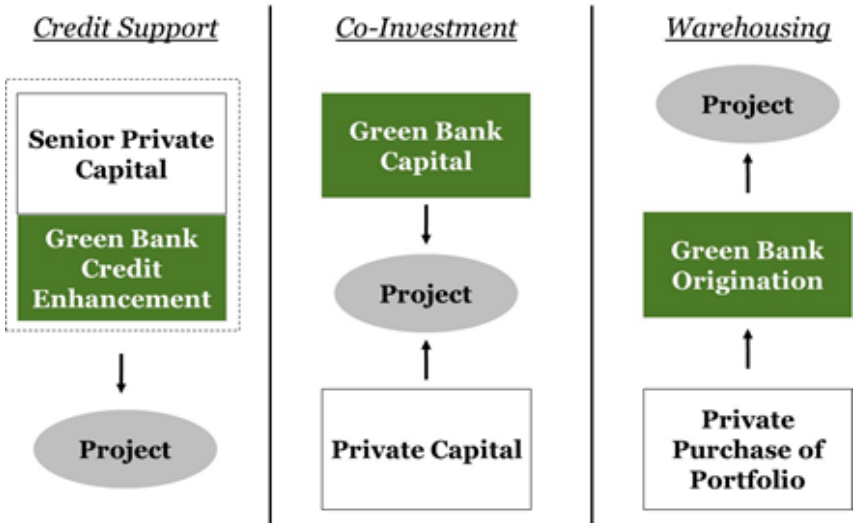
What Do Green Banks Do?

Green Banks generally use a common set of techniques and structures to offer public financing and leverage private investment in clean energy. These methods form the basis of many specific Green Bank activities and applications, and are adaptable to fit multiple markets segments and technologies. To complement financing, Green Banks also spur demand and develop markets to lower barriers to market penetration.

Financing Techniques

The following techniques form the three fundamental categories of forms of Green Bank financing activity. All Green Banks are using some derivation of these fundamental categories.

Figure 4: Green Bank Financing Techniques





Credit Enhancement

A credit enhancement is a tool offered by a Green Bank with the goal of increasing private lending activity and/or improving the terms of private financing. Green Banks accomplish this through multiple means, but loan loss reserves and loan guarantees are most common. This technique is suitable for a market where private lenders are interested in entering the market but are hesitant due to perceived risks. Or, a credit enhancement can be used when private lending is available, but at terms and rates that reduce the viability and market potential for clean energy projects. These kinds of investments can achieve high leverage ratios, stimulating many dollars of private investment per public dollar spent.

Co-Investment

Co-investment involves direct Green Bank investment in a clean energy project alongside a private investor. Unlike credit enhancements, where public dollars are not actually invested in the project technology, co-investment can take multiple forms and structures of actual project investment. A Green Bank may provide senior debt, subordinated debt, or equity in a project, which is then paired with multiple potential forms of private investment. For instance, a Green Bank and private bank may each make a 50% debt investment in a project. Or, a private investor may offer 80% of the debt needed for a project, and the Green Bank makes a 20% subordinated debt investment. This structure both fills financing gaps *and* acts as a credit enhancement for the senior debt. The leverage achieved on these co-investments depends on the precise product structure, and by its nature requires the presence of a private lender willing to at least make some level of investment in a project.

Warehousing/Securitization

In the event no private lender is willing to underwrite loans, even with a credit enhancement, it may be suitable for a Green Bank to underwrite 100% of a loan itself. This situation may arise if the technology itself is perceived as too risky or new, if the market segment is viewed as having more credit, or if the investments themselves are not cost-effective to underwrite. This final challenge is a significant barrier to private investment in small and geographically dispersed projects like residential or small business energy efficiency projects. By their nature the projects are relatively low cost and may differ in terms of credit, technology and location. This makes the projects relatively expensive to underwrite for a bank and – on an individual basis – not worth the trouble. However, if a pool of these kinds of loans were bundled together to diversify risk and achieve scale, the projects then become far more attractive to lenders. A Green Bank can accomplish this by underwriting loans directly and warehousing them until scale is reached. At this point the Green Bank can sell the loans to private investors. This can be done either through a private placement of the whole loans, a private securitization, or a public securitization. If the Green Bank is able to sell its entire stake in the portfolio of loans, then 100% of public dollars are replaced with private capital, effectively achieving infinite leverage. This technique is critical to allowing small clean energy projects to access the low-cost capital that can be found in publicly traded debt markets that are tapped through securitization.

Financing Structures

Green Banks can use the described financing techniques through a number of structures that the clean energy financing industry has developed as new delivery mechanisms. These delivery mechanisms were created to increase the security for a lender that otherwise would be making an unsecured loan with a perceived risk of repayment. These structures can be used with or without the involvement of a Green Bank, but it has been found that Green Banks are a suitable manager and implementer of these structures.

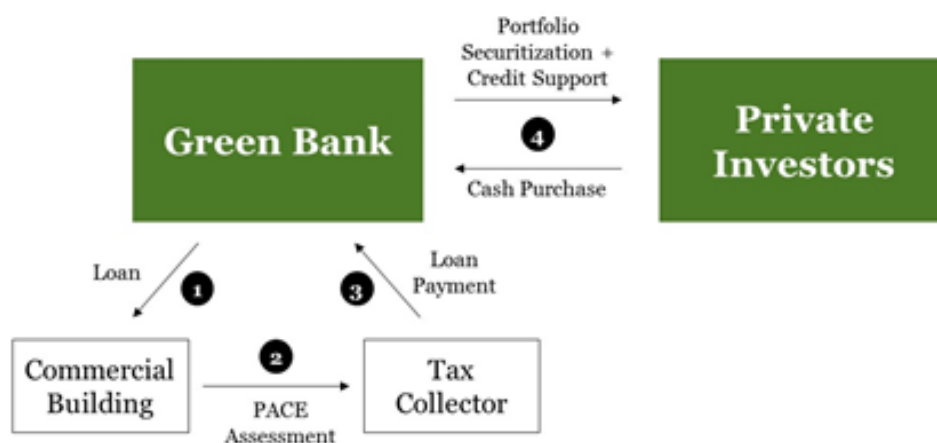
Property Assessed Clean Energy (PACE) Financing

PACE Financing is a structure through which a building owner repays an energy upgrade loan through property taxes via a new lien on the building. PACE liens typically sit senior to all other non-tax liens on a building, including the



mortgage, significantly reducing repayment risk. In any state that has passed legislation and any municipality that then allows PACE, technically a PACE loan can be made by any lender. The lender would provide a loan to a building owner to implement energy efficiency, for instance, and then the tax-collecting agency would place a new lien on the building equal to the loan repayment. That repayment is collected by the taxing agency and remitted to the lender. Though simple in concept this is difficult to execute and has struggled to attract private lenders in many states. However, Connecticut has found that the Green Bank is an ideal PACE program administrator *and* lender. A Green Bank could also offer a credit enhancement to entire private lenders into the PACE market. Many states that have relied entirely on private lender origination and underwriting have failed to create active PACE markets. Green Banks present a successful solution.

Figure 5: PACE Financing Warehouse



On-Bill Financing/Repayment

On-bill financing or repayment is a structure through which an energy upgrade loan is repaid through the customer's utility bill. Similar to PACE, this structure creates greater security for the lender because historically utility bills have a very high rate of repayment. On-bill financing has additional benefits, too, because it addresses the split incentive between building owners and tenants. By attaching a loan to a utility meter, rather than the customer, a tenant can reap the benefits of efficiency, repay only the portion of the loan that is due while still a tenant, and then hand the remaining payments to the next tenant who continues to benefit from the efficiency. This has the power to open up many new markets for efficiency financing that otherwise would be unsuitable. Like PACE, a Green Bank could act as a program administrator and/or a lender for on-bill programs. (Note: On-bill financing typically refers to programs where the utility itself uses its own capital to issue the loans. On-bill repayment refers to the programs that allow non-utility lenders to issue loans, where the utility merely acts as a collection platform.)

Market Development

Increasing the flow and availability of affordable capital is an essential element to market growth. But capital cannot be offered in a vacuum. Consumers and businesses must become engaged and understand the benefits of clean energy. And because the process of purchasing clean energy can be complex and multi-faceted, customers greatly benefit from a simplified process with a minimal burden for project management. Green Banks can play a central role in facilitating this kind of market maturation and information transparency.



Technical Assistance

A Green Bank can provide critical know-how, guidance and information to market actors to understand how to acquire clean energy technology and take advantage of state programs. For most market participants, the mere idea of choosing how to use and consume energy is a new concept. Therefore there is a sizable need for education and information. Consumers and businesses need to learn about technologies, clean energy economics, and adoption or purchase options. Procuring clean energy technologies, even in a straight-forward energy efficiency building upgrade, can be incredibly complex and daunting for new customers. The Green Bank can address these market challenges with a technical assistance program.

A green can offer a range of forms of market support. A “concierge service” can direct customers, contractors and businesses to the appropriate place in government to access various forms of support and information. A new website can provide clear, simple and comprehensive information about clean energy technology and the state’s current programs. Staff can help municipalities understand the project development process and direct them to engineers or contractors. And staff can give detailed guidance on financing options from the Green Bank or other potential sources. By streamlining information and creating a single point of access to learn about state programs, a Green Bank can greatly reduce market confusion and make clean energy seem more accessible. This initiative could be part of a broader state branding effort around clean energy, unifying all state clean energy programs under a single banner.

Turn-key Product Design & Delivery

Green Banks can help ensure that customer face a minimal complexity when considering a clean energy purchase. Today, adopting clean energy is typically a long, multi-phase and possibly intrusive process. This naturally stifles demand and discourages adoption. Part of the challenge is that the economic benefits are not clearly understood and harder to discern when faced with large upfront costs of adoption. Therefore Green Banks can help build the bridge between available capital and consumer demand by developing a turn-key, seamless adoption process. By asking customers to do little more than sign on the bottom line to immediately begin saving money, Green Banks can greatly reduce barriers to adoption.

Efficient and easy product delivery means designing easy-to-understand financing products that can be easily explained. It means pairing financing and clean energy as a unified offering, presented to the customer at a single point in time. It means training contractors to speak the language of financing and know how to sell clean energy with financing. And it means providing project management and technical assistance to give customers confidence that their project will be delivered and produce as promised. For instance, a Green Bank can provide the technical assessments needed to determine that a multi-measure project is indeed cash-flow positive. By using savings-to-investment ratios (SIRs), Green Banks can give customers confidence in an otherwise complex project. These kinds of demand-generating activities can and frequently are done in partnership with private actors.

Central Website & Access to Information

A simple solution is a single website that is the face of all Rhode Island programs. The site can inform customers about their options, understand the purchase process for clean energy, and then direct customers to the right program/entity, depending on the clean energy technology they want to adopt. From a customer perspective, clean energy is unknown and complex. The technology is new, the purchase is expensive, and the process of purchasing and installing can be incredibly cumbersome. The state can greatly minimizing these significant hurdles with an attractive and clear website that provides a roadmap for customers, and can identify suitable technology and programs to pursue. If prompted to answer just a few simple questions, a website can fare more accurately guide a customer to appropriate clean energy solutions and minimize confusion. For instance, simply by asking if a customer lives in a multi-unit apartment building, a website can be programmed to eliminate rooftop solar options from consideration.



A website can also work as an interactive hub for information about contractors and other providers of clean energy solutions. This kind of information can give customers confidence that they are working with a trusted partner that has been vetted by the state. Often, programs run by different entities will have a separate lists of approved contractors. These separate lists should be consolidated and unified into one list to make the process simple for customers. From the opposite perspective, contractors should be trained and educated on the full range of programs available that can be offered to customers, as they are the primary go-to-market channel for larger projects. Specifically, they may require training to understand the state's financing programs and learn how to sell a clean energy solution with financing (i.e. how to sell the savings and cash flow, not the loan).

What Green Banks Already Exist?

In the United States, five states and one county have state Green Banks and similar finance authorities. Abroad, four nations have national Green Banks. In the United States, Connecticut, New York, Hawaii, California and Rhode Island have state clean energy finance institutions. And Montgomery County, Maryland recently created the first county-level Green Bank.

Connecticut Green Bank

The Connecticut Green Bank was created in 2011 as the first state Green Bank in the U.S. Originally named the Connecticut Clean Energy Finance & Investment Authority; it was created through bi-partisan legislation that was initiated by newly elected Governor Dannel Malloy. The new Green Bank institution was born out of the existing grant-making institution, the Connecticut Clean Energy Fund. The Fund was repurposed and turned into a deployment financing entity. The Green Bank was created as a quasi-public agency, with a board of directors that are a mix of government officials and independent directors.

The Connecticut Green Bank is capitalized by two sources, both of which were identified in the legislation. The first is a systems benefit charge that collects roughly \$20 to \$25 million dollars per year. This was an existing system benefits charge, already in place in the state prior to the creation of the Green Bank. Previously the entire ratepayer collection went towards state-managed grant programs. The re-allocation of those funds to the Green Bank represents only a portion of the total collection, with the remaining funds still going toward grants. The new split in funding between grants and financing was based on a desire to build market-based mechanisms for clean energy growth. This re-allocation of funds was also driven by a desire to maximize private leverage from public funds and get the greatest "bang for the buck" for each public dollar. The second source of Green Bank funds are the state's proceeds from the sale of emission allowances through the Regional Greenhouse Gas Initiative (RGGI) Program. This repeated and perpetual capitalization means that the Connecticut Green Bank's balance sheet, and capacity to issue loans, continuously increases.

In addition to these public capital sources, the Connecticut Green Bank is authorized to issue its own bonds based on its own balance sheet. The Bank also has limited ability to issue bonds that are supported by a state bond reserve fund. This is not equivalent to full faith and credit, but does enable borrowing at lower rates based on the state's credit rating. The Bank has not yet issued bonds of this type to increase its lending capacity.

The Green Bank operates a number of residential and commercial financing programs, including a Solar Lease, a credit enhancement to enable private loans for residential upgrades, and Commercial PACE financing program. C-PACE is by far the most successful commercial PACE financing program in the country. These programs are explained in greater detail in *Appendix B*. The Green Bank also manages Solarize campaigns, trains contractors, and provides a number of other forms of support for market development



New York Green Bank

The New York Green Bank (NYGB) was created in December 2013 with the approval of funding by the Public Service Commission. It opened for business in February 2014 with the release of its open-ended RFP, seeking proposals for funding. Unlike the Connecticut Green Bank which offers specific retail products, the NYGB operates more like a wholesale infrastructure bank, working with lenders and developers who will then originate deals and offer retail financing. An ideal application to the NYGB will come from a private lender and developer together, who have a specific project that is only partially financed and needs the NYGB to fill the financing gap. The NYGB has no prescribed financing structures. However it will offer capital in the forms and structures outlined above, including loan loss reserves, guarantees, senior debt, subordinated debt, insurance, warehousing and securitization. The NYGB reviews and scores applications as they are received, and will only fund deals that (1) have the ability to scale, (2) can prove that private financing is unavailable for the entire project, and (3) can serve to transform clean energy capital markets. In the fall of 2015 the NYGB announced its first set of transactions, using \$49 million in public funds to leverage \$178 in private investment.³

Hawaii Green Infrastructure Authority

In 2014 Hawaii created a new Green Infrastructure Authority to manage clean energy financing programs. This first of these programs is called the Green Energy Market Securitization (GEMS) program, which will provide rooftop solar lease financing. GEMS uses a unique capitalization structure and is focused on narrow market segments, specifically the low-to-moderate income (LMI) market. Hawaii has the highest electricity prices in the country, making solar relatively cheap compared to the grid. This also means that increasing the availability of solar is a critical solar welfare issue in Hawaii. The advent of solar financing mechanisms like solar leasing enabled a huge portion of Hawaii homeowners to put solar on their roofs, with total market penetration above 10%. However, there was a huge difference in market adoption between high and low income households, as traditional solar leasing products were unavailable to low income and/or low credit households. The GEMS program was built to serve this specific market.

California CLEEN Center

The California CLEEN Center is a new financing initiative based within the state's existing Infrastructure Bank. It was created in fall of 2014 at the direction of the Governor. As described in the business plan, the objective of the CLEEN Center's programs is to "drive down the cost of EE projects and retrofits, leverage existing public programs, encourage private investment and earn investment returns for the IBank and partner with market intermediaries." This statement encompasses the broad set of objectives typically held by a Green Bank. The CLEEN Center's first two programs will be the Statewide Energy Efficiency Program (SWEEP) and the Commercial & Industrial Energy Efficiency Programs (CEEP). The programs will fill market gaps where viable efficiency projects are unable to access reasonable financing, specifically targeting the municipal, university, school and hospital (MUSH) market, as well as the Commercial & Industrial (C&I) market. The CLEEN Center is also designing a specialized LED street lighting program that will enable municipalities to swap out old street lights for LEDs while remaining cash flow positive throughout the term of the loan. Through each of these programs, the CLEEN Center will offer senior debt, subordinated debt, or credit enhancements to enable private sector investment

Rhode Island Infrastructure Bank

Recently-elected Governor Gina Raimondo campaigned and was elected on a pledge to create a state Green Bank. Rhode Island determined that the best path to creating its Green Bank was through legislation. And rather than build an entirely new institution, the Green Bank would be built upon an existing entity with a track record of success. The

³ Press Release, "Governor Cuomo Announces Three NY Green Bank Transactions to Improve Access to Clean Energy and Reduce Greenhouse Gas Emissions," October 21, 2015.



state's Clean Water Financing Authority (CWFA), which had financed water projects in the state for many decades, was tapped to become the Green Bank. The CWFA would be given expanded authorities to address clean energy markets, and be renamed as the new Rhode Island Infrastructure Bank (RIIB).

This new organizational structure was passed into law in June 2015 as part the Governor's fiscal year budget legislation. The RIIB was assigned responsibility for two specific financing programs in the legislation, which are to become the first Green Bank products in early 2016. RIIB has responsibility for designing, administering and possibly financing both commercial and residential PACE in the state. RIIB chose to follow the Connecticut model with a single, state-wide PACE administrative authority. The RIIB was also tasked with designing and implementing an Efficient Buildings Fund (EBF), which will finance energy upgrades for municipal buildings in the state. RIIB activities are funded through a combination of RGGI proceeds, system benefit charges, remaining federal ARRA funds, and a small amount of re-directed operating funds. The RIIB also has the authority to issue state qualified clean energy bonds (QECBs). In sum, these funds are intended to both serve as an equity portion of a broader bond issuance, as well as support a larger agency operation. The bond issuance, the proceeds of which will finance the EBF program, is estimated to raise \$20 million. RIIB, like the CWFA before it, is a quasi-public agency with a board of directors, where the chairman is appointed by the Governor.

What Have Green Banks Accomplished?

The Connecticut Green Bank is the most mature and developed Green Bank in the country, and has achieved incredible results after four years of operation. The Connecticut Green Bank has sparked remarkable growth in the state's clean energy markets. In FY2015, the Green Bank sparked \$365 million in total clean energy investment in the state, while achieving a private: public leverage ratio exceeding 5-to-1. This stands in sharp contrast to the market condition prior the Green Bank's creation. In the eleven years of operation of the prior Clean Energy Fund, a total of \$350 million was invested during that whole time period. And of that total, approximately half of the funds were public dollars, and nearly all were in the form of grants. Under the Green Bank, markets have grown quickly through greater private investment. And the public dollars that are used are returned to the Green Bank through repayments on financing. The Connecticut Green Bank is now developing new products to expand its market coverage to include the low-to-moderate income (LMI) sector and clean transportation.

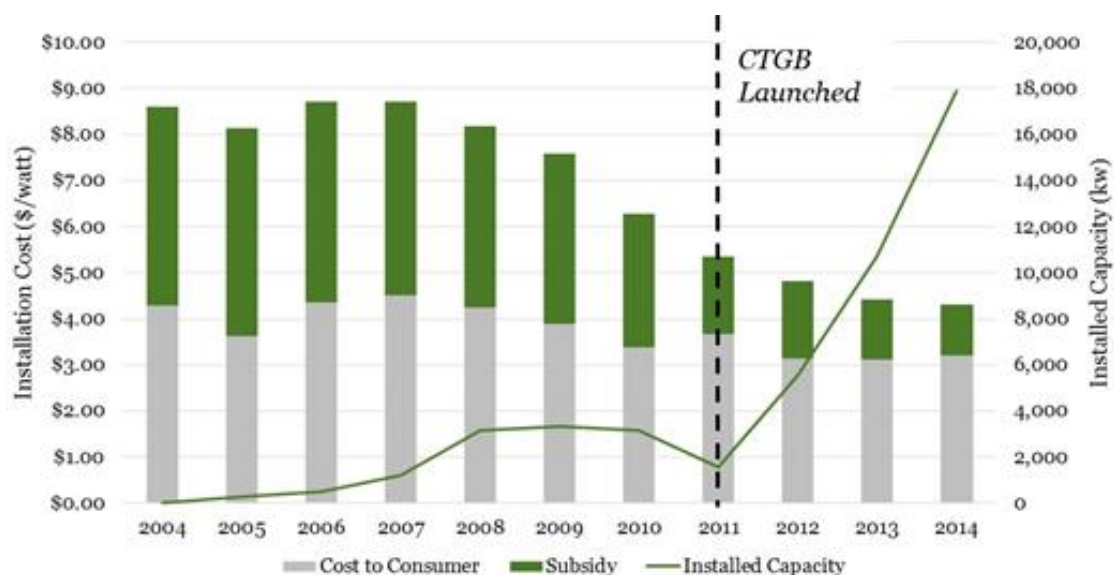
Table 1: CT Green Bank Outcomes V. Prior Grant-Making Entity

	FY 2000 – FY 2011 (CCEF)	FY 2012 – FY 2014 (CGB)	FY 2015 (CGB)
Model	Subsidy	Financing	Financing
Years	11	3	1
Energy (MW)	43.1	65.3	62.6
Investment (\$MM)	\$350	\$350	\$365
Leverage Ratio	1:1	5:1	5-10:1
Investment % Loans	9%	57%	77%



The solar market, specifically, has grown dramatically since the Green Bank's creation. By law, the Green Bank was assigned the responsibility for winding down the existing state solar rebate program, and transitioning toward a financing based model. Under this approach, residential rooftop solar penetration has increased rapidly despite a consistently falling solar grant amount. This is because financing is now consistently available and affordable, covering all the upfront costs of adoption. With financing, the amount of grant offered falls, as solar can be economically viable *and* attractive to customers without enormous subsidies.

Figure 6: CT Green Bank Residential Solar Market Growth



What Other States are Exploring Green Banks?

CGC is working with many other states that are currently considering or actively developing Green Banks and state clean energy financing authorities.

Maryland

In the spring of 2014, the Maryland state legislature passed a bill directing the Maryland Clean Energy Center to conduct a formal study of the need for a Green Bank in the state. The study will also identify specific Green Bank financing products and structural options for the state. CGC is completing this study on behalf of the Clean Energy Center.

Delaware

The Delaware Sustainable Energy Utility (SEU) is working with CGC to identify ways that the SEU could increase its financing activity, modelled on Green Bank principles. The SEU currently receives a large portion of RGGI proceeds, and wants to develop methods for better leveraging those funds to grow clean energy markets.

Washington, DC

In the spring of 2015, the District Department of Energy & Environment issued an RFP for the completion of a study to assess the need and potential for a District Green Bank. CGC won the contract and is currently working on the study. The first phase of the study was completed which found a significant need for greater clean energy investment in order to meet existing renewable end climate goals. Phase 2 will be completed by March 2016.



Nevada

In the summer of 2015, the Nevada state legislature directed the interim Legislative Committee on Energy, in partnership with the state energy office, to complete a study of a potential Nevada Green Bank. CGC is slated to complete this study in partnership with the state energy office, which a scheduled completion in summer. Legislation to create a Green Bank could be introduced in January 2017.

Virginia

In 2015, the Governor formed a Climate Commission, made up of leading policymakers, advocates and market participants, to propose climate-related solutions that were market-oriented and could be implemented with little political opposition. The number one recommendation to come from that Commission, as voted on by members, was the creation of a state Green Bank to increase financing for clean energy and resiliency. The Governor is now considering next steps for implementation.

Vermont

In Fall 2014, Vermont energy and economy leaders formed a steering committee to oversee a Clean Energy Finance Initiative, aimed at uncovering the need and opportunity for increased public financing for clean energy deployment. The Committee includes the state's Secretary of Commerce, Treasurer, Deputy Director of the Public Service Department, and other key actors. Work on this initiative is on-going, led by CGC with other in-state partners.

Massachusetts

There are currently two bills pending in the Massachusetts state legislature that propose creating a state Green Bank. Both bills are scheduled to be heard in committee in January 2016.

Colorado

The Colorado state energy office has received approval from the Governor's office to explore the Green Bank concept and prepare a formal proposal for Green Bank creation for the Governor's review. If approved, the Governor would introduce Green Bank legislation in 2016. Green Bank discussions in Colorado have included the potential for including water, transportation and other infrastructure. CGC has been advising the energy office as it prepares its proposal.



Appendix A – Grant & Financing Optimization and Design to Lower the Clean Energy Price

A helpful framework for assessing appropriate grant and finance levels is to examine the economics of a specific transaction and the relevant value flows. The value flows for renewables and efficiency are different, though the fundamental economic benefit to customers come from savings on energy bills. Through this transaction-specific lens, policymakers can better understand the level of grants and/or financing needed to spur adoption of clean energy solutions.

Energy Efficiency

Energy efficiency technology, generally, is net-present value (NPV) positive. This means the discounted present value of the savings on energy bills that come from energy efficiency are greater than the cost of the efficiency measure itself. Therefore, effectively in any energy market, energy efficiency is economically viable and cost-competitive with grid electricity without any incentive, grant or rebate. This does not mean rebates are entirely unnecessary, as they are a proven tool for attracting customers and generating demand. However it is important to note that energy efficiency rebates are *not* necessary for economic reasons, but purely for marketing reasons.

A rebate, then, may attract a customer to purchase efficiency technology, but the customer in most cases still must pay cash out of pocket for the purchase (assuming the rebate doesn't cover 100% of the cost). This has two consequences. The first is that customers may still hesitate to purchase efficiency technology because out-of-pocket payment is still required. A deep energy retrofit on a home may cost \$25,000. A \$5,000 rebate is helpful, but still leaves \$20,000 in upfront costs. The second consequence of requiring upfront cost is that the customer will necessarily consider the efficiency investment in terms of *payback period*. Payback period is the amount of time it takes for the cumulative savings of an efficiency project to equal the total upfront cost the customer paid. The problem with this framing is that most customers require incredibly short payback periods in order to go through with an efficiency transaction. If the payback is more than 3 years, for instance, the customer may decline the purchase. Therefore, upfront cost and payback period are inversely related.

This may lead to the conclusion that a larger rebate is necessary, but this is economically expensive for the state and economically unnecessary since the role of the rebate is purely to attract customers. Instead, if financing can be offered to cover the upfront cost remaining after the rebate, then the customer will face zero out-of-pocket cost. 100% financing is critical because it entirely alters the framework through which the customer assess the project. Payback period is no longer the relevant metric. As the customer has zero out of pocket cost, there *is no payback period*. Rather, the metric for consideration is now cash flow. Specifically, do the monthly energy savings exceed the monthly loan repayment. If the loan can be structured to achieve this cash flow, then the project is net cash flow positive from the outset of the project. The customer must make no cash out lay and begins saving money immediately. The customer does not have to wait for a date long into the future to begin seeing savings.

Three lessons of program design flow from this important reframing of efficiency purchases. The first is that the optimal level for an efficiency rebate is the lowest possible amount that still attracts customer adoption. The state should want to minimize rebates to save money for ratepayers/taxpayers, without disrupting market growth. The second lesson is that any upfront cost not paid for by a rebate should be paid for through financing. This financing can be either public or private, but the objective should be to give the customer efficiency with no upfront cost. (It is likely the case that when paired with 100% financing, rebate levels can be reduced from current levels without disrupting market growth.) The third lesson is that the financing offered will need to be at terms that generate a net cash flow positive stream over the course of the project. This means the loan term ideally matches the expected life of the efficiency measures, and



the interest rate offered will be at a level that allows monthly payments to be below the amount of monthly energy savings. If private lenders are unable or unwilling to offer financing at such terms, a Green Bank or clean energy financing authority can facilitate financing as needed.

Renewable Energy

Renewable energy generation, unlike energy efficiency, cannot be assumed to be NPV positive – it is not necessarily cost-effective for a customer. The common framework for assessing the economic viability of renewables is to compare the effective price of a given generation system to the cost of grid electricity. If the effective price of generation, or the levelized cost of electricity (LCOE) is below the cost of grid electricity, then it makes sense for a customer to choose renewable power over grid electricity. This framework is commonly applied to distributed solar generation, whether installed on rooftops or for community solar installations. Through this lens a state can precisely identify the level of rebate needed, if any, to make solar economically attractive to customers.

To calculate the LCOE of a specific solar system, all upfront and lifetime system costs are discounted to present value, and then divided by the lifetime generation of the system. This produces a dollars/kwh metric that can be compared to grid power. The upfront costs of solar includes the cost of the technology and installation. These costs need to be offset, though, by any rebates or other incentives offered by state or federal government upfront. There are effectively no long-term, on-going costs to solar, unless the system is financed. In that case, there is no upfront cost to the customer, but rather a stream of on-going payments that need to be discounted to present value. There may also be on-going benefits, in the form of performance based incentives or renewable energy credits. These benefits would need to be discounted and offset against the upfront system cost.

The common set of costs and benefits to be considered in a solar LCOE analysis are:

- the upfront cost of the system if it is not financed through a lease or loan;
- on-going financing payments (lease or loan) if the system is not paid for entirely upfront;
- the federal investment tax credit, worth 30% of the system cost;
- the tax benefits of accelerated depreciation if the system is leased, worth approximately 25% of the system;
- the value of renewable energy credits generated by the system; and
- the value of any additional state-specific rebates, performance incentives, or tax breaks.

Each of these value streams can be estimated, discounted to present value, and summed, and then divided by the expected generation of the system to determine the effective price of solar.

Through this framework, a state can easily determine how much rebate is necessary to produce a price of solar that is price competitive with grid power. In theory, if customers were perfectly rational, a state could adapt its rebate policies to produce an LCOE that is marginally less than the grid price and expect all viable customers to convert to solar. Evidence suggests, though that a more noticeable price advantage is necessary to drive conversions. So, for instance if the grid price of electricity is 18 cents per/kwh, a state may set its policies to produce a price of solar that is 16 cents/kwh, rather than 17.99 cents/kwh.

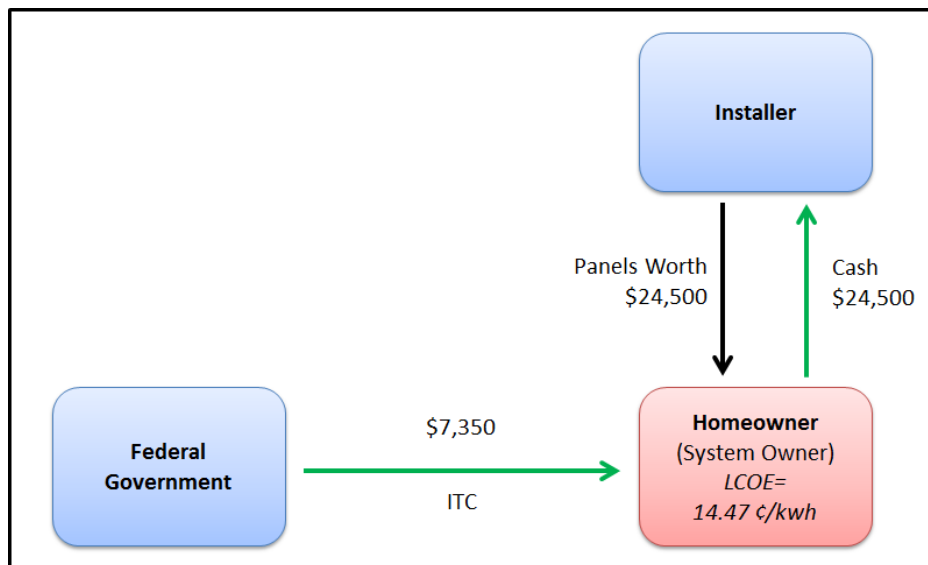
Economic analysis may reveal that a sizable rebate is necessary, or possibly that no rebate is necessary at all. Rebates set above the necessary levels are an unwarranted expense for the public, and rebates offered in the absence of private or public financing options may unintentionally act as a wealth transfer. If financing is not available, a \$5,000 rebate on a \$25,000 system is likely to only attract very wealthy customers who can pay \$20,000 out of pocket. Alternatively, a

lower grant may still produce solar at a competitive LCOE, and public dollars can instead be put towards offering financing to those that cannot get it through private capital sources. This not only eliminates all upfront costs for consumers - the number one barrier to adoption - but also has the added benefit of preserving taxpayer dollars through loans that are repaid.

It is important to consider the cost of financing. The interest rate, or cost of capital, can be a significant lever on the effective price of electricity from the solar system. A drop in the cost of capital of 3.5 percentage points can reduce the LCOE of solar by nearly 30%. Therefore any public financing solution, whether in addition to or in place of a grant, will need to carefully assess the economic impact of various costs of capital on the solar deal.

In Rhode Island, for example, the price of residential electricity in July 2015 was 17.59 cents/kwh. Today, under any purchase model, the LCOE of residential solar is equal to or less than grid power *without any state subsidy or REC value*. Accounting solely for the federal tax credit and accelerated depreciation (MACRS), residential solar is cheaper than grid power in Rhode Island whether purchased with cash or a loan, or used via lease. Under a cash purchase, the estimated LCOE of solar in Rhode Island is 14.47 cents/kwh. If purchased with a loan, the LCOE of solar is 16.56 cent/kwh. This assumes a loan at 6% and 15 year term. And a system that is owned by a third-party and leased to a resident has an LCOE of 16.02 cents/kwh, assuming an effective cost of capital of 9% and 15 year term.⁴

Figure 7: Example RI Solar Cash Purchase



⁴ Assumes installation cost of \$3.50/watt. The national average for residential installation at the end of 2014 was \$3.48/watt, according to the Solar Energy Industry Association and Greentech Media.

Figure 8: Example RI Solar Loan Purchase

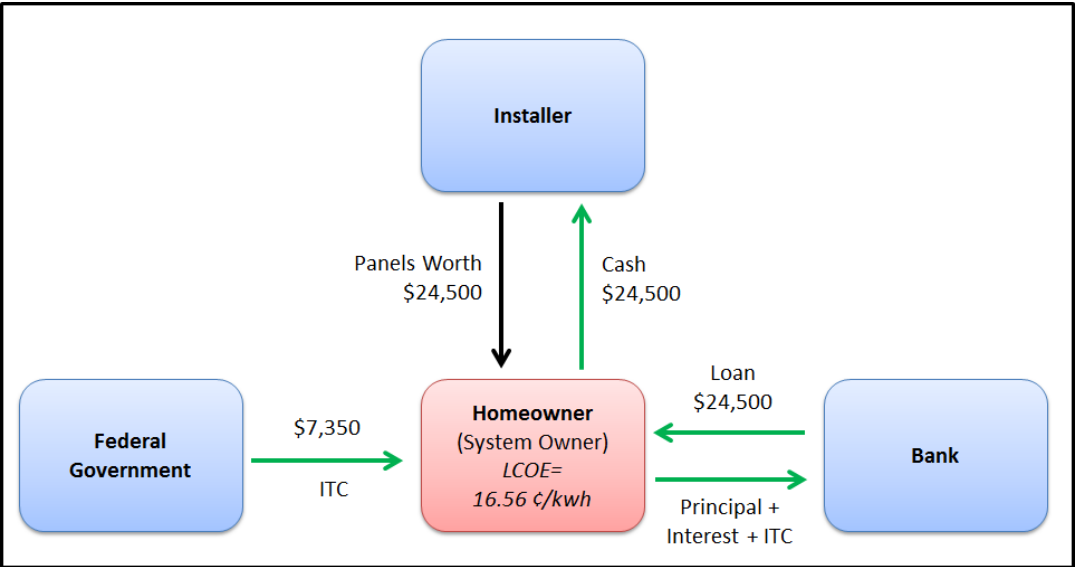
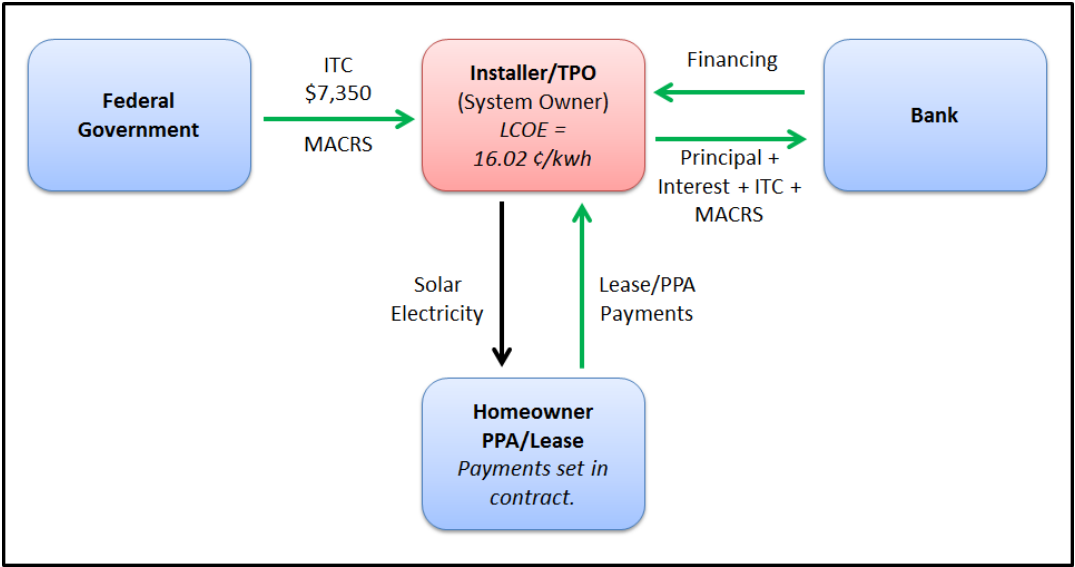


Figure 9: Example RI Solar Lease





Again, this means residential solar is competitive in Rhode Island without any additional rebate from the state in the form of a cash grant, a performance based incentive, or a feed-in tariff. With or without an additional state subsidy, the system owner is also generating and entitled to getting value for RECs. The price of a REC today in Rhode Island is approximately \$50/REC. If a customer were able to sell the system's RECs on a 15-year, fixed price contract at \$30/REC, that would give the system owner another \$3,556 in value, further reducing the LCOE of the system by approximately 3.0 cents/kwh. Therefore under current market rules a customer purchasing solar with cash and getting value for their RECs pays an effective price of solar of 11.47 cents/kwh, which is 35% cheaper than grid power.

This analysis demonstrates that in Rhode Island, public dollars devoted to rebates are an unnecessary public expense. Solar economics in the state do not require a rebate, meaning that as the state considers optimal solar program design, it may choose to devote limited public resources to financing rather than rebates. Dollars put towards financing can eliminate the primary barrier to adoption – the upfront cost – and are preserved as a public asset, rather than an expense. Broadly, no matter the market specifics, this LCOE-based framework that focuses on value flows can help optimize a program design that allocates public resources appropriately between rebates and financing.



Appendix B – Connecticut Green Bank Products & Programs

The Connecticut Green Bank effectively acts as a retail lender, working closely with end borrowers to either directly lend or enable direct lending for renewable energy and energy efficiency projects. It offers four primary products, two of which are being transitioned to private lenders.

Smart-E Loan – Residential Energy Upgrades

The Connecticut Green Bank provides a standard-offer loan loss reserve fund to enable local banks to make “Smart-E Loans” to residential customers to perform building upgrades. Rather than make loans directly to homeowners, the Green Bank seeks to spur greater activity and market understanding about retail lenders in Connecticut. To move these banks into the building energy upgrade market or entice those banks to offer more favorable terms, the Green Bank set up a loan loss reserve credit enhancement to cover a portion of potential losses a bank may have on those energy loans. This is technically a second loss reserve, where the bank bears the first dollar of loss, and the Green Bank takes a portion of losses after that (but not 100% of losses). In exchange for receiving the benefit of this credit enhancement, the participating banks agree to offer loans at extended terms with “not-to-exceed” rates that ensure borrowers can be cash flow positive on their energy projects. This has been found to be an essential component of project viability, and is only possible with long terms and reasonable interest rates. This form of credit enhancement is more efficient than an interest rate buy down or a full guarantee. An interest rate buy down is effectively a grant, as the Green Bank would have to make permanent cash payments to the banks to reduce their rates. Under the loan loss reserve, the Green Bank must only set aside cash that is drawn from only in the event of a loss. If there is no loss, then public dollars are preserved and can be used for other lending activity. And the reserve is more efficient than a guarantee because fewer dollars must be set aside to support the reserve than the guarantee. To date the product has been adopted and used by dozens of banks, many of which have partnerships with contractors that originate deals for the banks. And losses, with the resulting draw down from the Green Bank’s reserve fund, have been minimal.

CT Solar Lease II – Residential PV Solar Lease Product

The Connecticut Green Bank created the first state-sponsored solar lease fund in the country when it began offering the CT Solar Lease in 2008 through its predecessor agency. This product found initial success and was built again at greater scale in 2013 after the Green Bank was created. The purpose of this product was to provide local installers a financing product they could offer customers who could not buy a solar system with cash out of pocket, and didn’t want to own the panels themselves (as with a loan). As major national third-party owners (like SolarCity) began offering solar leases and PPAs, local installers in Connecticut that were too small to build their own financing products were left unable to serve the growing customer base in the state.

The Green Bank built a sophisticated tax equity-based lease fund to serve this specific market. The Green Bank formed a new special purpose vehicle (SPV) that would technically own the solar systems on homeowners’ roofs. The Green Bank made both an equity and subordinated debt investment in the SPV. A syndicate of banks, led by First Niagara, made senior debt investments, and US Bank was the tax-equity provider that would receive the federal tax benefits provided to solar investors. The Green Bank also provided a loan loss reserve credit enhancements using leftover federal ARRA funds to support the senior debt investors. The solar lease was offered with panel insurance and a warranty, removing any burden from system management from the customer who only had to make monthly payments for the use of the panels. This product has been a huge success and funds have almost been entirely expended. This product also created a strong base of political support for the Green Bank among the local installers who could not have survived without being able to offer financing to customers.



CT Solar Loan – Residential PV Solar Loan Product

When the Connecticut Green Bank was formed in 2011 no solar loan option was available in the state. If a homeowner wanted to own the panels on their roof, but didn't have \$25,000 in cash on-hand, that consumer had no way to adopt solar. To address this the Connecticut Green Bank launched the CT Solar Loan product, using \$5 million in public dollars to finance loans through its private origination partner, Sungage. The Green Bank then took two steps to draw in private capital. First, the Green Bank found a private investor, the crowd-sourcing platform Mosaic, to purchase 80% of the loan portfolio, immediately replacing public capital with private dollars.⁵ Second, after showing market potential, Sungage raised a private financing warehouse from Digital Federal Credit Union, who provided \$100 million for Sungage to originate far more solar loans across many more states.⁶ The Connecticut Green Bank pulled back its own capital, and allowed the private market to take over at greater scale.

Commercial PACE – Commercial, Industrial & Multifamily Building Upgrades

Through Commercial PACE, CT offers whole-building commercial energy retrofits. The whole-building approach to energy upgrades has long been viewed as the most effective way to significantly curtail energy consumption, but the projects are hard to execute and finance. They include multiple energy efficiency technologies and can also include roof-top solar when appropriate.⁷ The Connecticut Green Bank is able to finance these projects through its Commercial Property Assessed Clean Energy, or C-PACE, program. PACE is a structure that allows a borrower to pay back a clean energy loan directly through their building's property taxes. This makes payback easier for the customer and increases security for the lender, thus enabling more and lower-cost lending.

PACE is legally authorized in over 30 states, but Connecticut is one of only a two states to achieve significant scale with the program. Unlike in most states where each local government is charged with creating their own program, the Connecticut Green Bank is tasked with administering the program across the entire state. Through central administration the Green Bank implements programmatic consistency and standardization, critical elements for private investment. And the Green Bank also ensures that every loan offered can be paid back entirely through the savings generated by the project, as stipulated in the state's legislation. The Green Bank uses a standardized and rigorous technical underwriting method to ensure that every project has a savings-to-investment ratio ("SIR") greater than 1.

PACE programs all over the country have stagnated and failed to attract private capital because of program complexity and small investment scale. But the Connecticut Green Bank was able to kick-start the market by originating and underwriting PACE loans itself using public dollars and build scale by aggregating projects. Loans are offered at approximately 6%, which is low enough to expand the addressable market and make projects cash flow positive, but high enough to attract private investors who want to buy the loans from the Green Bank. After building a portfolio large enough to attract private investment, the Green Bank sold 80% of the PACE loan portfolio through an auction, drawing in \$24 millions of private investment.⁸ This was the first commercial efficiency securitization in the country, attracting specialized and institutional investors to participate in the market. Without Green Bank investment and coordination, the market would have remained dormant as it has in many other states.

Now that the Green Bank has demonstrated the mechanics and potential of PACE, private investors are preparing to enter the market at far greater scale. To satisfy the growing pipeline of projects, the Green Bank is raising an external warehouse of at least \$50 million in private capital that will be used to originate loans. Those private dollars will be paired with public debt and/or credit enhancements, and the loans will then be securitized in public markets. After only

⁵ Trubish, Herman K., "Will Crowdsourced Loans for Rooftop Solar Overtake Third-Party Ownership?" Greentech Media, February 19, 2014.

⁶ Reporter's Notebook, "Green Bank partner lands \$100M solar investment," Hartford Business Journal, November 10, 2014.

⁷ To date, roughly 50% of projects are PV only, 25% are EE only, and 25% are both PV and EE.

⁸ Lombardi, Nick, "In a 'Watershed' Deal, Securitization Comes to Commercial Efficiency," Greentech Media, May 19, 2014



one portfolio sale, the Green Bank has demonstrated market opportunity to draw institutional investors eager to originate the loans, reducing the need for public investment. Recent securitizations of residential PACE loans in California suggest that this new private capital will come with ever lower interest rates.⁹

Residential Solar Investment Program – Converting Grants to REC Financing

As part of its founding legislation, the Green Bank was tasked with managing and winding down the previously-existing residential solar rebate program, called the Residential Solar Investment Program (RSIP). RSIP is a grant offered in two forms – an upfront payment for host-owned systems, and a 6 year performance based incentive for third-party owned systems. This grant was intended to reduce the effective cost of electricity from the solar systems and make solar more attractive. By design, though, the RSIP was meant to be stepped down, reducing the amount of benefit as the cost of solar fell and the availability of financing increased. Through this transition, the state support for solar would move from an expense to an asset, eliminating permanent expenditure of public dollars.

The Green Bank team carefully managed the step down of the RSIP, pegging reductions to the achievement of market goals of installed capacity. The RSIP was designed to generate 30 MW of installed capacity in 10 years. However, the increased availability of financing for solar from the Green Bank allowed the 30 MW target to be reached in just 3 years while reducing the RSIP level by more than half.

Also built into the enabling legislation was the programmatic rule that any homeowner receiving the RSIP must automatically transfer ownership of their Renewable Energy Credits (RECs) to the Green Bank. The Green Bank in turn was free to manage and sell the REC portfolio as desired, which would in effect recoup a portion of the RSIP cost. Though not initially viewed as such, the Green Bank realized they were effectively offering a REC financing program for residential customers, where the upfront grant acted as lump-sum payment for the future stream of RECs from customers. If the Green Bank assumed an implicit 15-year contract term, it could calculate the effective REC price that Green Bank was paying to the customer through the RSIP grant. While the initial RSIP grant level produced an effective REC price far higher than the REC market would offer, the Green Bank quickly realized that as RSIP declined, the effective REC price was actually below the market price. This meant the Green Bank was stimulating solar development at far lower cost to the ratepayers than the REC procurement methods used by the utilities, who set the market price.

Through this analysis, the Green Bank conceived of a new program through which the utilities would sign 15-year REC purchase contracts with the Green Bank at a REC price *below* what they would otherwise pay on the market. This new program generates numerous benefits. It saves dollars for ratepayers as utilities are able to acquire RECs at a lower price, and therefore pass on less cost to customers. It creates more market certainty for the Green Bank, which does not have to sell its REC on the spot market. And it means that the RSIP program, once viewed as a grant, was now a self-sustaining REC financing program that entirely paid for itself and had no permanent cost. This innovative and entirely unique structure was formalized and approved through new legislation in summer 2015, and is now known as the Solar Home Renewable Energy Credit program, or SHREC. This sets a blueprint showing any state how it can stimulate solar market growth by increasing the availability of financing, reducing grant levels and eliminating permanent expenditure of public dollars.

⁹ Roselund, Christian, “Renovate America and 400 Capital complete \$129 million PACE securitization,” PV Magazine, November 20, 2014.