Green Bank Accounting: Examining the Current Landscape and Tallying Progress on Energy Efficiency

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Contents

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Glossary

Capital requirement. A standard that serves as a safeguard to a financial institution's depositors and other lenders, so that the financial institution does not take on excess leverage. This amount, dictated by the institution's financial regulator, is typically represented by a relationship between its equity and risk-weighted assets.

Capitalization. A pool of financial resources. For the purposes of this paper, we generally refer to NY Green Bank's $1 billion capitalization, which represents a $1 billion pool of financial resources from which the bank can lend.

Credit enhancement. Any method that offsets some or all of the risk for the financier.

Energy savings performance contract (ESPC). An agreement between an energy service company (ESCO) and a property owner in which the ESCO guarantees energy savings. The ESCO takes on performance risk and compensates the customer if the savings guarantee is not met. A customer can pay 100% of the costs up front, but typically financing is arranged.

> **Energy service agreement (ESA).** A type of energy service performance contract that is managed by an ESA provider. In a typical ESA, the provider creates a special-purpose entity (SPE) into which the provider places equity. The SPE acts as a conduit through which ESCO services and third-party capital flow. Payments are made to the SPE and dispersed to the ESA provider, capital provider, and ESCO based on the agreed-upon terms. The ESA provider is repaid by realized energy savings multiplied by a predetermined price per unit of energy. This predetermined price is designed to be less than the utility rate, guaranteeing savings. In this model the ESA provider takes on performance risk but not price risk.
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> **Managed energy service agreement (MESA).** An ESA in which the ESA provider also pays the utility bill on behalf of the customer. The customer pays the MESA a monthly amount based on energy savings. The cost per energy unit of savings is priced at less than what the utility would charge, so the MESA bill is guaranteed to be less than the utility bill. This arrangement differs from an ESA in that the MESA provider pays the utility bill and therefore takes on both performance risk and price risk.

Energy-specific financing tool. Financing that is specific to clean energy (e.g., on-bill, PACE, and others).

Green bank. An entity typically created by state or local governments to address the barriers faced by consumers and lenders in financing clean energy projects and to advance public objectives. They leverage public funds to stimulate private capital investment and typically provide resources above and beyond financing to support demand, including technical assistance and coordination with other clean energy entities.

Interest rate buy-down. An arrangement in which a third party provides payments to a lender to provide lower interest rates for a borrower.

Loan guarantee. A credit enhancement in which one entity agrees to repay the original lender in the event a borrower defaults or does not pay.

Loan loss reserve (LLR). A type of credit enhancement whereby funds are set aside to cover all or a portion of losses on loans resulting from default.

Loan participation. A common practice among lenders in which the original lender sells a portion of the loan to another lender or investor, under an agreement (called a participation) directing how interest and principal payments received from the borrower are to be shared, and stipulating what risks each party assumes in case of default. All contact and contractual rights with the borrower remain with the original lender.

On-bill financing. An arrangement in which a utility provides funding for the up-front costs of an approved clean energy program and the customer repays the cost of that project through its utility bill.

On-bill repayment (OBR). An arrangement in which a third-party capital provider furnishes funding for the costs of an approved clean energy project and the customer repays these funds via its utility bill.

Property assessed clean energy (PACE). A financing method that allows the property owner to finance up to 100% of the up-front costs of clean energy via a voluntary benefit assessment. In areas with supporting state legislation, a governing body can fund a PACE program through a dedicated bond, or a private lender can directly finance clean energy. The terms are drawn up similarly to those of a loan, but repayments are made through the property owner's property taxes and are generally associated with the property and not the borrower.

Revolving loan fund. A pool of money from which loans are made and the principal and interest payments from those loans go back into the fund to be loaned out again.

Secondary market. A place where investors can purchase securities or assets from other investors rather than from the original company or entity that issued the security or asset. The New York Stock Exchange is an example of a secondary market for shares in publicly traded companies.

Securitizing. The process of grouping together assets (e.g., mortgage, auto loan) and selling the rights to their cash flows to investors as securities.

Special-purpose entity (SPE). A legal entity that exists for a specific purpose or short period. Generally, an SPE is created in one of two ways: (1) A company creates a subsidiary, or (2) a company forms a trust in which assets (such as property, equipment, contracted revenue streams, or some combination of these) are held for the purpose of securing financing. SPEs are structured to prevent any financial stress or bankruptcy on the part of the parent from impairing the SPE's ability to meet its obligations under the terms of the financing; conversely, if the subsidiary SPE should fail, this should not on its own bankrupt the entire company. SPEs are used to isolate risk to the parent company or to facilitate payments to multiple parties engaged in one project.

Subordinated debt. A debt owed to a creditor that, in the case of default, can be paid only after the claims of creditors that have been given priority of repayment have been met.

Traditional financing tools. Financing products that are offered by commercial banks (e.g., loans and leases).

Warehouse lending. A line of credit made available from one financing institution to another, from which the borrowing institution will make additional loans and sell those loans to a separate, permanent investor. Warehouse lending facilities have been adopted from the mortgage origination business to fund a variety of clean energy financing transactions (such as solar power purchase agreements, solar leases, solar loans, or loans for energy efficiency improvements.

Wholesale lending. Lending to large clients like other financial institutions, government entities, and large corporations—generally clients that are not served by commercial banking, which serves individuals and small businesses.

Executive Summary

Over the past several years, the energy efficiency financing industry has made steady progress in leveraging private sector capital for efficiency investments. Utilities and third parties have used diverse financing models to encourage the private market to deliver greater energy savings to customers. State and local governments are interested in financing strategies for energy efficiency and clean energy investments because funds are recycled, allowing limited public dollars to be preserved. When paired with strong marketing and technical assistance features, these financing programs have the potential to expand the reach and depth of energy efficiency investments. As a result, some states and local jurisdictions are taking steps toward setting up and capitalizing green banks.

Green banks are entities typically created by state and local governments to address the barriers faced by consumers and lenders in financing clean energy projects and environmentally beneficial technologies. They take many shapes, but in general green banks share the following key features:

- They are publicly chartered financing institutions.
- They have a mandate to invest in clean energy deployment.
- They leverage public funds to stimulate private capital.
- They offer products across sectors, focusing on bridging market gaps.

This report reviews the progress of six green banks (Connecticut Green Bank, Hawaii Green Infrastructure Authority, Michigan Saves, Montgomery County Green Bank, NY Green Bank, and Rhode Island Infrastructure Bank) and four additional financing entities that serve similar functions (California Alternative Energy and Advanced Transportation Financing Authority, New Jersey Energy Resilience Bank, Nebraska Dollar and Energy Savings Loan program, and Toledo–Lucas County Port Authority). Our goals are to understand how green banks are working in specific market sectors and to identify promising strategies and lessons learned, with a particular focus on energy efficiency. Instead of presenting an exhaustive list of green banks, we have chosen to limit our scope to a representative sample in order to illustrate experience across the country. We include green banks that are commonly cited, those that have substantial data to report, and those that are up and coming.

REPORT FINDINGS

We reviewed current and planned portfolios of green banks to better understand their role in catalyzing energy efficiency projects. Nearly all of the green banks we reviewed invest in both renewable energy and energy efficiency projects, or they have plans to expand portfolio offerings to cover both. We found that established institutions like Connecticut Green Bank tend to have portfolios emphasizing renewables. In contrast are programs, like Nebraska's Dollar and Energy Saving Loans, that were developed with a specific mission to save customers money through efficiency investments, rather than to spur the clean energy economy more generally. These programs tend to emphasize efficiency over renewables. We found relatively few projects combining energy efficiency and renewables.

We also examined financial and energy data, both to understand how green banks measure their own progress and to benchmark the current state of program delivery. Commonly tracked and reported financial metrics include

- Fund deployment and project facilitation
- Leverage ratios
- Default and delinquency rates

Because some of the green banks we reviewed are still in the planning stages and have not yet deployed significant funds, even these data are limited. However we found that more-established green banks like Michigan Saves have been able to increase leverage ratios over time and have been particularly successful in residential markets. Although tracking for several more years will deliver more-reliable results, default and delinquency rates are currently at or near zero.

Data on energy savings are less commonly available and typically are not based on rigorous evaluation. For green banks that were able to report them, statewide incremental energy savings amounted to less than 0.01% of statewide electricity sales.[1] The size of these energy savings reflects the relative newness of green banks, with many programs not yet reaching full scale. We found that many green banks deliver financing jointly with utility efficiency programs. In these situations, utilities typically claim the energy savings associated with the project. Disaggregated savings attributable to green bank programs alone are not usually available.

We also reviewed the extent to which green banks operate in specific market segments. We found that they offer a variety of products for residential and commercial markets, including both specialty clean energy financing products like residential and commercial PACE, and traditional financing options like low-interest loans. In general, green bank projects are much more numerous in the residential sector than in the commercial sector, but since commercial projects tend to be much larger, funding is fairly evenly split. Green bank projects in the commercial sector account for about 43% of public and private funds, and projects in the residential sector account for about 57%.

We found that green bank operations are far more limited in multifamily and low-income markets, and that the most active green banks in these sectors are encouraged by board directives or public policy goals. Other entities, like New Jersey Energy Resilience Bank, operate in these sectors due to specific requirements of federal grant dollars.

Particular barriers limit multifamily and low-income green bank programs. For example, Michigan Saves initial commercial financing products are not compatible with multifamily buildings with financing insured or subsidized by the US Department of Housing and Urban Development. Nonetheless, many of the green banks we reviewed are committed to increasing their reach in these markets. In 2015, Connecticut Green Bank delivered about

[1] Incremental savings are first-year savings achieved from measures implemented in a given year.

22% of its projects in distressed communities, a classification given to about 30% of the communities in the state.

We also examined the extent to which green banks and utilities coordinate their program offerings. We found that most green banks work in tandem with utility-administered programs, leveraging ratepayer-funded programs to achieve deeper energy savings.

Finally, we considered whether green banks are an appropriate tool for all states or local governments. We found that while green banks are important strategies for many states and can complement existing efforts, they may not be well suited everywhere. States, localities, and efficiency program administrators together may be able to fill gaps in the financing market without creating a green bank. In Vermont, a yearlong stakeholder process examining the pros and cons of establishing a green bank led to a collective decision to set up a voluntary collaborative rather than a new, separate financing institution.

CONCLUSIONS

Green banks are still relatively new, and there is significant opportunity to expand and refine program offerings. In particular, green banks' potential to facilitate combined delivery of renewable energy and energy efficiency programs has not been fully maximized to date. Refining program marketing and delivery in order to maximize combined projects will be an important step in meeting increasingly ambitious state goals for clean energy deployment.

Public policy is also important in guiding green bank activity in certain markets. Without explicit policy directives carried out by green banks, today's investment industry may not have sufficient incentive to develop specialized financing products for low-income and multifamily markets or conduct outreach to these communities.

Data collection efforts need to be improved and standardized in order to truly assess the additional impacts of the financing programs offered by green banks. Green banks have ambitious goals of deploying clean energy technologies and delivering energy savings. It will be important to understand the incremental impacts of financing in deploying clean energy and energy efficiency, especially if states are interested in increasing the role of the private market in achieving overall energy savings goals. Policymakers and program administrators should develop standardized tracking metrics and evaluation frameworks across financing entities that include rigorous evaluations of energy savings.

Finally, green banks can add important tools to the toolbox. Because they leverage private capital and recycle public dollars, green banks offer an opportunity for states to expand energy efficiency and clean energy deployment. But they work best when they leverage existing resources. By partnering with utilities and program administrators to create a single package from a variety of services, including financing, rebates, and project guidance, green banks can break down more barriers than any one of these approaches could alone.

Introduction

A significant amount of cost-effective energy savings potential in the United States remains untapped. Recent research has shown that investing in innovative programs could yield electricity savings of 22% by 2030 (York et al. 2015) and that strong policies and increased funding for efficiency programs could lead to as much as 30% electricity savings in that same year (Neme and Gravatt 2016). One study estimated that more than $279 billion could be invested in energy efficiency retrofits and upgrades in commercial, residential, and institutional markets in the United States, resulting in more than $1 trillion of energy savings over 10 years (Rockefeller 2012). Yet today, the United States is not even scratching the surface of these investments. Research on major programmatic energy efficiency financing sources found that about $4.8 billion in financial capital was invested through financing programs in 2014 (Deason et al. 2016).[2]

Unlocking hundreds of billions more dollars of investments will require leveraging an entire toolkit of solutions, including utility energy efficiency programs that provide financial incentives and engineering support, financing tools, and education.

Over the past several years, the energy efficiency financing industry has made steady strides toward leveraging private sector capital for energy efficiency investments. Recent uptake of energy efficiency financing through diverse utility and third-party models has encouraged states to look increasingly to the private sector to finance energy efficiency projects and meet policy goals. State and local governments are attracted to financing strategies for energy efficiency and clean energy investments because funds are recycled, allowing limited public dollars to be preserved. When paired with strong marketing and technical assistance features, these financing programs have the potential to expand the reach and depth of energy efficiency investments. As a result, we observed some states and local jurisdictions taking steps toward setting up and capitalizing green banks.

Green banks are typically created by state and local governments to address the barriers faced by consumers and lenders in financing clean energy projects. They leverage public funds to encourage increased investment of private capital and typically provide resources above and beyond financing, including technical assistance and coordination with other clean energy entities.[3] They are not banks in the traditional sense, as we describe in more detail later.

Connecticut was the first state to adopt the term *green bank*; it did so in 2011 when the governor and General Assembly repurposed the Connecticut Clean Energy Fund and established a quasi-public agency designed to leverage public and private funds and accelerate clean energy growth in the state. Since then, other states and localities have

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[2] Deason et al. (2016) quantify capital originating from five programmatic sources: on-bill programs, other utility financing programs, PACE, state energy office revolving loan funds, and energy savings performance contracting. Other financing occurs outside of this space and is not included in this figure.

[3] Note that public funds may come from a variety of sources, including taxpayer dollars, ratepayer dollars, and regional cap-and-trade program revenues.

followed suit, existing entities have been reconfigured to deliver financing targeted at clean energy deployment, and more attention has been paid to long-standing financing programs that are having compounding impacts in the energy efficiency market.

In several states, green bank programs were envisioned as substitutes to utility programs, but in practice green bank programs have evolved into complementary efforts to maximize efficiency investments.[4] An emphasis on maximizing the reach of efficiency programs across all markets is important, since as stewards of public and ratepayer dollars both green banks and utility program administrators have a responsibility to take measures to ensure equitable access to energy conservation and renewable energy financing and should prioritize projects that promote economic and community development. Green bank and utility programs may be more effective at reaching all customer classes—including low- to moderate-income single-family, multifamily, and small business—when working together rather than in competition.

This report examines the existing landscape of green banks, identifying the common features of many of these institutions as well as their differences. It also attempts to assess the progress of selected green banks to date, both in terms of delivery/uptake of financial products and in terms of their impacts on energy efficiency and clean energy deployment. As states and localities consider ways to stretch public dollars to support ambitious clean energy deployment goals, it is important to understand the benefits and limitations of green banks, the markets they are able to reach, and the way they interact with other programs incentivizing efficiency and clean energy investments across the country. Many of the green banks we reviewed are only in the early stages of program delivery—some have yet to deploy funds into the marketplace—but all have lessons to share.

Encouraging Clean Energy Investments

Research on the role of financing in promoting energy efficiency has emphasized that "the up-front cost of efficiency investments is just one of many barriers, and often times not the most important one" (Zimring et al. 2013). Additional barriers include a lack of information and awareness, staff capacity constraints, inconvenience, split incentives between owners and tenants, and uncertainty of savings projections, among others (Granade et al. 2009, Vaidyanathan et al. 2013). Particularly in the commercial and industrial sector, payback periods of longer than two to three years may be unpalatable, limiting the projects a company is willing to invest in to a level well below what is cost effective.[5] Given this wide range of challenges, researchers have underscored that "financing is part of a holistic suite of strategies targeting multiple barriers to consumer EE adoption" (Zimring et al. 2013). Figure 1 illustrates the many complementary strategies that promote energy efficiency.

[4] See SEE Action (2015) for a discussion of financing as a substitute for or complement to traditional efficiency programs.

[5] For more on barriers to efficiency investments, see acadiacenter.org/wp-content/uploads/2015/06/Acadia-Center_Efficiency-Proposal-for-New-York.pdf.

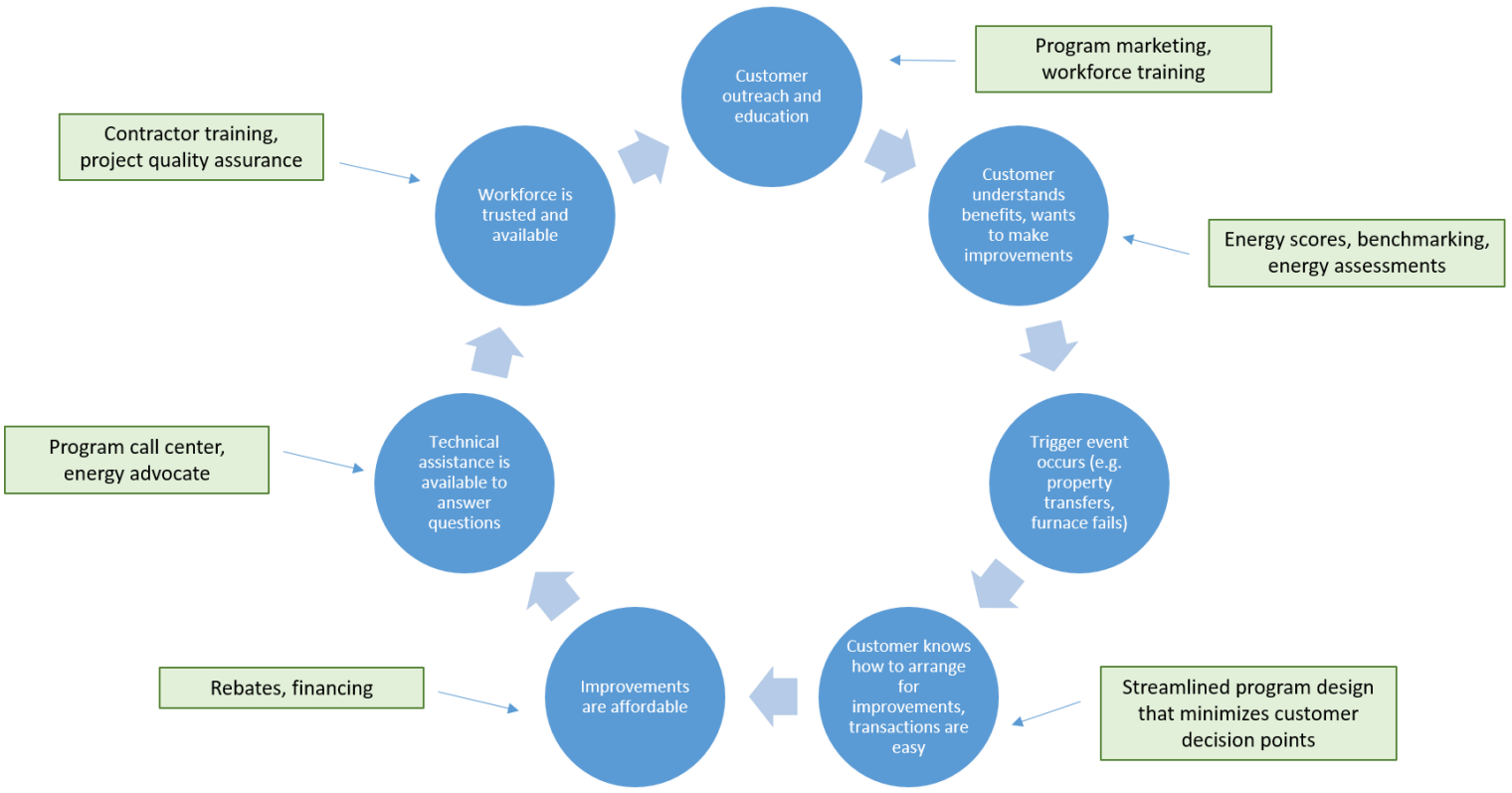

Figure 1. Linked strategies to drive and enable customer demand for energy efficiency. *Source:* Adapted from Zimring et al. 2013.

Customers are not the only ones facing barriers to efficiency investments. The lending market also faces barriers, limiting available capital. For example, a study on the potential for NY Green Bank posited, "The root cause of current market barriers/inefficiencies is existing lenders' insufficient understanding of the risk profile and track record of clean energy projects" (Booz & Company 2013; Harcourt Brown & Carey, Inc. 2011). Lenders who are unfamiliar with energy efficiency may be reluctant to provide the capital needed to support costly energy efficiency upgrades, or they may require high returns with strict underwriting standards that discourage borrower participation. Accordingly, increasing lender familiarity with energy efficiency, as well as tracking and demonstrating superior loan performance, could potentially lead to greater lender participation in energy efficiency markets, development of products with rates and terms better aligned with energy efficiency products, and greater flexibility in underwriting.

Despite existing barriers to lending, recent research suggests that traditional lenders may be more active in energy efficiency than previously appreciated. For example, a 2014 market baseline survey in California found that the conventional financing market for energy-related upgrades is an estimated $850 million to $1 billion across investor-owned utility territories. Conventional sources of financing—including banks, credit card companies, retailers, and contractors—accounted for more than 80% of energy-related loans in the residential sector (Opinion Dynamics and Dunsky Energy Consulting, 2016). Of course, it is also important to note that in cases where customers chose conventional financing, specialized efficiency financing might have been preferable had it been readily available.

The same study found that 75% of consumers did not finance their energy-related purchases. Decisions not to finance may have been based on a variety of factors, including the already low cost of a specific measure, the ease of paying for the measure out of pocket, or an inability or reluctance to take on more debt. Figure 2 shows the results of the California baseline survey of payment mechanisms for energy efficiency upgrades in residential markets.

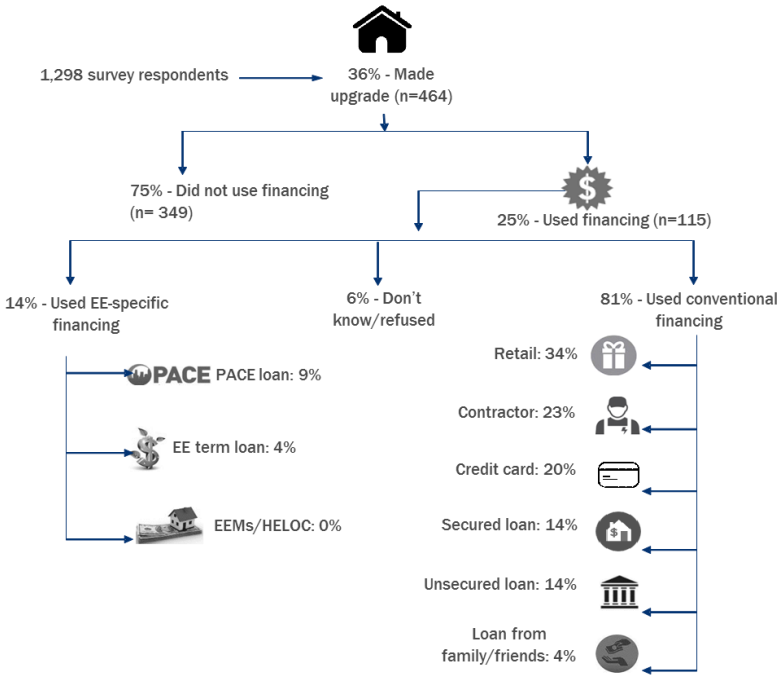

Figure 2. Sources of payment for energy-related upgrades in the California residential market. Customers may report using more than one type of financing. *Source:* Opinion Dynamics and Dunsky Energy Consulting 2016.

It might be that with well-designed and easily available financing programs in place, customers would invest in more and deeper energy efficiency measures. In practice, the extent to which financing can increase the uptake of such measures remains an open question that program administrators and policymakers continue to explore. To date, large energy efficiency financing programs have tended to consist primarily of measures that are installed reactively (e.g., replacements for failed heating systems) or those with significant levels of naturally occurring demand that may not be driven by energy performance exclusively (e.g., window replacement). The additional energy savings attributable directly to financing programs in these cases remains largely undocumented (SEE Action 2015). Consider the California HERO PACE program, one of the largest clean energy financing programs in the nation. Jurisdictions in this program report that the top three measures installed are solar (36%); energy-efficient HVAC (28%); and windows, skylights, and doors (24%) (Spoonhour and Adams 2016). Similarly, the top three measures in the Massachusetts HEAT Loan program, which supports approximately $100 million annually in energy efficiency installations, are heating systems (52%), hot water systems (13%), and central air-

conditioning (13%).[6] External factors often drive the markets for these measure categories (e.g., product labeling, upstream and downstream incentives, consumer preferences, and broader market trends). Although researchers have emphasized the importance of evaluating the incremental impact of energy efficiency financing programs in promoting energy efficiency (Goldman 2016), to date, few formal impact evaluations have shed light on financing's incremental contribution to efficiency efforts (Kramer 2015).[7]

CAPTURING ENERGY SAVINGS POTENTIAL

Energy-saving measures building owners and residents undertake on a proactive basis (i.e., not due to equipment failure), such as weatherization measures like air sealing and insulation and comprehensive, whole building retrofits, typically account for relatively small percentages of the project types within energy efficiency financing programs. This gap may represent significant untapped savings potential. For example, few financing programs have supported a significant volume of weatherization measures, yet the US Department of Energy (DOE) estimates that nearly 60% of American single-family homes (about 47 million) are not well insulated (EIA 2005). Addressing a wide range of other barriers in addition to up-front costs may be needed to effectively drive demand within these key markets, though financing may play an important role in supporting the costs of necessary and deeper upgrades.

Barriers to energy efficiency are numerous and complex, and while financing certainly does not address all of the obstacles to scaling up clean energy investments, several states have embraced green banks as a key strategy for meeting clean energy goals. Recently, more focus has been placed on the ability of efficiency programs to help achieve climate goals. California Governor Jerry Brown has called on the state to double its energy efficiency efforts. Several states have attempted to fill the energy efficiency gap by developing frameworks for utility-delivered energy efficiency programs that use ratepayer funds to invest in energy efficiency as a utility system resource. These programs typically lower the cost of initial investments for customers, provide technical assistance and engineering support for energy upgrades, develop qualified contractor networks, provide marketing and communications about energy efficiency options, and sometimes offer financing options. In 2014 these utility programs accounted for more than $7 billion in spending on energy efficiency (Gilleo et al. 2015).

Participation in these programs has varied by market segment. For example, a study of utility programs with high participation rates found that the best-performing residential HVAC programs tended to reach between 1% and 6% of residential customers each year, and that whole-home retrofits achieved anywhere from 1% to 25% market saturation. The most successful commercial programs had participation rates that varied between 1% for prescriptive lighting measures up to 50–60% for new construction programs (York et al.

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[6] In both cases, data are reported by number of measures rather than dollar volume.

[7] Researchers have also underscored the importance of distinguishing between the influence of financing in general versus financing offered specifically through programs. Given the wide availability of private financing options, understanding the influence of program financing may require evaluating whether projects undertaken through such programs would have otherwise occurred with the support of private financing (SEE Action 2015).

2015). Scaling up program funding and implementing effective program design can help improve program reach and results, but there are also complementary tools that states can use to improve efficiency results.

KEY FEATURES OF TRADITIONAL BANKS AS A WAY TO UNDERSTAND GREEN BANKS

In the sections that follow, we outline the key features of depository and investment banks and those of green banks. Although we offer our own definition of a green bank in this report, we acknowledge that there is not one standard definition. Rather, the idea of a green bank is an emerging concept, and many of those we reviewed for this report do not call themselves green banks at all. But all share the features we have identified as core to green banks: They are publicly chartered financing institutions that leverage public funds to stimulate private capital. They have a mission to invest in clean energy. And they often go above and beyond developing financing products, offering technical assistance and coordination to support investments in energy efficiency and clean energy.

To understand the function of the green bank in the marketplace, it is useful to recognize the differences between a green bank and a traditional depository banking institution. They vary in a number of ways. In fact, the primary role of a traditional bank—accepting deposits—is not something any green bank does.

Features of Traditional Banking Institutions

The business model for lending institutions is to make sure the payments received from their lending activity (including expected write-offs for defaulting borrowers) exceed what they pay to use those funds (the "cost of funds"). The type of lending activity and source of funds is what distinguishes one type of financing institution from another.

In simple terms, the role of a traditional depository bank is accepting deposits from customers and lending some of those deposits out to other customers. The primary funding source for traditional banks are deposits held in checking and savings accounts, so a large portion of the cost of funds is the interest payments paid to the owners of these accounts. Deposits are a very inexpensive source of capital; the average interest rate on a checking account is 0.04% (FDIC 2016). While depository institutions have a low cost of funds, deposits are typically insured by the federal government, which places a number of restrictions on how banks are allowed to operate.

Due to their restrictions and limited risk tolerance, depository institutions typically engage in standard financial products like consumer loans (credit cards, auto loans, etc.), mortgages (first mortgages and home equity lines of credit), small-business lending, and commercial real estate loans. It is also important to note that because these relatively low-risk loans are so common, with standardized structure and documentation, they can be securitized—that is, bundled and sold on to investors. Securitization makes these products even more attractive to traditional banks, as they are able to move these products off their balance sheets and make their capital available for additional lending.

Features of Non-Depository Institutions

Investment banks are more akin to the green banks we reviewed in this report. These non-depository institutions, by definition, do not have access to deposits as a low-cost source of funding. They are not subject to the same lending and funding restrictions, and this allows

them a greater range of financial assets and liabilities. Examples of non-depository institutions are pension funds, mutual funds, insurance companies, venture capital firms, government-sponsored entities, and hedge funds. Each type of non-depository institution raises funds differently, depending on its structure, and each funding source has its own cost of capital.

Most of the green banks we reviewed in this report rely on financing products common to traditional non-depository institutions. However they typically complement these financing tools with specialty products designed to address barriers in certain target markets (e.g., multifamily buildings), and may offer technical assistance and additional tools beyond financing to simplify the investment process for customers.

Traditional Lending for Clean Energy: Options and Limitations

In this paper we discuss clean energy–specific financing options, but traditional banks do operate in green financing. Large, multinational banks like Bank of America and Citigroup are players in almost every part of the clean energy lending process. Smaller institutions are also important participants. For example, many clean energy projects are financed through community development financial institutions (CDFIs). The federal government licenses and supports these institutions, whose mandate is to lend to underserved customers in their areas. Many CDFIs have experimented with secured and unsecured loans for clean energy. However, unlike the green banks we profiled in this report, the primary objective of a CDFI is to support economically disadvantaged communities. Clean energy lending from CDFIs typically comes as a complement to their mission to support these communities rather than their sole purpose, and the investments they make are usually small in scale.

Despite activities undertaken by large commercial banks and CDFIs, these financing programs have not reached the scale that many predict is possible for clean energy investments. For many private-market lenders, beginning an energy efficiency lending program may be cost prohibitive. Setting up a new lending program takes time and money. Additionally, the financing needs for energy efficiency measures are project-specific, so the transaction costs may be higher than for a more common financial product like a mortgage. Project evaluation metrics are not standardized, and the lending community is not as fluent in the valuation and cash flow models as they need to be for large-scale lending. This steep learning curve translates into risk, which is monetized as less-attractive terms for the end user.

This is the crux of the energy efficiency financing issue that green banks try to solve: there are a lot of energy efficiency investments to make, but the terms a private capital provider would have to stipulate (to justify its own costs) create a product that is too expensive for the customer. Partially de-risking the investment for capital providers should, theoretically, solve this pricing problem, encouraging them to lend to these relatively new types of projects and adding liquidity to these markets. This, in turn, would provide necessary data and experience to develop a market that is less and less reliant on public risk-reduction measures over time.

In this way, the very basic purpose of a green bank is to use its role as a conduit of public funds and proponent of clean energy to bridge the gap between the pool of private funds

and the clean energy projects that need capital. Ultimately, investments in clean energy should become conventional and fully supported by private investment.

KEY FEATURES OF GREEN BANKS

In the section above, we identified the factors that make a traditional bank different from a green bank. The factors that define a green bank, however, are relatively loose. All of the institutions we surveyed for this report are different but share some notable features. We identified the following characteristics in all of the green banks we reviewed for this report:

They are publicly chartered financing institutions. The green banks profiled in this report were developed as state or local government responses to gaps in the marketplace. Today some operate as nonprofits, some are quasi-governmental organizations, and others are housed within previously existing state agencies. Their varying structures give them different amounts of flexibility in how they work within the clean energy market. However all have goals and strategies guided by government directives.

They leverage public funds to stimulate private capital investment. There are several examples of state agencies using financing as a tool for encouraging energy efficiency investments. Revolving loan funds proliferated in the late 2000s as a result of the American Recovery and Reinvestment Act (ARRA). Currently, 35 states have revolving loan funds or credit enhancement programs, representing a total of about $1.7 billion in available financing (NASEO 2016). Unlike many of these revolving loan programs, green banks work to leverage the flow of *private* dollars into energy efficiency investments. They do this in a variety of ways, including buying down interest rates, loan loss reserves, loan guarantees, and other forms of credit enhancements, which we discuss later in the paper.

They offer products across sectors, focusing on bridging market gaps. State agencies, utilities, and private institutions have historically offered financing programs for residents and businesses. While these programs' administrators may offer financing products to several sectors, green banks consolidate financing offerings, technical assistance, and marketing under a single umbrella. The green banks we covered in this report tend to do more than just offer financing programs. They provide technical assistance to customers and contractors, helping them understand both the role of energy efficiency and clean energy and the best ways to fund and finance investments. They also simplify transactions for customers by partnering with utilities and other organizations delivering clean energy and energy efficiency.

They have a mandate to invest in clean energy development. While commercial banks and other lenders may operate in the clean energy space, their investments tend to be limited. This is due to several factors, including the small scale of transactions and the lack of standardization of projects. Unlike commercial banks, green banks have a public mission to

make investments that result in increased deployment of clean energy, environmentally beneficial technologies, energy efficiency improvements, and advances in resiliency.[8]

In the sections that follow, we detail six green banks, including their structure, financing tools, and experiences. During the course of our research, however, we found that the line between a green bank in name and a well-developed financing program is often quite blurry. Therefore, we also included four financing entities that do not meet our definition of a green bank but do provide useful context and insight.

Methodology

The green banks included in this report are not an exhaustive list but rather a sample meant to illustrate experience across the country. We found that there is not yet complete agreement in the literature around which entities are green banks and which are not.[9] The aim of our research was to understand how green banks are working in particular market sectors and measure progress in order to identify best practices and lessons learned. Therefore, we chose to limit our scope to a representative sample, emphasizing green banks that are commonly cited (e.g., Connecticut Green Bank), those that have significant data to report (e.g., Michigan Saves), and those that are up-and-coming (e.g., Maryland's Montgomery County Green Bank).

Table 1 lists the mission statement, legislative or regulatory mandate, or stated goals of the green banks profiled in this report, as well as founding date and information on initial capitalization.

[8] *Resilience* refers to a community's reduction of and preparation for risk. See Ribeiro et al. (2015) for a discussion of the intersection of resilience and energy planning.

[9] For example, see the variety of institutions profiled in Cadmus (2014), DOE (2015), and Kennan (2014).

Table 1. Mission statements and funding sources of green banks around the country.

Institution	Date established	Funding sources	Mandate or mission statement	Reference
Connecticut Green Bank	2011	Bonding authority, ratepayer surcharge, RGGI, ARRA	"The Connecticut General Assembly has found and determined that stimulating, supporting and increasing the use of clean energy, investment in clean energy projects and sources, demand for clean energy, the development of technologies that support clean energy, and the development of the state's energy-related economy are important state policy objectives. To achieve those objectives, the General Assembly, among other things, created Connecticut Green	Connecticut Green Bank Resolution of Purpose
Hawaii Green Infrastructure Authority	2013	Bond secured by ratepayer tariff. Ratepayer tariff offset by reduction in public benefits fund to be cost neutral to ratepayers.	"The purpose of this Act is to establish a regulatory financing structure that authorizes the public utilities commission and the department of business, economic development, and tourism to acquire and provide alternative low-cost financing, to be deployed through a financing program to enable installations of green infrastructure equipment, achieve measurable cost savings, and achieve Hawaii's clean energy goals."	Act 211
Michigan Saves	2009	Michigan PSC reallocated funds, ARRA, DOE	"The mission of Michigan Saves is to stimulate and support investment in energy efficiency and renewable-energy systems and measures in Michigan homes, businesses, and public buildings."	Michigan Saves mission statement
Montgomery County Green Bank	2015	Pepco-Exelon merger	Bank was established on the basis of an act "to authorize County government to designate a County Green Bank to promote the investment in clean energy technologies."	Bill 18-15
NY Green Bank	2013	Ratepayer funds, RGGI	The mission of NY Green Bank is "to accelerate clean energy deployment in New York State by working in partnership with the private sector to transform financing markets."	NY Green Bank mission statement
Rhode Island Infrastructure Bank	2015	Residual RI Clean Water Finance Agency funds, Qualified energy conservation bonds, ratepayer funds, ARRA, RGGI	"It is hereby further found that expanding the Rhode Island clean water finance agency and renaming it the Rhode Island infrastructure bank provides the best avenue towards fostering the creation of jobs and the realization of energy cost savings through the facilitation of infrastructure improvements."	Budget Article 24 H5900

We also decided to include within the scope of our research several entities that do not explicitly fit our definition of a green bank because we felt they provided useful experience for developing financing institutions to draw upon. Generally, these programs have mission statements somewhat different from those of the green banks listed above, as shown in table 2.

Table 2. Other financing institutions included in our research

Institution	Date established	Funding sources	Mandate or mission statement	Reference
California Alternative Energy and Advanced Transportation Financing Authority	1980	Bonding authority, ratepayer funding (CHEEF program only)	Established to advance the state's goals of reducing greenhouse gas emissions, increasing the deployment of sustainable and renewable energy sources, implementing measures that increase the efficiency of energy, creating high quality employment opportunities, and lessening the state's dependence on fossil fuels."	2015 Annual Report to the California Legislature
New Jersey Energy Resilience Bank	2014	Community Development Block Grant–Disaster Recovery (CDBG-DR) allocation after Hurricane Sandy	"Financing through the Bank will be used to develop or enhance distributed energy resource (DER) technologies at critical facilities that were directly or indirectly impacted by Superstorm Sandy or directly impacted by other eligible disasters."	ERB Program Guide
Toledo–Lucas County Port Authority	The Port Authority's Better Buildings program began in 2010	ARRA (Retrofit Ramp-Up), bonding authority	"The mission of the Toledo–Lucas County Port Authority is to develop expertise and assets that drive and grow the region's transportation and logistics infrastructure and its economic prosperity for all."	TLCPA mission statement
Nebraska Dollar and Energy Saving Loan Program	1990	Oil overcharge funds, ARRA	No program mission statement, but list of eligible measures is largely focused on energy efficiency.	Dollar and Energy Savings Loan brochure

We sent each entity a questionnaire asking for information on the financing products offered, clean energy deployed, and energy savings achieved. We also asked all the financing institutions we surveyed to report financial indicators and experience serving various market sectors. Our intent was to develop a complete picture of the challenges faced by green banks today as well as successes in achieving clean energy deployment.

Seven of the ten institutions we surveyed submitted answers to the questionnaire, although most were incomplete. This was in large part due to lack of data—several of these institutions have not yet deployed funds or are in the early stages of deployment. We supplemented the information we received with interviews with green bank staff and data collected from annual reports.

Results

ACTIVE GREEN BANKS

We identified six active green banks through our research and asked each to provide information on their history and portfolios. Several have not yet deployed funds, while others have well-developed programs. Below, we summarize each green bank. We list program offerings in Appendix A and describe program types in more detail in Appendix B.

Connecticut Green Bank

Connecticut Green Bank (CTGB) is a quasi-public agency established through legislation passed in 2011. It was the first institution to define itself as a "green bank," with a mission to develop innovative programs to finance clean energy investments across all sectors and stimulate demand for clean energy products. CTGB was initially funded through several sources, including the state's Clean Energy Fund (a 1 mill surcharge on electric ratepayer bills), Regional Greenhouse Gas Initiative (RGGI) proceeds, and ARRA grant funding.[10] The green bank is also authorized to issue revenue bonds and partners with for-profit and nonprofit organizations to support certain products.

CTGB offers clean energy and efficiency programs for all sectors, including loans for homeowners, a commercial PACE program, multifamily project financing, energy service performance contracting assistance, and solar services including incentives and loans.[11]

Hawaii Green Infrastructure Authority

Legislation passed in 2013 established the Hawaii Green Infrastructure Authority (HGIA). Its mandate is to make clean energy investments accessible and affordable to Hawaii's consumers, especially underserved communities, low- and moderate-income homeowners, renters, and nonprofits. HGIA operates the Green Energy Market Securitization (GEMS) program, which offers financing to deploy clean energy, especially solar photovoltaic (PV), across the state.

GEMS was capitalized with green bonds, based on a financing order issued by the public utility commission in 2014. GEMS bonds valued at $150 million were issued at the end of that year. The state projects that the program will have major impacts on clean energy deployment. However rollout has been relatively slow to date, with only 12 projects financed as of June 30, 2016. HGIA predicts that it will deploy the majority of its funding between 2016 and 2018.[12]

Michigan Saves

Michigan Saves is a nonprofit institution formed in 2009 with a grant of $8.1 million from the Michigan Public Service Commission (MPSC). The grant allowed a two-year period to establish the organization and an initial portfolio of programs to support energy

[10] CTGB continues to operate using RGGI proceeds and ratepayer dollars.

[11] See www.ctcleanenergy.com/Default.aspx?tabid=62 for more information on CTGB.

[12] See HGIA (2015) for more information.

installations. In September 2011, the organization became fully independent. Governed by a 15-member board of directors and a special policy adviser appointed by the MPSC, Michigan Saves has no employees but is staffed by contract with Public Sector Consultants. Michigan Saves has been awarded several grants by state of Michigan agencies and by DOE to expand and enhance its programs (MEEA 2014).

Michigan Saves offers a variety of loans for energy efficiency projects in residential, commercial, multifamily, and public sector markets. The organization works with private lenders throughout the state and offers a loan loss reserve in order to lower interest rates and expand terms. Michigan Saves also provides training for contractors and conducts quality assurance. Staff noted that their mission is to "pull all the pieces together to make it easy and affordable for customers and contractors to implement energy efficiency and renewable energy projects."

Montgomery County Green Bank

In June 2015, Montgomery County, Maryland, population 1 million, authorized the creation of the United States' first green bank at the local government level. Legislation designates the green bank to provide financing for clean energy technologies, including both renewable energy and energy efficiency projects.[13] Montgomery County Green Bank (MCGB) is a nonprofit corporation, not an instrumentality, and is slated to receive approximately $20 million in funding from the recent Exelon-Pepco merger.[14] MCGB also intends to pursue outside funding. Once the funding is secure, MCGB will create a structure and deployment plan. Working in conjunction with the Coalition for Green Capital and with the support of a legislated Work Group, the county completed a market assessment identifying a $2.7 billion clean energy market and evaluating what types of financial products are best suited for that market. It aims to model itself after state-level green banks, offering technical assistance alongside innovative financing in an effort to leverage its public funding to attract private capital.[15] Montgomery County has a commercial property assessed clean energy (C-PACE) program up and running and is exploring residential PACE (R-PACE) and a variety of financing products across multiple sectors.

NY Green Bank

NY Green Bank (NYGB) was established as a division of the New York State Energy Research and Development Authority (NYSERDA) to act as a state-sponsored specialty finance entity. Governor Andrew Cuomo announced the formation of NYGB in his State of the State address in January 2013. In December of the same year, the New York Public

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[13] See Bill No. 18-15 for more information: www.montgomerycountymd.gov/COUNCIL/Resources/Files/bill/2015/20150630_18-15.pdf.

[14] The amount slated to be dispersed to MCGB was accurate as of the time of research. As part of a merger agreement, Exelon and Pepco agreed to provide concessions for consumers in order to gain the approval of relevant utility commissions. These concessions are meant to demonstrate that the merger is in the public interest. Funds dispersed as a result of the merger are not ratepayer funds. See www.neep.org/blog/utility-mergers-where-does-energy-efficiency-fit for a discussion of energy efficiency and utility mergers.

[15] Information on MCGB based on pers. comm., Michelle Vigen, senior energy planner, Montgomery County Department of Environmental Protection, April 8, 2016.

Service Commission (NYPSC) originally capitalized NYGB with $165.6 million in reallocated ratepayer funds from NYSERDA. In addition, NYSERDA transferred $53 million of its RGGI revenue to bring the total capitalization to more than $218 million. In January 2016, NYPSC approved ratepayer collections that will increase capitalization to $1 billion over the next 10 years. In terms of capitalization, NYGB is the largest of all the green banks in this study.

NYGB seeks not only to scale up green investment in New York—which Booz & Company (2013) assessed as an $85 billion market—but also to create standardized clean energy financial products so it can build a robust secondary market. Under its market-responsive approach, NYGB currently provides credit enhancement, short-term lending intended for aggregation, and longer-term direct investing. Transactions must demonstrate potential for energy savings or greenhouse gas (GHG) reductions in order to qualify. NYGB has already received proposals from commercial, industrial, residential, and multifamily facilities as well as the so-called MUSH sectors: municipal, university, school, and hospital.

Rhode Island Infrastructure Bank

Although it has existed as an infrastructure agency for a number of years, Rhode Island Infrastructure Bank (RIIB) is the newest of the green banks in this paper focused on financing energy efficiency and clean energy projects. The Rhode Island Clean Water Finance Agency was formed in 1989 as a quasi-public entity and renamed Rhode Island Infrastructure Bank in 2015. The original agency primarily administered financing programs related to wastewater and drinking water. With the name change came additional programmatic responsibilities, including developing and sponsoring financing programs focused on energy efficiency and clean energy projects for municipal, residential, and commercial property owners. The bank does not receive annual capitalization from the state or other resources to operate these programs, but it did receive a one-time infusion of funding from unused ARRA funds, RGGI proceeds, ratepayer funds from the utility National Grid, and state and local allocation of Qualified Energy Conservation Bonds. RIIB also has the flexibility to use equity built up from its time as the Clean Water Finance Agency to support energy efficiency and clean energy projects.

RIIB is still in the process of developing a deployment plan. However as of July 2016 it has financed more than $17 million in municipal energy efficiency and renewable energy projects and has launched its commercial PACE program.

OTHER RELEVANT PROGRAMS

There are several entities often mentioned as green banks that do not meet our definition. We nonetheless included these institutions in our research and found that while they may be missing one or more of the key characteristics of a green bank, their experiences and strategies are relevant to the discussion.

California Alternative Energy and Advanced Transportation Financing Authority

The California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA) was initially created in 1980 as a conduit bond issuer to assist the state in developing large-scale renewable energy projects. After a period of inactivity, CAEATFA was relaunched in 2010. Today the agency's purpose is to help the state reduce greenhouse

gas emissions, increase the deployment of clean energy, implement energy efficiency measures, and develop jobs. To meet its goals, CAEATFA provides financial assistance and credit enhancements to leverage private capital.

CAEATFA programs include a loss reserve for the state's residential PACE programs; bond financing for green projects; and a sales tax exclusion program for alternative energy (including energy efficiency), advanced transportation, recycled feedstock, and advanced manufacturing projects. Most notably for this paper, the agency is developing California Hub for Energy Efficiency Financing (CHEEF) pilot programs. These financing programs, a collaboration with the state's investor-owned utilities, are meant to encourage private lending by offering loan loss reserves, debt service reserve funds, and on-bill repayment programs across all sectors. The California Public Utilities Commission (CPUC) allocated $65.9 million in ratepayer funds to develop CHEEF pilot programs.[16]

CAEATFA largely meets our definition of a green bank. However to date California has determined it does not need to designate a specific entity as a green bank. CAEATFA, along with several other state entities, provides a comprehensive set of programs to encourage clean energy and efficiency deployment. These entities include the California Energy Commission, the Air Resources Board, the Pollution Control Financing Authority, and the California Infrastructure and Economic Development Authority. Because CAEATFA does not conduct any direct lending and instead focuses on credit enhancements leveraging public dollars, CAEATFA does not consider itself to be a green bank.

New Jersey Energy Resilience Bank

New Jersey Energy Resilience Bank (ERB) was formed in the wake of Superstorm Sandy. Its financing programs are meant to develop and enhance distributed energy resources at critical facilities. The bank was seeded using $200 million of Community Development Block Grant–Disaster Recovery funds allocated to New Jersey by the US Department of Housing and Urban Development (HUD). Initially the program was developed as a partnership between the New Jersey Economic Development Authority (EDA) and the New Jersey Board of Public Utilities (BPU). However, since ratepayer funding was ultimately not rolled into the program, full oversight was transferred to EDA, with BPU playing a consulting role under a formal memorandum of understanding.

Given its focus on resilience and the stipulations of the HUD funding agreement, ERB programs are restricted to specific customer bases and technologies. The program's first round of funding was open to water and wastewater facilities, and the second round also included hospitals. ERB provides a mix of grants and loans to develop combined heat and

[16] See www.treasurer.ca.gov/caeatfa/cheef/index.asp for more information on CAEATFA.

power (CHP) systems at these facilities.[17] All HUD funding must be obligated by September 2017 and spent by September 2019.[18]

ERB is more limited in scope than the green banks we list above, with a focus on delivering a specific technology (CHP) to a specific sector (wastewater facilities and hospitals). Furthermore, the bank has no current plans to regenerate funding once the HUD funds are spent down. However ERB does combine financing and grant funding and is often cited as an example of a green bank. For these reasons we included it in our research.

Nebraska Dollar and Energy Saving Loan Program

The Dollar and Energy Saving Loan (DESL) program is a loan participation program administered by the Nebraska Energy Office (NEO). While the program is more limited in scope than the green banks we reviewed, its cumulative loan volume, longevity, and ability to leverage private capital make it a useful case study in effective financing programs for energy efficiency. Since 1990, the program has invested more than $322 million in funds into the clean energy market, supporting more than 28,000 projects. Of that amount, more than $151 million came from the energy office's revolving loan fund, with the rest funded by participating lenders and borrowers. The DESL program was initially capitalized with oil overcharge funds.[19] It was augmented with additional oil overcharge, state, federal, and utility funds and is currently capitalized at $43 million. Loan repayments from borrowers are remitted to the fund and made available for new loans. The program leverages funding from more than 260 Nebraska lending institutions, focusing on clean energy and energy efficiency upgrades for homes, businesses, and industrial facilities, although the vast majority of projects financed with Dollar and Energy Saving Loans are residential. Interest rates vary depending on the project (NEO 2015).

While this program is a single financing strategy offered by the energy office and does not have the scope of a green bank, it has successfully demonstrated how public dollars can leverage private capital and has proved fiscally sustainable. This is particularly notable since utility incentives are limited within Nebraska, partly because Nebraska is the only 100% public power state in the nation. Electric utilities in Nebraska are managed by publicly elected boards and subject to oversight by the Nebraska Power Review Board, whose members are appointed by the governor.

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[17] Combined heat and power systems generate electricity and useful thermal energy in a single, integrated system. CHP has been identified as a critical resilience strategy in New Jersey and across the country. See aceee.org/topics/combined-heat-and-power-chp for more information on the technology.

[18] Information on New Jersey ERB is based on Bruce Ciallella, managing director, New Jersey Economic Development Authority, pers. comm., May 4, 2016 and supplemented by www.state.nj.us/bpu/pdf/erb/Final%20ERB%20Program%20Guide.pdf.

[19] Oil overcharge funds were allocated to states by DOE in the 1970s and 1980s as a result of federal court action requiring some oil producers to pay restitution for violation of federal oil price and allocation controls.

Toledo–Lucas County Port Authority

The Toledo–Lucas County Port Authority (TLCPA) in Ohio was established in 1955, with a mission to develop transportation infrastructure and spur economic development in the region. In 1988 the agency began to offer financing products as a means to stimulate economic growth. In 2009 it filed for and received a DOE Energy Efficiency and Conservation Block Grant. The port authority focused its work under the grant on energy improvements catalyzed by commercial PACE financing. Today TLCPA is one of the largest commercial PACE energy improvement and financing districts in the country. As of March 2014, it had sponsored three energy bond issues totaling $16.54 million. The port authority operates a loan loss reserve and has turned over its revolving loan fund twice. Programs focus on commercial, industrial, multifamily, governmental, and educational facilities.[20]

We do not consider TLCPA a green bank since its mission is economic development rather than clean energy deployment. Energy efficiency financing is just one tool in the port authority's toolbox. However TLCPA's clean energy financing programs have proved successful and sustainable, and therefore there is much to learn from them.

PORTFOLIO COMPOSITION

Nearly all of the green banks we reviewed invest in both renewable energy and energy efficiency projects or have plans to expand portfolio offerings to cover both efficiency and renewables. There are benefits to having products targeting the full range of clean energy and efficiency technologies under one roof, since in theory it should streamline the process of packaging products so that customers can invest in both simultaneously. In addition, doing efficiency upgrades first allows customers to downsize their mechanical systems and save money by rightsizing their renewable energy requirements. However it is difficult to assess the extent to which green banks are taking advantage of packaging efficiency and clean energy into individual projects since most green banks are still in the early stages of fund deployment and data are not comprehensive. Even those that are in the advanced stages of fund deployment, like Michigan Saves, do not always separate investments in renewables and efficiency in their reporting.

Connecticut Green Bank does report on investment in energy efficiency versus renewable energy. Table 3 shows project composition for CTGB for fiscal year 2015.

[20] TLCPA activities are described in more detail in DOE (2015) and at energy.gov/eere/better-buildings-neighborhood-program/toledo-betters-buildings-financing-options.

Table 3. Total energy efficiency and renewable energy investment in FY2015 through Connecticut Green Bank

Category	Total private dollars raised	Total public dollars committed	Total funding deployed**	% of total project funding deployed	Total projects	% of total projects
Renewable energy*	$218,526,172	$43,278,612	$261,804,784	93%	344	58%
Energy efficiency	$4,806,873	$1,774,646	$6,734,414	2%	158	26%
Combined projects	$9,251,771	$3,415,654	$12,961,701	5%	96	16%
Total financing	$232,584,816	$48,468,912	$281,500,899	100%	598	100%
RSIP***	N/A	$37,398,900	$37,398,900		7,303	
Total portfolio	$232,584,816	$85,867,812	$318,899,799		7,901	

*Renewable energy refers to financing only and does not include data for the Residential Solar Incentive Program (RSIP), a non-financing legacy program administered by CTGB. Data provided directly by staff at CTGB. ** To avoid double counting, totals include adjustments for projects that use financing and also receive an incentive from CTGB. These adjustments are not included in detailed line items. The table does not include funds and projects categorized as "unknown/other." *** RSIP data from Lucy Charpentier, manager of evaluation, measurement, and verification, CTGB, pers. comm., June 24, 2016.

In dollar terms, most CTGB programs to date have leaned heavily toward investments in renewable energy, with exclusive energy efficiency projects making up just 2% of overall funding deployed in fiscal year 2015 and combined projects an additional 5% of funding deployed. However, in terms of the number of projects delivered, energy efficiency makes up a much larger proportion of the total: 26% of all financing projects in 2015 focused on energy efficiency, and an additional 16% were combined projects that delivered financing for both efficiency and renewables. This suggests that individual renewable energy projects have been larger and more costly than energy efficiency projects financed by CTGB. The largest portion of CTGB's portfolio, in terms of project numbers, is a non-financing program focused on solar. The Residential Solar Incentive Program (RSIP) is an incentive rebate program for residential solar PV administered by the Connecticut Green Bank. That program alone accounted for 7,303 of its 7,901 projects in 2015.[21] However, even as RSIP incentive levels have been steadily dropping since 2007, solar installations have dramatically increased (Cadmus 2016).

In contrast to CTGB, programs developed with a specific mission to save customers money through efficiency investments, rather than to spur the clean energy economy more generally, tend to have very different portfolio compositions. Nebraska's Dollar and Energy Saving Loan program was developed to help customers invest in typical energy-saving improvements. Its portfolio breakdown reflects that focus, showing a portfolio makeup inverse to that of CTGB. Total project costs using DESL financing are shown in table 4.

[21] RSIP participants can and do participate in other programs offered by CTGB and utilities in the state. All RSIP recipients are required to complete an energy audit prior to receiving an incentive, and according to CTGB staff, about 55% of households that install solar PV also participate in the Home Energy Solutions program offered by utilities.

Table 4. Total Nebraska Energy Office investments in Dollar and Energy Saving Loan projects as of June 30, 2015

Category	NEO share	Total cost of projects	% of total project costs	Total projects
Energy efficiency (all sectors)	$146,021,752	$313,765,441	97.3%	28,419
Transportation/ telecommunications	$4,587,484	$7,539,805	2.3%	35
Wind, solar, fuel cell	$708,012	$1,082,669	0.3%	26
TOTAL	$151,317,248	$322,387,915	100%	28,480

Source: Nebraska Energy Office (Danielle Jensen, public and legislative affairs officer, NEO, pers. comm. July 6, 2016). Energy efficiency results are the sum of investments in agricultural, commercial, industrial, local government, and residential sectors.

NY Green Bank is another entity that reports on its project pipeline by technology type, including both public funds and private capital. The projects of NY Green Bank have been more balanced in terms of dollars targeted to renewables and efficiency than the projects of other green banks examined in this report. For dollars invested by NYGB, exclusive of private dollars, about 47% of funding has been committed to energy efficiency projects and 53% to renewable energy projects (NYGB 2016b). About one-quarter of overall funding, including both public and private capital, has been targeted to energy efficiency projects, with an additional portion committed for projects that combine multiple technologies.

With many programs still in the early stages of fund deployment and product development, it is likely that portfolio composition will shift. For example, in 2015 the Hawaii Green Infrastructure Authority launched two solar PV products that currently make up the full scope of their portfolio, one product targeted at consumers and another at nonprofits. However, in its 2015 report, HGIA noted that there were several efficiency products in the pipeline, including commercial financing for small-business and nonprofit efficiency projects.

DEFINING AND MEASURING SUCCESS

With many states interested in the green bank model, it becomes essential to measure the extent to which these entities are expanding the market for clean energy and energy efficiency investments. As these programs continue to grow, energy savings from green bank projects could influence utility resource planning. However green banks currently do not track and measure success in a uniform way. We asked green banks to report on the metrics they track—including financial, energy savings, and renewable energy deployment metrics—and found that these varied quite substantially, especially in terms of measuring energy savings associated with investments. In many cases, green banks are still in the process of developing evaluation systems.

By What Metrics Do Green Banks Track Their Success?

The mission of most green banks is to increase the flow of capital from investors to end users to increase participation in energy efficiency and clean energy projects, thereby increasing energy savings levels and clean energy deployment. Green banks tend to measure their success by tracking metrics in two categories, financial outcomes and energy

outcomes.[22] We discuss these tracking metrics—including fund deployment and projects facilitated, leverage ratios, default rates, and clean energy deployment and energy savings achieved—in depth in the sections that follow. However, since most of these programs are relatively new, data are limited.

FUND DEPLOYMENT AND PROJECTS FACILITATED

The deployment goals of green banks vary with their stage of development. For most early-stage programs, the financial goal is simply to develop a strategy for fund deployment or to deploy the funds they have at hand in a financially sustainable way. The green banks in our study fall generally into four stages of development: incomplete deployment plan, deployment plan but no deployed funds, limited deployment, and advanced deployment. Table 5 shows where each green bank falls in terms of fund deployment as of summer 2016.

Table 5. Fund deployment status of green banks

Fund deployment status	Green bank
Incomplete deployment plan	MCGB
Deployment plan but no deployed funds	CAEATFA CHEEF Pilot Program, New Jersey ERB, RIIB
Limited deployment	NYGB, HGIA
Advanced deployment	CAEATFA R-PACE loan loss reserve program, Connecticut Green Bank, Michigan Saves, TLCPA, Nebraska DESL

Table 6 shows the number of projects facilitated by each green bank as of the time of our research. For the green banks that have not yet deployed funds, no project data were available to report. We also did not report NYGB data since this bank tracks portfolio performance at the wholesale level (as data become available) rather than the end-user level, and therefore does not publicly report information on individual projects facilitated.

[22] Some green banks also track progress toward other policy-related goals. For example, both CAEATFA and Connecticut track job creation. While NYGB does not track job creation, it does recognize that this is a likely outcome of NYGB investments (Booz & Company 2013).

Table 6: Number and dollar amount of projects facilitated by green banks

Green bank		Projects facilitated (number)	Projects facilitated (total investment dollars)	Investment period
CAEATFA (PACE LLR only)		56,137	1,200,000,000	2014–2015
CTGB	RSIP*	11,238	663,199,456	2012–2015
	All other programs	753		
Nebraska DESL		28,480	322,387,915	1990–2015
Michigan Saves		5,853	63,021,051	2010–2015
TLCPA Better Buildings		63	10,198,745	2010–2013
HGIA		12	385,453	2015–Q2 2016

Includes both energy efficiency and renewable energy projects. * The Residential Solar Investment Program (RSIP) is a non-financing program that provides an incentive based on the size of the solar installation added to a home.

As table 6 shows, it takes time to get programs up and running. Although CTGB is at a more advanced stage of fund deployment than many of the other green banks we reviewed, the majority of its projects are credited to its Residential Solar Investment Program (RSIP). RSIP is not a financing product. Rather, it offers a direct incentive to homeowners to install solar PV systems. The program predates the green bank, although CTGB now administers the program. CTGB has completed far fewer financing projects.[23] California's legislature and governor established CAEATFA's loan loss reserve to mitigate the potential risk to mortgage lenders associated with residential PACE financing. Although CAEATFA operates this loss reserve, it does not originate any of the R-PACE assessments, nor does it regulate the operations of the R-PACE implementers. Many of CAEATFA's other planned offerings under the CHEEF have yet to be deployed, and so we did not include those programs in the table. HGIA was clear that rollout of GEMS programs has required "vigorous effort" and that project lead times have proved lengthy, resulting in limited project numbers (HGIA 2015).

NY Green Bank is also in its initial stages, and due to the nature of its lending, we could not measure the impact of resulting projects. While programs like CTGB lend out money directly to end users, NYGB provides money at the wholesale level to program administrators, who in turn develop financing products for consumers. This means that although NYGB has a $54.5 million "overall portfolio size," which includes both committed ($44.5 million) and deployed ($10.0 million) NYGB funds, the impact of those funds is

[23] Despite limited project numbers, the size of individual projects under CTGB's C-PACE program is large, averaging about $650,000.

dependent on their recipients.[24] With the relative newness of the program, this information is not yet available (NYGB 2016a).

LEVERAGE

Green banks that are stewards of public and ratepayer funds use "leverage" as a shorthand to represent the ratio between private loan capital deployed and public or ratepayer funds used for energy efficiency and clean energy projects. For example, a leverage ratio of 4:1 means that $4 from the private sector has been invested for every $1 spent by the green bank. This aligns with the mission of green banks to scale up investment with limited public funding; in order to facilitate more clean energy project dollars, they must increase the amount of private financing dollars flowing to clean energy projects.

However maximizing this ratio may be at odds with other institutional goals. For example, developing a new program or serving a new sector would require a green bank to offset more risk for private investors, whereas proven clean energy investments would not. Therefore, an entity seeking only to maximize this ratio would forgo the type of market development necessary to increase the total amount of clean energy deployment. Furthermore, green banks could increase this ratio by either increasing the number of clean energy projects or reducing the amount of public dollars. If public dollars are reduced only to satisfy this ratio, it could adversely affect the total amount of clean energy deployment. Table 7 shows reported leverage ratios.[25]

[24] According to NYGB, "'Committed funds' means, in any period, the aggregate funds to be provided by NY Green Bank pursuant to fully negotiated client and partner financing agreements executed in that period, without such funds having yet been deployed, expressed in dollars. 'Deployed funds' means, in any period, the aggregate funds that have been advanced by NY Green Bank subject to the terms of fully negotiated client and partner financing agreements executed in that period, expressed in dollars." Data and definitions available in NYGB (2016d).

[25] CAEATFA and HGIA do not yet track leverage, as neither has enough projects in its portfolio. CAEATFA has indicated that it will track leverage ratios in the future for its CHEEF program. Nebraska does not actively track leverage, and Toledo's definition does not differentiate public and private funds.

Table 7. Reported leverage ratios of private capital to public dollars

Green bank	Leverage ratio
CAEATFA	N/A
CTGB	7:1*
HGIA	N/A
Michigan Saves	4:1, 10:1, 20:1**
Nebraska DESL	1.13:1
NYGB	5:1–8:1***
TLCPA	N/A

* CTGB leverage ratio is an average across all programs for FY2016. ** Michigan Saves ratios are multifamily, commercial, and residential, respectively. *** NYGB leverage ratios are estimates only. The lower end of the range is based on its current portfolio; the higher end is a 10-year forecast.

For Michigan Saves, leverage is representative of how much private capital its loan loss reserve (LLR) can support. Loan loss reserve leverage ratios are essentially measures of risk; a capital provider might increase investment into projects if a loan loss reserve reduces its risk of loss in the case of default. For example, a green bank program with a reserve fund intended to cover all losses might create an LLR to cover 5% of the total dollar amount of a loan program assuming such a rate of default, thus leveraging program funds 20:1. Michigan Saves maintains LLRs of exclusively public dollars and runs programs solely on private capital. Therefore, its LLR ratios are both a measure of private to public funding and a measure of the portfolio size its LLR can support. Michigan Saves has a 4:1 ratio for its multifamily program, a 10:1 ratio for its commercial program, and a 20:1 ratio for its residential program (Mary Templeton, executive director, Michigan Saves, pers. comm., April 8, 2016).

Increasing leverage is an explicit goal for CTGB and NYGB. CTGB's Comprehensive Annual Financial Report states the following: "One of the main goals of Connecticut Green Bank is to attract and deploy private capital to finance the green energy goals for Connecticut. To that end, the greater the leverage ratio of private to public funds, the better" (Connecticut Green Bank 2015b). So far it has managed a ratio of 7:1 over its entire portfolio. CTGB staff also recognize the importance of providing non-financing resources like technical assistance and combining financing options with utility rebates. While NYGB's program is still developing, it estimates that it will have a ratio of at least 3:1 on its current portfolio of investments and that the entire program could see a ratio of 8:1 in its first 10 years (NYGB 2015).

DEFAULT AND DELINQUENCY

Green banks track defaults and delinquencies to ensure they are carefully managing risk and to inspire confidence in investors. Table 8 offers a sample of programs that report delinquencies and defaults.

Table 8: Delinquencies and defaults

Green bank	Program	Delinquency	Default
CTGB	Solar loan	1.8%	0%
	Solar lease	0.2%	0%
	Smart-E loan	0.2%	0.2%
	C-PACE	2.3%	0%
Michigan Saves	Residential loan	Not reported	1.5% of total
	Commercial loan/lease	Not reported	0%
Nebraska	DESL	Not reported	0.1% of total loans

Data reflect default and delinquency rates as of May 2016.

Defaults and delinquencies can happen at any time over the term length of a loan, lease, or assessment, so the numbers in table 8 are not representative of defaults over the life of an average loan. Most of the originations in the programs listed in table 8 have occurred within the past 3 years with term lengths as long as 25 years, so it is still too early to determine how these rates compare with other programs or sectors. In Nebraska, the DESL program has had write-offs of $149,668 out of $151,317,248 of Energy Office dollars invested over 25 years, for a default rate of 0.1% (Danielle Jensen, public and legislative affairs officer, Nebraska Energy Office, pers. comm., July 6, 2016).

Defaults and delinquencies were not available for TLCPA. HGIA and NYGB have not yet experienced any defaults or delinquencies.

ENERGY SAVINGS

While spurring investments in clean energy and energy efficiency is a primary goal of all of the green banks we examined in our research, none currently have procedures in place to independently evaluate the energy savings achieved as a result of these investments. Therefore, data on energy savings resulting from these programs are relatively limited. Some entities, like Michigan Saves, rely on a deemed savings database developed by utilities to estimate savings associated with projects, and others, like Connecticut Green Bank and CAEATFA, are in the process of investing resources in developing evaluation protocols specific to financing efforts.[26]

While all of the green banks we surveyed were designed to ramp up private investments in clean energy, only a few have specific energy savings goals. Connecticut Green Bank has a

[26] CAEATFA is studying evaluation protocols as part of a joint effort with the California Public Utilities Commission. CTGB is near completion of an Evaluation Framework that lays out how goals and targets are set; financial and human resources allocated; programs and products implemented; and data collected, analyzed, and reported.

long-term goal of enabling energy efficiency improvements for at least 15% of single-family homes (about 150,000 homes) in the state by 2020. It also sets annual program targets, approved by its board of directors, for energy savings within specific sectors. These goals combine clean energy generated and energy saved. For example, the 2016 target for the residential sector is 66,388 MMBtus of clean energy generated and saved (Connecticut Green Bank 2015b).[27] However these targets are not set via a regulatory process, and there is no regulatory consequence for failing to meet them, as there is for utilities in the state. There is also no regulatory incentive for meeting or exceeding targets, as there is for utilities. NY Green Bank does not have specific goals for energy savings, but the program is a key strategy for achieving the state's overall goal of a 23% reduction in building GHG emissions from 2012 levels by 2030. As of March 31, 2016, NYGB projected that its investments would lead to lifetime energy savings of about 1 million MWh and 10.0 million MMBtus, clean energy generation of up to 3.2 million MWh, and an increase in renewable energy installed generation capacity of 128 MW (NYGB 2016b).

For most of the other green banks covered in this report, the interaction of green bank activities and savings targets is still under discussion. For example, in both California and Rhode Island, green bank activity may be reflected in utilities' regulatory goals. The mechanics of including energy savings attributable to green bank activities within utility goals is still to be determined. Montgomery County Green Bank, meanwhile, is still very early in its development, but staff noted that the board of directors may set specific energy savings targets in the future.

The non–green bank entities in this review typically have not set energy savings goals because their principal mission is not necessarily energy savings. For example, New Jersey Energy Resilience Bank does not have savings targets due to its focus on resilience. Similarly, TLCPA emphasizes energy efficiency as a tool in its economic development portfolio.

Because few of the green banks we reviewed have clear energy savings goals in place, reporting on energy savings achievements was inconsistent. Furthermore, unlike utility-delivered financing programs, green bank programs are typically not subject to third-party evaluation of energy savings. Despite the lack of independently evaluated energy savings, several green banks did report energy savings data along with information on spending on energy efficiency programs. For green banks that were able to report them, statewide incremental energy savings amounted to less than 0.01% of statewide electricity sales. Table 9 shows data for the most recent program year for green banks that were able to provide energy savings data.

[27] Where projects also receive utility incentives, they will be claimed as utility savings under regulatory targets. We discuss the joint efforts of utilities and green banks in the section that follows.

Table 9. Energy savings in the most recent program year for select entities

Entity	Sector	Incremental electricity savings (kWh)	Electricity savings as % statewide retail sales	Incremental natural gas savings (therms)	Natural gas savings as % commercial and residential retail sales
Nebraska DESL	Residential	110,617	0.000%	40,676	0.006%
Michigan Saves	Residential	1,031,986		248,777	
	Commercial	11,168,048		209,070	
	Total	12,200,034	0.012%	457,847	0.009%
CTGB	Residential	778,000		3,569	
	Commercial & industrial	1,598,000		34,600	
	Total	2,376,000	0.008%	38,169	0.004%
TLCPA*	Commercial	5,463,970	0.004%	90,120	0.002%

Nebraska only reports savings on DESL residential loans, and Michigan Saves energy savings are claimed by utilities where programs deliver financing and incentives jointly. *TLCPA data are the most recent available and reflect Q4 of 2012 and Q1–3 of 2013 as reported to the Better Buildings Neighborhood Program. Incremental savings are first-year energy savings. *Sources:* Data as reported by green banks in responses to questionnaires (Michigan Saves, CTGB) or annual reports (NEO, TLCPA, NYGB).

To understand the impact of these programs more broadly, it is useful to compare them with savings achieved by traditional utility programs. Utility programs are decades old in many states, typically with clear policy drivers that enable or require energy savings. Table 10 shows utility electricity savings in the states where green banks operate.

Table 10. Incremental electricity savings achieved by utilities in 2014

State	Incremental savings from utility programs (2014, MWh)	Electricity savings as % statewide retail sales	Incremental savings from utility programs (2014, MMTherms)	Natural gas savings as % statewide retail sales
California	4,082,256	1.58%	68.58	0.93%
Connecticut	387,863	1.32%	6.47	0.69%
Hawaii	144,240	1.53%	NA	NA
Maryland	792,354	1.29%	1.50	0.10%
Michigan	1,386,912	1.35%	50.00	0.99%
Nebraska	67,878	0.21%	0.00	0.00%
New Jersey	500,784	0.68%	12.87	0.32%
New York	1,338,551	0.92%	37.79	0.52%
Ohio	1,565,049	1.05%	0.00	0.00%
Rhode Island	268,468	3.51%	4.10	1.37%

Includes savings achieved in all sectors. Hawaii does not use natural gas. *Source:* Gilleo et al. 2015.

In nearly all of the states in which these green banks and financing institutions operate, utility and third-party-delivered energy efficiency programs are well established and are successfully bringing electricity savings to customers. However most of these states have ambitious goals. Accordingly, they have developed financing functions to support even greater levels of savings. Because green banks are relatively new in all these states, they have much smaller operating budgets, and in many cases project deployment is still limited. Green bank programming is also typically aimed at broader energy and environmental goals, meaning funds are deployed not just to energy efficiency projects but also to renewable energy projects and programs that encourage other environmentally beneficial technologies. Nonetheless, measuring energy impacts is imperative as green bank programs grow in scale, since utilities may depend on these energy savings for resource planning purposes.

Several factors make it complicated to report green banks' energy savings. First, data were rarely provided in common formats, making it difficult to draw comparisons across banks. For example, Michigan Saves reported incremental and annual savings data for investments made in each year.[28] Connecticut Green Bank was able to provide similarly granular data but reported life cycle rather than annual data. There are efforts to standardize financing data, including the SEE Action Network Financing Solutions Working Group convened by DOE and cochaired by CTGB. However these processes are still in the early stages. For comparison purposes, we reported only incremental savings above. We did not include NY Green Bank data in table 9 since reported estimated data on energy savings were cumulative for all committed and deployed funds; we could not separate single-year investment impacts, and even projects not yet deployed were included in the totals.

A second issue in reporting energy savings is determining whether these savings are truly additional impacts, or whether they would have occurred in the absence of financing programs. For example, when green banks partner with utilities to provide customers with packages that include both rebates and financing, utilities typically claim the savings associated with these programs. It is difficult to disaggregate the amount of energy savings associated with green bank programs from the energy savings associated with utility incentive programs, and it is likely that green bank savings may be rolled into total savings reported by utilities. Table 11 shows data reported by green banks on the proportion of programs in which customers combine rebates and financing.

[28] Incremental savings are first-year savings. Annual savings include the sum of all savings achieved in a given year from programs implemented in that years as well as those implemented in past years for which savings are still accruing.

Table 11. Projects receiving both utility incentives and green bank financing

Green bank	Sector	% of green bank projects receiving utility incentive or statewide program incentive*
CTGB	C&I**	50%
	Residential	97%
	Overall	92%
Michigan Saves***	C&I	80–85%
	Residential	80%

* Does not account for projects receiving incentives from tax credit or non-ratepayer-funded sources.
** While this figure represents the overall CTGB portfolio in this sector, ratios vary by program. For example, 94% of C-PACE efficiency and combined projects use incentives, covering about 17% of total costs.
*** Michigan Saves numbers are estimates provided by staff. Other green banks could not provide data on utility interactions.

Green banks have shown interest in developing evaluation frameworks to overcome attribution issues. CAEATFA's CHEEF pilot program EM&V plan asks consultants to identify savings from installed measures, as well as changes in the market, that may be attributable specifically to the financing program. While the methodology is still under development by the California Public Utility Commission, CAEATFA staff reported that analytical methods will likely include self-reporting from customer surveys and several modeling techniques. Connecticut Green Bank is also developing an evaluation framework to assess, monitor, and report on program impacts and processes. However this framework focuses primarily on evaluating market transformation impacts. It is unclear to what extent it will deal with attributing specific savings to CAEATFA financing options, particularly in cases where financing products are combined with incentives offered by utilities. While it may currently be difficult to say what portion of program uptake can be credited to financing and what portion of energy savings is due to the availability of utility rebates, it is clear that when these programs work in tandem, customers benefit from the complete package of financial and technical resources at their disposal.

DEVELOPING FINANCING PRODUCTS THAT WORK FOR ALL MARKET SECTORS

Most of the entities we reviewed in this report are wide reaching, with a mission to deliver clean energy and energy efficiency to all segments of the market. Typically, this mission means developing several financing products, each suited to a particular market segment. Below, we outline the program offerings of each green bank.

Commercial, Industrial, and Residential Markets

The green banks we profiled in this report take a variety of approaches toward serving different market sectors. While not all green banks cover all market sectors, most provide products for at least the commercial and residential markets. We summarize the products offered by each green bank or financing entity in table 12.

Table 12. Financial products offered to residential and commercial markets by green banks

Green bank	Program	Financial instrument	Sector	Projects facilitated (number) to date	Projects facilitated ($ million) to date
CAEATFA	R-PACE LLR	LLR	Residential	56,137	1,200
CTGB	C-PACE	Warehouse of funds	Commercial	88	56.9
	Fuel Cell–Bridgeport	Loan	Commercial	1	71
	Solar Loan	LLR, subordinated debt, warehouse of funds	Residential	279	6.0
	Solar Lease	LLR, subordinated debt, equity	Residential	1,349	48.8
			Commercial	22	9.2
	Smart-E	Loan	Residential	510	12
	Solar RSIP*	Rebate	Residential	11,238	367
	Wind Turbine–Colebrook	Loan	Commercial	1	23
Michigan Saves	Home Energy Loan Program (HELP)	LLR	Residential	5,663	51.9
	Business Energy Financing (BEF) Program	LLR	Commercial	422	13.1
Nebraska	DESL	Interest rate buy-down **	Residential	26,610	252.0
			Commercial	1,208	50.5
TLCPA	Better Buildings NW Ohio	Revolving loan fund, LLR	Commercial	63	10.2

Low-income and multifamily programs are discussed in the section that follows.*RSIP is used in conjunction with the loan, lease, and Smart-E programs for 1,495 projects. ** DESL program purchases parts of approved loans, which brings the interest rate down below market rate. It is technically not an interest rate buy-down, but the outcome is the same (see Appendix B for details).

Of the above programs, the majority of projects and dollars are in the residential sector. Table 13 offers an aggregate view of projects in the commercial and residential sectors.

Table 13. All projects facilitated by green banks and similar entities, by sector, to date

Sector	Projects facilitated (number)	Projects facilitated ($ million)	Number of projects facilitated (% of total)	Dollar amount of projects facilitated (% of total)
Commercial	1,820	140.80	2%	8%
Residential	101,786	1,558.65	98%	92%

The above totals include the outsize effect of CAEATFA's R-PACE LLR and CTGB's Solar RSIP program. They also include the programs that we did not classify as green banks, such as those in Toledo and Nebraska, which may also skew results. When all of these are removed (see table 14), it is evident that the residential programs make up the vast majority of projects undertaken but involve a much smaller majority of the dollars provided (this will be even more pronounced once the dollar amounts for CTGB's fuel cell and wind generation projects are provided). This makes clear that commercial and industrial projects are fewer but larger in investment terms.

Table 14. Projects implemented by green banks, excluding RSIP and CAEATFA programs

Sector	Projects facilitated (number)	Projects facilitated ($ million)	Number of projects facilitated (% of total)	Dollar amount of projects facilitated (% of total)
Commercial	549	80.10	7%	43%
Residential	7,801	106.65	93%	57%

Also excludes projects facilitated by non-green-bank entities.

For almost all of these projects, it is too early to determine best practices. CTGB is the oldest green bank, and it is only five years old, which is a shorter period than most loan terms. It should also be noted that even with similar financial products, the market, the demand, customer awareness, competition, and local policy can all have a greater effect on adoption than financing terms or structures.

CREDIT ENHANCEMENTS

So far, most green banks have primarily used credit enhancement, a method for reducing risk for private investors and thus increasing access to financing by providing attractive financing terms. CAEATFA, for example, maintains a loan loss reserve for the state's R-PACE program. The reserve was created by the legislature and governor to grow residential PACE in California, specifically to mitigate concerns raised by the Federal Housing Finance Agency and to mitigate the potential risk for mortgage holders by allowing them to draw on the reserve to cover the R-PACE lien in the event of foreclosure or forced sale.

Michigan Saves uses its own funds to provide a loan loss reserve for private financing. Financing institutions enroll in the program, and Michigan Saves administers the loan or lease, allowing private funds to pass through it to the end user, while setting aside its public funding for an LLR to partially mitigate risk. Its residential and commercial loan loss reserves are roughly $833,000 and $1.1 million, respectively. Michigan Saves uses its own

funds only for the LLRs and does not lend directly, so the dollar amount of outstanding loans or leases is directly proportional to the amount of money allocated to the loan loss reserves, and that proportion is equal to the leverage ratio. This means that total clean energy deployment is capped by the leverage ratio and the available funding. For this reason, one of Michigan Saves's goals is to increase the leverage ratio of its commercial LLR from 10:1 to 20:1, so it can engage in more projects without increasing the pool of funds allocated to the LLR (pers. comm. Mary Templeton).

Connecticut Green Bank uses a loan loss reserve alongside other financing. For the solar loan program, it created a $300,000 LLR and combined it with $5 million in a warehouse of funds and $1 million in subordinated debt. For its solar lease program, the LLR was $3.5 million, and it was combined with $2.3 million in subordinated debt and $7.2 million in equity (Connecticut Green Bank 2015a). Unlike Michigan Saves, CTGB actively co-lends alongside its LLR, so its capacity is not constrained by the size of its LLR.

Nebraska offers a reduced interest rate for borrowers to increase program participation. The reduced borrower interest rate is achieved through a loan participation model, in which the energy office's funds are used to purchase a portion of the eligible loans from the lender at no interest, thus allowing lenders to earn an attractive yield on their remaining share of the loan. Loan applicants desiring the lower interest rate can take paperwork directly to eligible depository institutions to secure the discounted loan (NEO 2015). This program has been going on for more than two decades, so its numbers are not comparable with those of younger programs.

As mentioned before, residential PACE in California has been very successful, although CAEATFA's role has been more to open the door than to directly manage an R-PACE program. CTGB has also had early success with its commercial PACE program, generating $57 million in assessment advances (DOE 2015). In this case, CTGB worked with municipalities to increase C-PACE adoption. In commercial and residential PACE financing, local governments are responsible for collections. CTGB not only reimburses the municipalities for the costs of servicing these liens, but also takes assignment of the lien and enforces collection in the event of a delinquency. In so doing, it alleviates responsibility on the part of local governments and speeds up adoption of the program. To date, 109 of 169 Connecticut localities have adopted it, serving 88% of the commercial and industrial properties in the state (Connecticut Green Bank 2015a). C-PACE has had success in other states as well, but CTGB administers the program for the entire state, provides a warehouse line of credit for implementers, and enrolls lenders and contractors into its network, which is a novel role for a green bank.

Low-Income and Multifamily Markets

As states and localities examine financing as a strategy to reach more customers, it is important to consider whether these programs are truly available to all customer classes. Lenders often do not address the low-income market at all because it is characterized by low credit scores and a large proportion of renters who lack home equity to offer as security against a loan. Furthermore, financing can add expenses to already-stretched budgets in these communities. Given these factors, special care must be taken in developing financing

products that not only reach these markets but provide adequate consumer protection from additional financial risk.

Although there are challenges to working in the low-income market, there are also significant opportunities. Financing programs have the potential to serve as a complement to energy efficiency programs for low-income consumers. Well-designed energy efficiency loan programs in which energy savings cover monthly loan payments can provide a means for these customers to finance efficient and cost-saving measures. Drehobl and Ross (2016) note that financing can be critical to furthering investments in multifamily housing. Since building owners face increasing operational costs as buildings age, they may prioritize spending their limited capital on maintenance and building improvements rather than energy efficiency. Low-interest financing can significantly reduce up-front costs, allowing building owners to take on much larger clean energy and energy efficiency projects and thereby reduce their operations cost in the long-term.

MOTIVATORS FOR GREEN BANK ENGAGEMENT IN LOW-INCOME AND MULTIFAMILY SECTORS

We identified three main drivers for green bank products focused on low- and moderate-income (LMI) markets:

- Commitment by leadership to direct investments into hard-to-reach markets
- Stipulations that seed funding be directed toward particular sectors, including low-income and multifamily
- Market-driven proposals for products and programs geared toward these markets

Several of the green banks and other institutions we surveyed for this report work in affordable multifamily and low-income markets. However only a few indicated that serving hard-to-reach markets was part of their mission.

Connecticut

Connecticut Green Bank does have an explicit mission to serve low-income and multifamily markets. In 2013 its board of directors affirmed support of solutions for the deployment of clean energy in the multifamily sector, and in 2014 the board directed CTGB to support comprehensive solutions in the low-income single-family and multifamily sectors. CTGB has since invested significant resources into developing products that serve these markets, supported by $5 million of impact investment funds from the MacArthur Foundation earmarked for coordination with the Housing Development Fund.

CTGB oversees a variety of products and initiatives relevant to the low-income sector, including an LMI solar incentive, a partnership with solar and energy efficiency provider PosiGen, a statewide Smart-E lender for credit-challenged homeowners, and affordable multifamily housing energy financing products like the Low Income Multifamily Energy (LIME) Loan, C-PACE, and predevelopment loan programs. Connecticut Green Bank will

also work with multifamily properties to provide credit enhancements if projects are not eligible for C-PACE or LIME financing (Connecticut Green Bank 2015c).[29]

The green bank assesses its progress in this market sector by tracking projects by census tract. CTGB defines low to moderate income as less than 100% of area median income. (AMI). Table 15 shows clean energy projects delivered to customers in different income bands for the most recent fiscal year.

Table 15. Clean energy projects delivered in the residential sector by census tract AMI for FY2015

Income band (% AMI)	Projects (#)	% total projects	Installed capacity (MW)
<60%	313	4.0%	8.6
60–80%	549	7.0%	24.7
80–100%	1,587	20.1%	32.6
>100%	5,429	68.9%	125.4
Total	7,878	100%	191.3

Source: Connecticut Green Bank 2015b

CTGB offers financing programs with an income criterion of 100% AMI (the tiered solar incentive) as well as programs with an income criterion of 80% AMI (a low-income multifamily loan). The green bank developed these LMI definitions in conjunction with the Connecticut Department of Housing and the Connecticut Housing Finance Authority. This coordination is important, as definitions of "low income" can vary across agencies. For example, HUD applies the term to households whose income does not exceed 80% of the area median income (HUD 2016). Connecticut's Energy Assistance Program, which administers federal funds to help low-income customers throughout the state afford their energy bills, sets the eligibility criterion at 60% of the state's median income (LIHEAP 2016). In contrast to these definitions, CTGB's LMI threshold of 100% AMI encompasses a larger swath of the state's population. Staff noted that CTGB sets income eligibility cutoffs based on the market gap a program is meant to address. Very low-income customers are generally reached through affordable multifamily housing partnerships with housing agencies and CDFIs rather than through homeowner financing products. This alignment ensures that energy upgrades are considered as part of any grant or financing program these agencies offer. CTGB strives to work toward parity in uptake of clean energy investment. In 2015 about 11% of CTGB projects reached households below 80% of the area median income, and an additional 20% reached households between 80 and 100% of AMI. CTGB reports do not indicate numerical targets for its work in the low-income sector, but the most recent annual

[29] Properties with FHA mortgages, HUD insurance, or CHFA bond financing are not eligible to participate in the C-PACE program. The LIME Loan is available to properties in which 60% of units serve households whose incomes do not exceed 80% AMI.

report recognizes that there is work to be done in this sector (Connecticut Green Bank 2015a).

CTGB also targets distressed communities.[30] Table 16 shows projects delivered by community type in the most recent fiscal year.

Table 16. Approved, closed, and completed projects by community for FY2015

	Projects (#)	Total project costs	Annual MMBtu
Not distressed	6,211	$287,577,441	335,915
Distressed	1,755	$75,240,947	374,092
Total	7,966	$362,818,388	710,007
% distressed	22%	21%	

Source: **Connecticut Green Bank 2015a**

About 25 communities out of the total of 169 in the state have been classified as distressed, covering just over 30% of the state's population. On a community-wide basis, CTGB's work has successfully targeted distressed communities. CTGB reports steadily increasing the percentage of projects deployed each year in these towns and estimates that to date projects in distressed communities have totaled about $200 million (Connecticut Green Bank 2015a).

Hawaii

The Hawaii Green Infrastructure Authority similarly has service to low- and moderate-income communities built into its mission statement. The agency notes that its GEMS program is meant to "expand the market to include underserved segments such as low- to moderate-income homeowners, renters, and nonprofits." The first product launched as part of the GEMS program was a nonprofit PV loan product. While HGIA reports that there is a pipeline developed for this product, no loans had been issued as of 2015 (HGIA 2015). HGIA also notes that uptake has been slower than expected generally, and that the agency plans to modify its entire portfolio with a more forward-looking view.

For many of the other institutions we examined, entry into these markets tends to be driven by their source of funding. Those leveraging federal dollars in the form of community block grants often have particular requirements to serve LMI markets, typically as defined by the Small Business Administration.

New Jersey

New Jersey ERB does not offer financing products for residential markets but does prioritize funding for hospitals and water treatment centers located in areas identified as LMI. This

[30] Distressed communities are as defined by the Department of Economic and Community Development. Towns are scored using criteria like per capita income, percentage of population living in poverty, and unemployment rate. The 25 towns with the highest total scores are designated distressed communities. See spark2.cronindev.com/wp-content/uploads/2015/11/Connecticut-Green-Bank-2015-CAFR.pdf for more details.

focus is a direct result of funding requirements. Resilience Bank applications are run through a HUD database that identifies income at the census tract level. Projects for hospitals and wastewater facilities located in areas where more than 50% of the population is below specified income levels are considered to benefit LMI communities. ERB staff noted that in practice, identifying the communities that private hospitals serve is more difficult and requires an understanding of hospital revenue streams by department (e.g., specialty versus emergency room visits).

Michigan

Like New Jersey ERB, Michigan Saves's involvement in the multifamily market is guided by funding stipulations, in this case those of a DOE grant. Since 2014, Michigan Saves has issued 15 loans in the multifamily sector, totaling $898,880. These projects include affordable housing as well as traditional multifamily properties. Michigan Saves does not serve customers who do not qualify for loans but has structured its multifamily program differently from its residential and commercial programs, setting up a 25% loan loss reserve compared with the 10% loan loss reserve it holds for business transactions. The larger loan loss reserve allows the Michigan Saves multifamily program lender and contractor to pursue projects in this sector that they might not otherwise pursue and ultimately approve for financing. Table 17 shows loan volume and value for each year since the program was implemented.

Table 17. Loan volume for Michigan Saves multifamily projects through February 2016

Year	Volume	Value ($)	Cumulative balance ($)
2014	**6**	**532,203**	**532,203**
2015	**7**	**268,613**	**800,816**
Jan	1	73,446	
May	2	45,394	
Jul	2	83,557	
Sep	1	22,900	
Oct	1	43,316	
2016	**2**	**98,064**	**898,800**
Feb	2	98,064	
TOTAL	**15**	**898,880**	

Source: **Michigan Saves Program Performance Review as of February 29, 2016. (Mary Templeton, executive director, Michigan Saves, pers. comm., April 8, 2016).**

Michigan Saves staff noted that working in the multifamily space presents unique challenges. To date, the program has not achieved the number of transactions that Michigan Saves targeted. The organization partners with utilities for program identification and delivery, and many of the issues that utilities face in offering rebates and efficiency services in this space also hold true for financing. For example, the split incentives that building

owners and renters face have limited program participation. Additionally, the reality that multifamily buildings can be both commercially and residentially metered has posed problems with looking at projects holistically—particularly pairing financing products with appropriate utility incentives. Michigan Saves staff noted that utility programs bridging commercial and residential sectors are helpful for streamlining program delivery, including the financing component. Finally, the complex policy and regulatory structures of affordable multifamily buildings complicate the ability of Michigan Saves to provide financing for efficiency and renewable energy investments. HUD mortgages cannot be subordinate to other financial investments, so Michigan Saves commercial financing products are not compatible with buildings with HUD financing. The organization is working on developing an unsecured loan to deal with this issue, but staff noted that navigating the complex ownership structure of multifamily buildings is likely to remain a challenge.

Although Michigan Saves does not have additional requirements to serve hard-to-reach markets, it has made some efforts to serve these markets in other ways. For example, the organization ran a pilot program that referred applicants who did not qualify for loans through Michigan Saves to a CDFI. This program proved to be complicated, and since it did not result in any loans the program was eliminated. Michigan Saves is now working on a pilot that uses utility bill repayment history as underwriting and is hoping to expand the residential customer base it reaches in this way.

Montgomery County

While MCGB is still in development, the Pepco-Exelon merger dollars negotiated by the county for seed funding come with a number of requirements. One is that the green bank endeavor to direct 20% of funds to LMI residents in single-family and multifamily housing, and the other is that it target 10% of incentives and financing to benefit multifamily communities. The county has two other programs besides the green bank envisioned for merger funding; these programs can contribute toward those requirements, but the spirit of the agreement carries a strong expectation that the green bank will provide programs that serve the LMI community and pursue investments in the multifamily sector.

Additional Considerations

Some green banks that leverage ratepayer funds also have regulatory requirements concerning the populations they serve. For example, the CPUC decision that authorized the CAEATFA CHEEF pilot program requires that one-third of the credit enhancement funds be targeted to low- to moderate-income households. The decision notes that "a significant portion of the new participants [CPUC] hope[s] to attract to the energy efficiency market are low and moderate income homeowners" (CPUC Decision 13-09-044). Therefore, the utility commission issued regulatory requirements in order to encourage financial institutions to reach out to these markets and report on their efforts.

Green bank structure also matters when it comes to program delivery for LMI markets. NY Green Bank, for example, is designed to be market responsive and does not provide loans directly to retail consumers or homeowners. NYGB addresses underserved markets only when proposals seeking to address those market segments are presented to it. NYGB staff indicate that they have received such proposals and have worked alongside private sector entities to structure financial products that may encourage investments in LMI markets, but

they have not released a request for proposals that specifically targets the LMI market segment. The institution has, however, worked with representatives of several CDFIs to identify potential collaborations that could benefit LMI end users. According to NYGB staff, the green bank expects to work with NYSERDA on strategies to better serve multifamily markets and will proactively engage with efforts that assist foundations, financial institutions, and any others that work with LMI communities in formulating opportunities aligned with NYGB's investment criteria.

ALIGNING GREEN BANKS AND UTILITY ENERGY EFFICIENCY PROGRAMS

While the green banks outlined above are designed to address several market barriers, providing both financing tools and technical resources, it may be possible for states and localities to fill these gaps without creating a green bank. Utilities and other traditional energy efficiency program administrators have managed energy efficiency financing programs for several decades, with programs such as PG&E's Zero Interest Program (ZIP) having made as many as 450,000 residential energy efficiency loans as far back as the late 1970s and early 1980s (Gaspari, Ku, and McGuckin 2014). Today, utilities continue to operate some of the largest energy efficiency financing programs in the country, such as the residential Massachusetts HEAT Loan program, with annual volume at approximately $100 million (Rothstein 2014), and the Connecticut Small Business Energy Advantage financing program, which has cumulatively reached nearly 30% of its target market (SEE Action 2014).

Rationales for Separate and Integrated Financing Programs

The rationales for the establishment of a separate financing entity include the following:

- *Mission.* Some policymakers have argued that a primary purpose for establishing a separate green bank is to create a nimble entity focused on an overall mission of scaling up the delivery of energy efficiency savings by ushering in new sources of private capital.
- *Scale.* While there are some examples of utility financing programs that have reached significant volumes in targeted sectors, a separate entity may be designed to raise and deploy large amounts of capital across a broad range of market sectors at a level needed to achieve long-term energy efficiency goals.
- *Capacity.* Although a number of energy efficiency program administrators around the country manage financing programs, some administrators may not feel that financing is part of their core capacity. Green banks may be established to provide financing skills and expertise that complement traditional program delivery activities.

Still, some jurisdictions have chosen not to establish a separate financing entity but instead to develop an integrated approach (e.g., see Vermont sidebar). Some rationales for this approach include:

- *Mission*. Rather than scaling up with private capital, the mission of traditional program administrators is typically to scale up in whatever ways are considered cost effective. Operating under this overarching principle may steer programs toward choices aimed at driving demand, even where those choices may involve an increase in program investments relative to the level of private capital raised, as long as the investments are considered cost effective.
- *Scale*. In some cases, jurisdictions may determine they can most effectively scale up by combining all available tools and resources through an integrated programmatic approach.
- *Capacity*. Existing program administrators may already be well practiced in identifying key barriers to energy efficiency in particular markets and identifying solutions. This makes existing program staff well suited to manage both financing and traditional rebate and grant programs. Packaging financing alongside other existing programs also allows administrators to more seamlessly promote the entire toolkit of investment options for energy efficiency and clean energy projects.

Vermont: Building Capacity across Existing Institutions

In Vermont, a yearlong stakeholder process examining the pros and cons of establishing a green bank led to a collective decision to establish a voluntary collaborative rather than a new and separate financing institution (EAN 2016). This decision was based in part on a feeling among stakeholders that existing financing programs within several institutions functioned as integral strategies within each organization's overall respective mission. These organizations included several utilities, the state's economic development agency, and a fund supporting renewable energy deployment, among others. Separating out the financing from other core activities within each institution was perceived as potentially interfering with the seamless promotion of financing alongside other strategies used to achieve these organizations' broader goals.

At the same time, stakeholders recognized the need to build financing capacity, increase scale, and strengthen collaboration across these various institutions. Stakeholders therefore agreed to establish a Clean Energy Finance Collaborative (CEFC) to bring partners together for the purpose of exploring energy efficiency and clean energy financing options for all Vermont residents and businesses. This collaborative would be based on a memorandum of understanding signed key institutions, led by the Vermont Public Service Department (PSD). The collaborative would be tasked with convening a series of workshops to explore financing gaps, solutions, and potential partners. Going forward, stakeholders emphasized that in order to be successful, the collaborative would need to build capacity in capital raising, financial product design, and market deployment.

In some cases, a well-designed separate institution may provide enhancements to utility energy efficiency programing. An organization with technical financing expertise, for example, may help bridge the gap between private capital providers and traditional program delivery mechanisms, allow utilities to reach deeper savings in their programs, and expand marketing efforts at no additional cost to the programs. Regardless of the path chosen, policymakers may wish to ensure that financing programs enhance other existing strategies and that financing strategies and existing programs are implemented as seamlessly as possible.

Over green banks' relatively short history, the ways they interact with existing programs have evolved. Initial conceptions of the role of green banks relative to other programs have

been refined to incorporate analysis and stakeholder feedback regarding potential modes of collaboration. We describe these key trends in more detail below.

Initial Frameworks

Early frameworks set green banks in contrast to utility programs offering rebates and incentives, though a number of these mission statements have since been refined. Initial policy statements suggested moving beyond a focus on rebates, incentives, and other traditional program approaches and toward a focus on leveraging private capital to achieve greater scale. Below is a selection of examples of these framework statements.

- *California.* "The Commission's goals include developing scalable and leveraged financing products to stimulate deeper energy efficiency projects than previously achieved through traditional program approaches (e.g., audits, rebates, and information)" (CPUC 2013).
- *Connecticut*. Connecticut Green Bank has established a goal "[t]o reduce reliance on grants, rebates, and other subsidies and move towards innovative low-cost financing of clean energy deployment" (Connecticut Green Bank 2015a).
- *New York.* Its proposal envisions moving from a "Focus on Government-Driven Grants & Subsidies" before green bank implementation toward a "Transition to Market-Based Investments and Multiple Deployments for Each Dollar" afterward (NYSERDA 2014).

In some jurisdictions, initial program plans also intended to shift resources from traditional programs toward green banks, though several of these plans have also evolved over time as policymakers and regulators have recognized that financing alone cannot replace the functions served by rebate and incentive programs but is more useful as a complement to traditional programs. Below are a few examples of these early program designs:

- *New York.* Initial proposals suggested ramping up capitalization of NY Green Bank to $1 billion over three years (NYGB 2014), while decreasing NYSERDA ratepayer collections by 57% over 10 years (NYSERDA 2015).
- *Rhode Island.* Initial proposals suggested consolidating existing sources of funds, including ratepayer collections previously administered via traditional energy efficiency programs, "under one roof" within a Rhode Island Green Bank. (Raimondo 2014; Magaziner 2014).
  Hawaii. Ratepayer collections that normally support traditional energy efficiency programs are now being partially redirected to support repayment obligations on a $150 million bond capitalizing the GEMS financing program; in 2015, for example, approximately $14 million (about 38%) of a total of $37.2 million in collections that would typically support traditional programs was redirected to support bond repayment obligations (Hawaii Public Utilities Commission 2015).[31]

[31] As bond capital is lent out, GEMS loan repayments are expected to replenish the account into which ratepayer energy efficiency funds are typically deposited. Once deposited, however, the public utilities commission will have discretion as to whether such funds will be reinvested into traditional programs (Hawaii PUC 2014).

Over time, policy statements regarding the purpose of green banks vis-à-vis traditional programs have evolved, often becoming more nuanced and emphasizing the complementary roles that financing and traditional strategies play in boosting progress toward overall energy savings goals. For example, Connecticut updated its goal for 2017, looking to "leverage limited public funds to attract multiples of private capital investment while returning and reinvesting public funds in clean energy deployment over time" (pers. comm. Matt Macunas).

Refining the Vision

Ideas about the role green banks can and should play have changed, largely due to more detailed analyses in several jurisdictions. For example, a 2013 potential study in California analyzed the projected incremental energy savings that newly proposed financing programs might add to the traditional portfolio (Navigant 2014). As highlighted in figure 4, the results show that estimated additional savings from financing strategies are not at a scale that would support a portfolio-wide transition to financing approaches.[32]

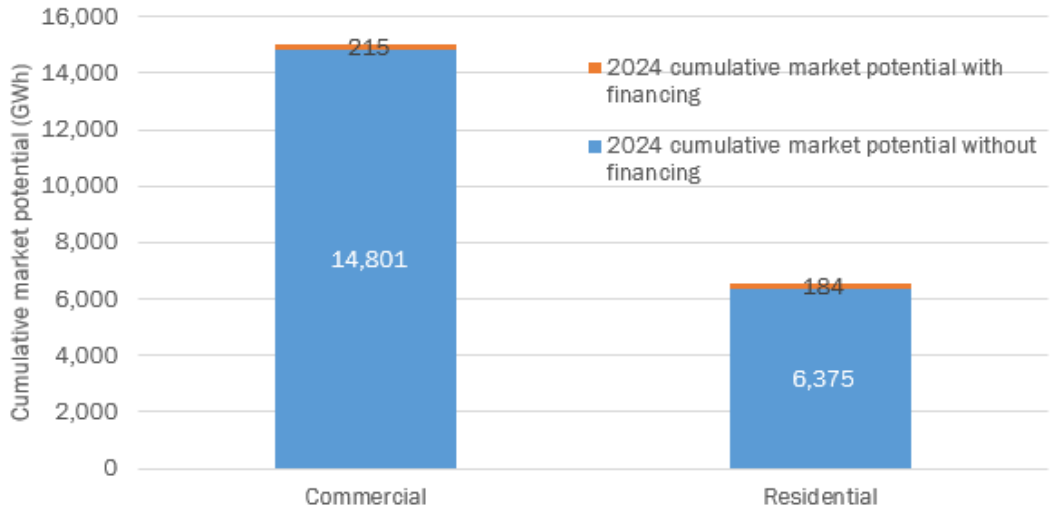

Figure 4. Cumulative market potential for energy efficiency in California by 2024, including traditional programs and financing. *Source:* Navigant 2013.

Updated results in 2015 suggested similar impacts at a portfolio-wide level, although the study also highlighted important differences within specific market segments (Navigant 2015). For example, financing was projected to have a greater impact on the residential

Replenishment is also dependent on the pace and timing of loan deployment and repayment. As noted in the most recent GEMS annual plan, "During the reporting period January 1, 2015 to December 31, 2015 . . . the GEMS Program had not released any capital to fund eligible technologies" (HGIA 2016).

[32] These quantitative conclusions are consistent with the qualitative findings of a Cadmus focus group study, which found that "hesitation in taking out a loan" was a common characteristic of four market sectors: medium-to-large business, small business, single-family residential, and multifamily (Cadmus 2013).

sector than the commercial sector, partly as a result of findings that access to capital presented a higher barrier for residential customers in the state.

In Connecticut, analysis indicates that green bank programs could play an important role in "leveraging up" savings from traditional delivery mechanisms. The bulk of overall projected savings in utility analysis still derived from traditional programs, indicating that financing likely could not serve as a replacement for traditional strategies. However the analysis did suggest that financing could help push overall savings outcomes higher than if traditional strategies were operating alone. Figure 5, from a 2015 presentation to the Connecticut Energy Efficiency Board, is based on respective savings goals from utility and green bank planning documents. It indicates that adding Connecticut Green Bank programs to the utility portfolio was expected to help increase overall energy savings levels in the commercial sector (Kramer and Tumidaj 2015).[33]

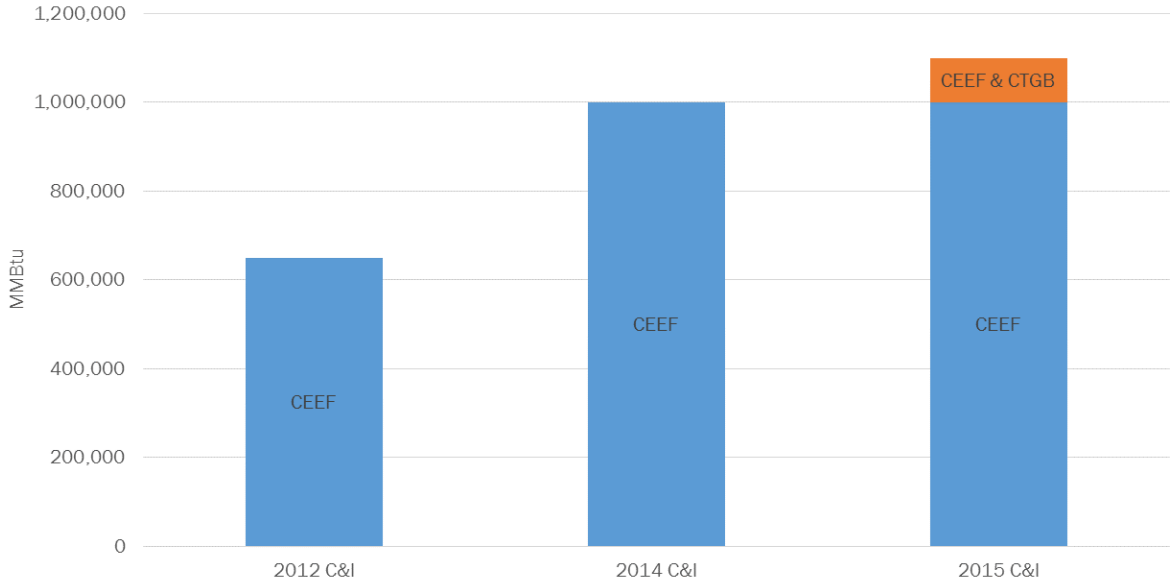

Figure 5. Connecticut savings goals in the commercial and industrial sectors, including the addition of CTGB in 2015. *Source:* Kramer and Tumidaj 2015.

A key finding from this analysis was that the effort to increase savings levels depended on a combination of traditional program delivery mechanisms and financing working in concert to produce more and deeper energy savings. The summary highlighted the fact that historically 92% of green bank commercial energy efficiency projects had made use of utility program incentives. The analysis also showed that without these incentives, nearly half of all commercial PACE projects would not have met legislatively mandated project-level eligibility criteria requiring projected savings to exceed loan repayment obligations.

[33] Actual Connecticut Green Bank reported results for 2015 were 34,600 annual MMBtu for the commercial sector (Connecticut Green Bank 2016), as compared with a projected 80,395 annual MMBtu (Connecticut Green Bank 2015). Actual reported utility program annual MMBtu savings from the commercial sector were approximately 1.1 million MMBtu (Connecticut Energy Efficiency Fund 2016) as compared with a projected 1,078,346 MMBtu (Connecticut Light and Power Company et al. 2015).

To date, financing has helped commercial customers in Connecticut to invest in more comprehensive measures with longer payback periods for which incentives cover a relatively smaller portion of the total cost. Table 18 shows financing and incentive data for C-PACE programs in Connecticut, illustrating their complementary functions.

Table 18. CTGB closed and approved C-PACE projects

Measure payback (years)	Number of measures undertaken	Total cost	CT Energy Efficiency Fund (CEEF) incentives	% of cost covered by CEEF incentives	C-PACE financing*	% of total measure cost supported by C-PACE financing	Total energy savings (MMBtu)	Total $ savings
Up to 3	52	$2,049,339	$760,121	37%	$1,263,724	62%	186,678	$8,958,390
3 to 5	33	$2,532,644	$481,664	19%	$1,988,970	79%	132,811	$8,093,249
5 to 10	61	$8,204,999	$1,494,704	18%	$6,574,380	80%	413,225	$18,025,224
10 to 15	30	$3,594,630	$230,574	6%	$3,191,383	89%	112,627	$5,172,001
> 15	91	$15,956,118	$1,210,323	8%	$13,924,839	87%	442,695	$14,005,748
Total	267	$32,337,730	$4,177,386	13%	$26,943,296	83%	1,288,036	$54,254,612

*Does not include closing costs. *Source:* Matt Macunas, legislative liaison and marketing manager, CTGB, pers. comm., July 11, 2016.

Analyses like these of the complementary roles of financing and traditional delivery mechanisms have helped contribute to a refinement in the positioning of green banks relative to existing portfolios. At the same time, stakeholder input in a number of jurisdictions has contributed to a renewed vision based on the shared goal of "leveraging up" existing resources with innovative financing to reach higher goals.

Paths Forward: Leveraging Up

As green banks around the country have continued to take shape, they have increasingly evolved toward models designed to enhance the core functions of existing program delivery mechanisms. In several cases, this evolution has led to adjustments in both program designs and policy statements aimed at fostering the seamless promotion of shared energy efficiency objectives. Below are a few examples of this type of evolution in various jurisdictions

New York. In June 2015, NYSERDA filed a supplement to its original program plan that adjusted both the speed of Green Bank capitalization and the pace of traditional program funding reductions. In making these adjustments, NYSERDA and Green Bank officials acknowledged the importance of stakeholder feedback in contributing to a renewed vision of the green bank and traditional program interaction. As stated in the supplemental filing, "NYSERDA and NYGB are . . . cognizant of the feedback received in connection with both the CEF and NYGB proceedings, and the importance that the CEF and NYGB work in tandem to deliver the combined benefits of their related efforts" (NYSERDA 2015).[34] In light

[34] CEF is the Clean Energy Fund, which will fund NYSERDA programs going forward.

of this feedback, NYSERDA adjusted its green bank capitalization schedule from a three-year to a 10-year time frame, which also allowed for a "significant easing" in initially planned traditional program funding reductions (NYSERDA 2015).[35]

Connecticut. In April 2015, the Joint Committee of the Connecticut Energy Efficiency Board (which oversees utility-administered energy efficiency programs) and Connecticut Green Bank's board of directors agreed on a mission statement highlighting the ways in which both programs could reinforce their coordinated efforts. The statement read, "The Energy Efficiency Board and Connecticut Green Bank have a shared goal to implement state energy policy throughout all sectors and populations of Connecticut with continuous innovation towards greater leveraging of ratepayer funds and a uniformly positive customer experience" (Connecticut Green Bank 2016).

That same year, a set of "coordinated priorities" shared by both programs was developed, which focused on combining the resources of both programs to enhance program efforts toward the shared statewide goals of increased energy efficiency and renewable energy deployment. These coordinated priorities were adopted into the respective program plans of both administrators. For example, in the commercial and industrial sector, the programs agreed to "cross-leverage Connecticut Energy Efficiency Fund and Connecticut Green Bank programs . . . to help achieve the state goals of acquiring all cost-effective energy efficiency and expanded renewable deployment through highly effective leveraging of customer funds" (Connecticut Green Bank 2016; Connecticut Light and Power et al. 2015; Eversource Energy et al. 2015).

Rhode Island. Proposals in 2014 left undefined the level of funding from utility ratepayer energy efficiency programs that might be redirected toward a green bank. Stakeholder input over the following year contributed to a decision among program planners to maintain core functions of traditional energy efficiency program administration within the existing utility program structures, while supporting targeted green bank financing programs expected to enhance core program results.

By the time legislation was introduced in the spring of 2015, proposals suggested directing 5% of ratepayer energy efficiency funds to the RIIB, while 95% of ratepayer funding would continue to flow through existing channels (Rhode Island House of Representatives 2015a). Of the funds directed toward the green bank, any amounts in excess of administrative costs and reserve fund requirements would be redirected back to existing channels of efficiency program deployment. Ultimately, this structure was further refined to direct 2% of ratepayer energy efficiency funds toward the state's green bank, with no mechanism to

[35] Under the revised proposal, capitalization would also occur in three stages, with each stage requiring the green bank to demonstrate that at least 75 percent of funds from the previous stage had been committed (NYSERDA 2015). In order to allow the green bank to operate with more capital on hand as needed than the slower capitalization schedule would allow, officials also proposed that the green bank take out a line of credit to use for its operations, which could be repaid with future capitalization from ratepayer funds (NYSERDA 2015). The line of credit would be drawn upon only if market demand were sufficient to warrant the drawdown of available funds.

return unused funds to traditional program administrators (Rhode Island House of Representatives 2015b).

These examples demonstrate an increasing trend toward incorporating both formal analyses and stakeholder feedback into efforts to align green bank activities and traditional program delivery mechanisms. Overall, the trend has pointed toward increasingly collaborative and nuanced partnerships among these different types of programs, designed to achieve overall policy goals as effectively as possible using all available resources. Policymakers considering the potential development of green banks to further energy efficiency goals in their own jurisdictions may wish to consider applying insights from these early experiences to their own discussions of potential options.

Discussion

LESSONS LEARNED FROM GREEN BANKS

Listen and react to stakeholders. Each green bank we spoke to for this research emphasizes active engagement with stakeholders and the flexibility to adapt based on stakeholder feedback. Michigan Saves staff offers this advice to anyone considering building a green bank: Engage stakeholders early and often, and respond to their feedback both during program development and after the program is launched. This iterative approach is illustrated by Michigan Saves's three-phase approach to its Business Efficiency Financing program for commercial properties. In the pilot of this program, the application was eight pages long and, even though financing was cheap, business owners would not make the time necessary to finish the application. Administrators addressed this in their next iteration by shortening the application to one page. Michigan Saves staff indicates that the key to getting a decision to move forward with financing from a customer is an approval process that takes just minutes. This feedback produced a model of high engagement that has worked well for Michigan Saves. Montgomery County's Green Bank legislation explicitly required the convening of a stakeholder work group, which met in committees nearly 20 times over the course of a year. The group produced a market assessment report, recommendations for establishment of the green bank, materials to aid the incoming board of directors, and amendments to the legislation to clarify certain aspects of the green bank's operations. This process leveraged expertise and experience in the community and garnered support and buy-in from key stakeholders necessary for the green bank's success.

Provide technical support, and make the process simple. Green bank staff noted the importance of extra guidance to close deals. Both Michigan Saves and CTGB engage multiple actors within the industry to make the process as simple as possible for the end user. By having an approved contractor network, working utility rebates in on the back end, coordinating with utilities to provide technical assistance, and having capital at the ready, the process can be made much easier for the end user. If customers were required to handle all of these aspects of a project independently, the hassle and time cost alone might dissuade them. However, by aggregating all the actors to sell as one product, green banks working with utilities and other key partners can make clean energy adoption much more attractive.

Embrace trial and error as a means to understanding the market. Due to the relative newness of these programs, trial and error is a key component of creating the types of programs that stakeholders will find most useful. Not all green banks' initial offerings have proved

successful. HGIA was established in November 2014 and launched two solar PV loan programs, one for consumers and another for nonprofits, in 2015. Both programs have seen underwhelming deployment; the former has made only 12 loans so far and the latter has not made any. HGIA notes that the lack of uptake is likely due to policy and market changes, including the end of net metering and the rise of private-sector financing for residential solar. In establishing HGIA, the legislature and utility commission gave the agency flexibility to finance a variety of other technologies, including energy storage, commercial energy efficiency, and more-resilient energy infrastructure. Because of this, HGIA is retooling its program offerings and plans to spread capital deployment over the next several years (HGIA 2015).

Use your existing state resources. Many of the green bank staff we spoke to noted that their banking institutions were created out of existing programs or state agencies. Many also rolled legacy programs, like a loan loss reserve, into their existing offerings. This model meant development focused on expansion rather than building from the ground up. Furthermore, models like RIIB, which refocused the work of an infrastructure bank, allowed the state to rely on financial models already proven to work in other markets. RIIB's experience financing large projects with long payback periods was directly relevant to financing in the clean energy space.

FUTURE DEVELOPMENTS FOR GREEN BANKS

Most of the green banks we examined are relatively new. Even Connecticut Green Bank, considered by many to be the most established green bank operating in the marketplace, is still in the process of assessing the market and better understanding the tools and products it can provide. Because green banks are still very much in developmental stages, we asked staff at green banks to report on areas where they expected to see growth.

Several green bank staff pointed to particular products as areas where they hope to see additional financial activity. Both Rhode Island Infrastructure Bank and Connecticut Green Bank reported that commercial PACE programs were likely to grow significantly in the future. Michigan Saves staff noted that existing programs have grown rapidly in recent years but that they were looking to on-bill financing programs in an effort to pick up customers not eligible for traditional loans.

Specific market sectors are also an area of opportunity for green banks. For example, the RIIB expects to see uptake of its public buildings revolving loan fund by local school districts. In Connecticut, CTGB staff noted that they expect their multifamily programs and services to grow, especially those in the affordable multifamily sector.

For other programs, future directions were less clear. In New Jersey, staff at the ERB reported they were not currently considering changes to programs or applicants and said they were not likely to seek additional funding once the $200 million pipeline is fully obligated. CAEATFA staff reported that areas of growth will depend on the priorities laid out by the state. California is focused on reaching distressed communities and areas with environmental concerns, but what that means in terms of green bank programming remains to be seen. In New York, staff reported they expected to see significant market growth overall. A NYSERDA-commissioned market assessment showed unrealized opportunities of about $85 billion over the next decade (Booz & Company 2013), although reaching this level

of investment would require a significant ramp-up in activity. The majority of the opportunity was predicted to lie in energy efficiency (about $55 million of the overall $85 million). NYGB staff noted that flexibility and responsiveness to the marketplace would be critical.

Conclusions

Green banks are still in the very early stages of development, making it difficult to measure progress. Although we set out to learn how much impact green banks were having in the energy efficiency market, we found that information on results is still relatively limited. Six of the green banks we reviewed are in the very early stages of fund deployment or have not deployed funds at all. While these entities have lessons to impart, any assessment of whether green banks have been successful would be premature.

Green banks offer an opportunity for combined and enhanced delivery of renewable energy and energy efficiency programs that has not been fully maximized to date. Not every green bank or similar entity we reviewed in this report offers financing for both renewable energy and energy efficiency. Some, like NJERB, were developed specifically to encourage a single technology. Others, like Nebraska's DESL, were set up with a mission to invest in energy efficiency and only later expanded to include small renewable wind, solar, and fuel cell projects; dedicated alternative-fuel vehicles and fueling facilities; and energy-efficient new home construction. However many of the green banks we reviewed were conceived with a more general mission: to ramp up investments in clean energy technology. Among these green banks, portfolios tend to lean toward renewable energy, particularly in the case of CTGB. In 2015, CTGB reported that 16% of its projects focused on combined delivery of renewables and efficiency. NYGB reported a similar ratio in terms of funding committed to projects using multiple technologies. Refining program marketing and delivery in order to maximize combined projects will be an important step not only in meeting state goals for clean energy deployment but also in moving toward a modernized grid.

Green banks can provide important financing options for multifamily and low-income markets but may not be active in this space unless driven to do so by policy or other directive. The green banks most active in multifamily and LMI sectors were all pushed to develop products for these target markets by policy or other directives. Conventional financing products are not always accessible to these markets, and there may be additional barriers that need to be addressed in order to generate interest in efficiency upgrades and clean energy investments. Policymakers and governing bodies should consider the extent to which it is a policy imperative for green banks to operate in these markets. Green banks may require specific policy or directives to have sufficient incentive to develop specialized financing products or provide outreach and services to these communities.

Data collection efforts need to be improved and standardized in order to truly assess the impacts of the financing programs offered by green banks. Most of the green banks we reviewed for this report are in the relatively early stages of program delivery. It is therefore difficult to say what is truly working, and even more difficult to back up those assertions with data. Green banks have lofty goals of deploying clean energy technologies and delivering energy savings. However what data are available are not based on independent evaluations. Furthermore, since green banks often partner with existing utility programs to deliver

energy efficiency measures to customers, determining the added value of financing is difficult. In time, it will be important for green banks to demonstrate the extent of the role that financing plays in deploying clean energy and energy efficiency, especially if states are interested in increasing the role of the private market in achieving overall energy savings goals. States and localities are looking at these examples of green banks and waiting to see how they perform. It will be important to develop standardized tracking metrics and evaluation frameworks that include good estimates of energy savings in order to truly understand the role that green banks, collectively, play in the marketplace.

Green banks show promise in several states but may not be necessary or appropriate for every state. As in the case of Vermont, it may be possible for states and localities to fill gaps in clean energy and energy efficiency markets without creating a green bank. In areas with well-established energy efficiency programs, it may be possible to bring stakeholders together to develop methods to leverage existing programs. Integrated strategies serve both customers and program administrators, in that it allows for seamless promotion of financing alongside other strategies and contributes to program administrators' respective missions. Existing program administrators may already be well suited to identify key barriers to energy efficiency in particular markets and to identify solutions. While green banks are useful tools in Connecticut, Michigan, and other states, they are not the only strategy to provide streamlined clean energy financing to customers.

Green banks can add important tools to the toolbox. While we were not able to draw conclusions about energy savings resulting from green banks due to lack of data, financing entities working in concert with utility energy efficiency programs can provide a powerful complement to advance clean energy investment. Building a market that supports the fullest extent of energy efficiency and renewable energy implementation will require states and localities to develop a suite of coordinated programs. Green banks work best when they leverage existing resources. Partnerships with utilities and program administrators that can roll a variety of services, including financing, rebates, and project guidance, into a single package can break down more barriers than any single one of these approaches can alone. For this reason, it is important to think of clean energy deployment strategies holistically. Green banks are a tool in a toolbox, but they do not overcome all market barriers, and policymakers should not see them as replacements for existing programs.

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Appendix A. Green Bank Offerings by Sector

Green bank	Residential products	Commercial and industrial products	Multifamily and low-income products	MUSH market products
CAEATFA	REEL, R-PACE LLR	Small Business Loan (OBR), Small Business Lease (OBR), Non-Residential OBR, STE	MMMFP	
CTGB	Solarize CT, Bulk Solar Purchasing, Smart-E Loan, PosiGen Solar + Efficiency for LMI, Solar Lease	C-PACE, Solar Lease	LIME Loan, C-PACE, Technical Assistance Energy Loan, Predevelopment Energy Loan	C-PACE Municipalities, ESPC
HGIA	Solar Loan			
MCGB	Specific products to be determined			
Michigan Saves	Home Energy Loan Program	Business Energy Financing	Multifamily Energy Financing	Public Sector Energy Financing
NJERB		Grant/Loan		Grant/Loan
NYGB	As a wholesale lender, NYGB will offer a number of products that impact all sectors. Recent transactions are listed below (NYGB 2016d).			
	Warehouse Credit Facility for residential solar installer (Level Solar) and energy software company (Sealed)	Stand-by Letter of Credit for commercial and not-for-profit PACE (Energize NY), Revolving Construction Loan for 160 wind energy projects (residential, agriculture, and commercial end users) (United Wind)		Tax-exempt subordinated debt for biomass generation project (ReEnergy)
RIIB	R-PACE	C-PACE		EBF

Appendix B. Funding Sources and Product Offerings

Except where noted, all information in this appendix was provided by responses to the questionnaire or via personal communication.

CAEATFA

Funding

- CAEATFA's various programs are individually funded and authorized or allocated under tax code, predominantly through state special funds (not general funds); in addition, the administrative costs of several of its programs are designed to be replenished through user fees.
- Sales and Use Tax Exclusion Program: $100 MM in STE annually
- PACE Loss Reserve: $10 MM fund
- The California Hub for Energy Efficiency Financing (CHEEF) will be funded by $65 million in ratepayer funds.

Programs

- *Sales Tax Exclusion (STE)*. Provides approved projects with a sales and use tax exclusion on equipment and machinery used in the creation of advanced transportation technologies (e.g., electric cars), renewable energy, advanced manufacturing, and processing recycled feedstock. The benefit equals 8.42% of the value of equipment purchased. Approved projects must create a net benefit for the state, determined by the cost of the tax benefit compared with the anticipated fiscal and environment benefits of each project. As of May 1, 2016, the program had approved 91 projects, awarding $395.7 million in financial assistance to facilitate $4.7 billion in private capital equipment purchases.
- *CHEEF*. This will incorporate several programs: Residential Energy Efficiency Loan Assistance Program (REEL); Master-Metered Multifamily Finance Pilot (MMMFP); a small-business lease, loan, and energy service program; and the Non-Residential On-Bill Repayment Program (with no credit enhancement). Although it has not deployed credit-enhancement funds, it is developing a pipeline with the $65 million it received from the California Public Utilities Commission (CPUC). $30 million will go toward credit enhancements, and $10 million is reserved for marketing, education, training, on-bill repayment functionality, and a centralized data portal.
    - REEL's primary initiative surrounds unsecured lending to residential customers, with an emphasis on the LMI market. The program's financial product will be a loan loss reserve to incentivize lending, enrolling lenders and contractors into the program. REEL will further incentivize lending to LMI households by providing additional loss reserve contribution amounts. A sub-pilot incorporated into REEL, available in PG&E's service area and named Energy Financing Line-Item Charge (EFLIC), will test out residential on-bill repayment (OBR).
    - MMMFP: an OBR program available to affordable multifamily residences that share one meter. It will provide credit enhancement to leverage loans and energy service agreements (ESAs). This program, and OBR functionality, are under development.

    - The small-business lease and loan programs will be available to small businesses (as defined by the Small Business Administration), and CAEATFA will provide a loan loss reserve. They will feature credit enhancement for OBR loans, and on-bill or off-bill ESAs and leases.
    - The Non-Residential On-Bill Repayment Program is the alternate option for applications that are ineligible for the small-business program; it does not offer a credit enhancement. Program requirements have not yet been established but may include distributed generation.
- *Residential-PACE LLR*. Set up to put first-mortgage lenders in the same position they would be without a PACE assessment, making them whole in the event of a foreclosure or forced sale.

CTGB

Funding

- Clean Energy Fund: approximately $27 million annually through a 1 mill electric surcharge on ratepayer bills
- RGGI: approximately $5 million a year
- ARRA: $8 million
- CTGB has bonding authority, although it has not issued any bonds yet.

Programs

- *C-PACE*. CTGB enrolls contractors, administers the program, and provides a warehouse line of credit. Sold $30 million tranche to Clean Fund at a 4:1 leverage ratio and recently engaged in a $100 million public–private partnership with Hannon Armstrong at a 9:1 leverage ratio.
- *CT Solar Lease*. CTGB provided a $3.5 million LLR, $2.3 million in subordinated debt, and $7.2 million in equity. Acted as a manager of funding and repayment via a special-purpose entity that it structured.
- *CT Solar Loan*. CTGB provided a $300,000 LLR, a $5 million warehouse of funds for Sungage Financial, and $1 million subordinated debt to provide unsecured loans that were originated, served, and financed with the support of CTGB. Sold off $1 million in transactions to Solar Mosaic through the first crowd-funded residential solar PV loan and an additional $2.6 million to the Reinvestment Fund, a CDFI.
- *Lead by Example*. ESPC financing and technical assistance for the Lead by Example program. Assists Connecticut Department of Energy and Environmental Protection in administering.
- *Low-Income Multifamily Energy (LIME) Loan*. Administered with the Connecticut Housing Investment fund to serve LMI households with unsecured, low-interest, and long-term loans.
- *Multifamily Energy Financing Programs*. Technical assistance, financing, incentive and rebate management, and performance measurements.
- *PosiGen Solar + Efficiency for Low- to Moderate-Income Homeowners*. PosiGen partnered with CTGB to offer a solar lease contract that combines energy efficiency measures through an energy savings agreement.
- *Smart-E Loan*. Zero-down, low-interest financing for residential customers. Administered by local lenders.
- *Solar RSIP*. Declining incentive block program.

- *Solarize CT.* Community solar financing and technical assistance.

HGIA

Funding

- $150 million bond offering. The bondholders are being paid by a ratepayer tariff called a "green infrastructure fee." To offset ratepayer costs, there was a corresponding reduction from another line item on their bills for the Public Benefits Fund.

Programs

- *Residential Solar Loans.* HGIA has facilitated 12 such loans as of the time of research, totaling $385,453 (pers. comm. Tara Young).
- HGIA is currently working on a deployment plan that it believes will begin in 2017. Its goal is to deploy $26 million through commercial, nonprofit, and small-business PV products; residential PV and PV and battery storage products; commercial energy efficiency; and other projects and technologies.

MCGB

Funding

- Slated to receive $20 million from the Pepco-Exelon merger.

Programs

- The board of directors has not yet determined a plan for the funds.

NEBRASKA DESL

Funding

- Originally funded with oil overcharge funds.
- Subsequent funding came from ARRA and state funds.
- Loan repayments provide continual funding.

Program

- Nebraska DESL will purchase part of a loan (50–75%) made by an approved financial institution for an approved project. This effectively blends its 0% loan with the financial institution's loan, securing a lower interest rate (DSIRE 2015).

NJERB

Funding

- $200 million of New Jersey's second Community Development Block Grant–Disaster Recovery (CDBG–DR) allocation after Hurricane Sandy

Programs

- Promote development, through grants and low-cost financing, of distributed energy at critical facilities to allow them to continue operating during power outages. Grants and forgivable loans will be accessible for up to 40% of unmet funding needs. Low-interest loans will be offered for the remaining 60%.

RIIB

Funding

- Excess funds from the years it spent as a revolving loan fund (the Rhode Island Clean Water Finance Agency)
- $8 million from ARRA, RGGI, and ratepayer funding from National Grid

Programs

- *C-PACE.* RIIB will be the program sponsor for C-PACE. It will market it toward the municipalities and oversee the lien assessment, billing, and collection processes. All funds lent out will be from third-party capital providers, who will also do the origination.
- *Efficient Buildings Fund (EBF).* A financing program for municipalities is taking applications. The program will provide technical assistance in the form of energy audits. No terms have been set for the financing as the pipeline is still being developed. However it is hoped that energy savings of 20% will lead to energy bill savings that exceed debt repayment.
- *R-PACE LLR.* A $2 million loan loss reserve has been set aside for residential PACE using unused ARRA funding. All funds lent out will be from third-party capital providers, who will also do the origination and servicing.

MICHIGAN SAVES

Funding

- Michigan Public Service Commission (MPSC): $8.1 million to cover administrative costs and establish a loan loss reserve
- ARRA: $2.6 million to add to the residential loan loss reserve
- SEP/DOE: $2.5 million for the commercial loan loss reserve
- Additional funding from the ARRA and SEP grant to support marketing and program development efforts

Programs

- *Business Energy Financing.* Michigan Saves maintains a loan loss reserve and solicits funding from multiple lenders for commercial leases. It also maintains a contractor network and administers the program.
- *Home Energy Loan Program.* Michigan Saves maintains a loan loss reserve and solicits funding from multiple lenders for unsecured residential loans. It also maintains a contractor network and administers the program.
- *Multifamily Energy Financing.* Michigan Saves's partner, Cinnaire, maintains a loan loss reserve using a DOE grant awarded through the Michigan Agency for Energy. Michigan Saves solicits funding from multiple lenders for loans, maintains a contractor network, and administers the program.
- *Public Sector Energy Financing.* Markets and provides links to authorized contractors through its website. Also performs an independent quality assurance review after the project is complete. Due to the nature of the public sector market, no loss reserve is utilized.

NYGB

Funding

- $165.6 million of ratepayer funds authorized by the New York Public Service Commission (NYPSC) on December 19, 2013
- $52.9 million of RGGI funds authorized by NYPSC on December 19, 2013
- An additional $150 million of ratepayer funds authorized by NYPSC on July 7, 2015
- On January 21, 2016, NYGB's full capitalization at $1.0 billion was authorized by the Commission pursuant to the Clean Energy Fund Order.

Programs

- NYGB has a complete suite of financing products including credit enhancement, short-term lending for warehousing or aggregation, and long-term loan or asset lending. NYGB will operate in most proven technologies in energy efficiency, solar, wind, bioenergy, and other technologies. It will also lend to all sectors: agricultural, commercial, MUSH/government, residential, and utility-scale/grid interconnected.
- NYGB's current project pipeline can be found at greenbank.ny.gov/Investments/Portfolio-and-Pipeline.

TLCPA

Funding

- $15 million Energy Efficiency and Conservation block grant

Programs

- $10.5 million of the grant went toward a revolving loan fund ($3 million) and loan loss reserve ($7.5 million).