District of Columbia Green Bank Report

Prepared for the
District Department of Energy and the Environment
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Prepared by the Coalition for Green Capital

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Executive Summary

This report finds that, despite the District of Columbia's significant investments in renewable energy and energy efficiency, the District has a multi-billion dollar clean energy investment need that cannot be realized without greater private investment. Public capital is limited, so public-private partnerships, innovation, and flexibility will be needed to achieve the District's energy goals. A Green Bank is a dedicated financing institution that can be created by government to help fill this market need. This report finds that the District should create a Green Bank to stimulate and attract more private investment, fill market gaps, and drive clean energy market transformation. A Green Bank can make energy cheaper *and* cleaner for District businesses and residents, and facilitate an influx of private investment into the District economy.

Summary of Recommendations

CGC recommends that the District create a Green Bank as an institution solely dedicated to driving more total investment in clean energy and green infrastructure. This study funds that the level of clean energy investment needed to meet the District's ambitious sustainability goals cannot be met by public capital alone. And private capital is not flowing into the District as quickly as necessary. Therefore, cost-effective public-private financing is needed to stimulate more overall investment.

The District should create a new quasi-public instrumentality, wholly-owned corporation of the government to operate as the District's Green Bank. With a Board of Directors appointed by the Mayor and Council, this structure ensures the Green Bank is aligned with the policy objectives of the District, while operating with flexibility, more like a private entity that can move quickly with markets. The suggested funding level for a District Green Bank is $100 million, spread over 7 years. This includes $40 million in initial capital and $60 million spread over the following 6 years This level of funding can drive over half a billion dollars of total investment in clean energy over the funding period, making significant progress toward filling the Serviceable Addressable Market (SAM) for clean energy (which is over $3 billion) and meeting the District sustainability goals.

The initial funding can and should come from multiple potential sources, identified in this Report. The Green Bank should also have a reliable, recurring funding stream, which is why it is recommended that the SETF be increased to generate an additional $10 million per year, with the new funds directed to the Green Bank. This stream of funding could be terminated after 6 years, when another $60 million of capital has flowed into the Green Bank. The Green Bank should also have the ability to issue bonds of various types so that it can recycle capital and raise additional funds. Creating this Green Bank will require the passage of legislation that enumerates the powers and authorities of the institution and identifies its funding sources. The legislation would also outline accountability and transparency requirements.

The Green Bank will need to hire dedicated staff, drawing on investment and banking professionals from the private sector. At start up, the Green Bank should borrow certain administrative functions from existing entities, like the DOEE. The Green Bank will need a CEO/Executive Director, a Chief Investment Officer, and other program staff. The overall operating expense at start-up should be less than $1 million per year. The Green Bank should be a breakeven entity, where the revenues earned from financing activity cover all the costs of operating the Bank. However, as it will take time for the Green Bank to develop and launch products, and begin earning a return, the first few years of activity will result in operating deficits. The funds to cover this operating deficit should come from the overall capitalization of the Green Bank.

The Board and staff together should develop a formal business plan, identify their priority markets and roll out products to serve those markets.

CGC recommends that the priority market of the Green Bank be distributed solar (through rooftop and community-scale) and building efficiency upgrades. Efficiency upgrades should focus on residential customers, offering whole-home solutions that includes solar, and commercial properties that may not be suited for ESCO-based financing. Within the residential, space, it is critical that the Green Bank develop solutions to specifically serve the low-to-moderate income space. The best financing structure available to serve this market is on-bill financing, as it enables financing for renters and allows for underwriting based on utility bill payment history. And finally, the Green Bank must engage in a range of coordinated market development activities that aim to stimulate demand. The Green Bank must do this in concert with the SEU, as rebates, financing and market development should be seamlessly aligned to lower barriers and ease customer adoption of clean energy. The DOEE should act as the bridge between the SEU and Green Bank, to ensure close communication around responsibilities and program design.

Green Bank Model

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

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

Green Banks also support market development and demand for clean energy solutions. Offering capital, on its own, is insufficient to drive market growth without additional market development activities. Therefore Green Banks also offer turn-key financing solutions, delivered through targeted market channels, so that end-users can adopt clean energy through a simple process. This requires thoughtful product design, strong partnerships with a host of market actors, and close consideration of market behaviors. Green Banks also facilitate transparency and easy access to information for all market participants. These actions promote competition, lower costs and increase the adoption of energy solutions. Finally, a Green Bank can be part of a centralized, coordinated program structure that integrates

financing and incentives into a single offering. This requires trained contractors and integrated systems. In sum, Green Bank activities create a robust marketplace where capital supply increases, there is greater clean energy adoption, public dollars are used efficiently, and customer energy costs fall.

To date, five states operate Green Banks in the United States. Nearly a dozen other states are also at some stage of Green Bank exploration or development. There is also one official county Green Bank, and at least four countries outside the U.S. have national Green Banks. Each of these Green Banks has a slightly different model and approach, tailored to suit the institutional landscape, legal requirements and market objectives of that jurisdiction. Some Green Banks are directly part of government, while others are quasi-public. They draw on a range of public capital sources, and have varying legal authorities. Some Green Banks are established with a specific list of financing programs already defined that they must implement, while other Green Banks are less structured, offering capital in response to requests from market actors.

The strongest Green Bank examples in the U.S. are the Connecticut Green Bank and the New York Green Bank. Connecticut created the first state Green Bank in the country in 2011, and in 5 years of operation has driven nearly a billion dollars of total clean energy investment. In its last full year of activity, it drove $365 million of investment, which is 10x greater than total investment in the state under the prior subsidy-based regime. The Connecticut Green Bank operates what is by far the most successful commercial PACE program in the country, and has increased annual residential solar deployment in the state by 40x since it was founded. The New York Green Bank is slated to be the largest Green Bank in the country, with a full capitalization of $1 billion which is being disbursed in increments. It has completed two rounds of financial transactions, which have allowed it to facilitate the deployment of a number of distributed energy technologies. It has already animated approximately $250 million of investment in the last few years. A District Green Bank can learn from and borrow the best practices of existing Green Banks.

Chapter 1 – The Green Bank Model

Introduction to Green Banks

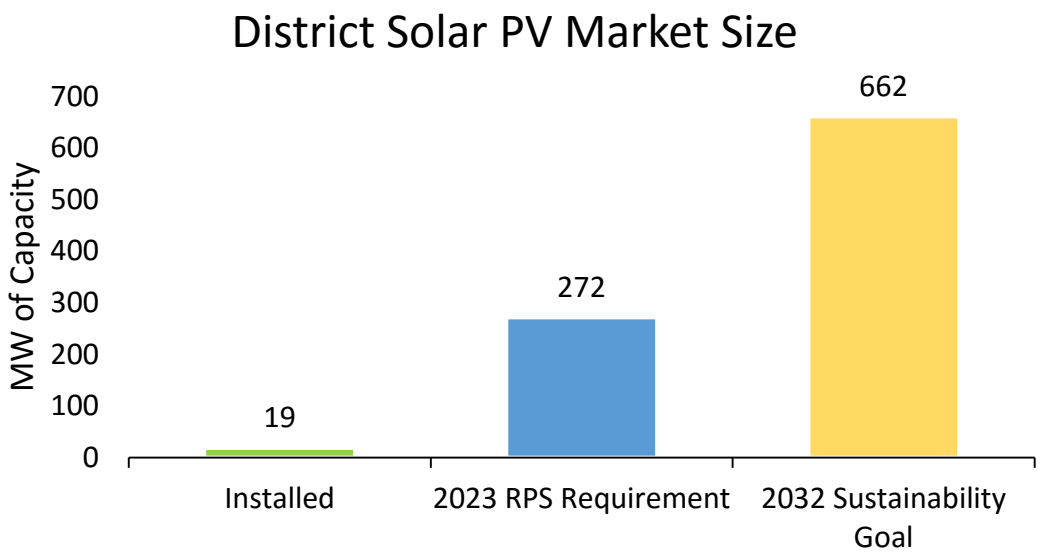
A Green Bank is a public or quasi-public institution that finances the deployment of renewable energy, energy efficiency, and other clean energy and green infrastructure projects in partnership with private lenders. They are an institutional platform for public-private partnerships ("PPP" or "P3"). Green Banks are capitalized with public funds, which are then used to offer loans, leases, credit enhancements and other financing services to close gaps in the private capital markets for clean energy projects. Green Banks typically invest in the project deployment of mature, commercially viable technologies – not in early stage tech or in clean energy companies. The goal of a Green Bank is to accelerate the deployment of clean energy by removing the upfront cost of adoption, leveraging greater private investment in clean energy, and increasing the efficiency of public dollars.

Through Green Banks, consumers and businesses can install clean energy technologies with little to no upfront cost while reducing energy costs and states can meet their public policy objectives to increase the amount of renewable energy generated and consumed in their jurisdiction. And because public dollars are used for financing, rather than grants, all public dollars are preserved through loan repayment. For a number of reasons discussed below, economically viable, low-risk clean energy projects are often unable to access affordable private financing. Green Bank financing methods "crowd-in" private capital to fill financing gaps by reducing real and perceived risk, and allowing private investors the chance to learn about a new market opportunity with the security of government partnership. As private lenders gain experience and information about the processes, risks and addressable market size in clean energy, they can become increasingly comfortable and confident lending into these markets. Green Banks have shown that with experience and data, private investors are more eager to enter clean energy markets at scale, ultimately without any Green Bank support.

Green Banks and public clean energy financing programs are increasingly common across the U.S., as governments recognize the importance of financing in addition to traditional grant models. Green Banks, by their nature, are flexible institutions that can be shaped and implemented to address the needs of the government/market that is creating it. Historically, many governments have supported the adoption of mature clean energy technologies by offering incentives, rebates, tax credits and other forms of subsidies. These programs have been generally effective in improving the economics of clean energy installation (primarily for renewables) and stimulating demand among consumers.

However, rebate programs have two primary weaknesses that financing can address. The first is that rebates traditionally only cover a small portion of a project's cost. If a rebate covers $2,000 of a $15,000 efficiency project, for example, then the customer still must find $13,000 in cash. This requirement for upfront, out-of-pocket cash stands as a significant barrier to adoption. The second problem with grants is that they are expensive, as they are permanent expenditures of taxpayer dollars. To bring clean energy markets to meaningful scale using grants would require more public expenditure than is available or politically viable. Therefore new program solutions are needed that address upfront costs for consumers and the expense of public capital.

Figure 1: Current District Solar Capacity (MW) and Capacity Necessary to Meet Goals



Transitioning to a clean power platform, as outlined in the Sustainable DC Plan, will require enormous amounts of investment capital. For instance, achieving the 2.5% solar energy requirement for 2023 under the RPS will require approximately 272 MW of in-District capacity at a cost of approximately $814 million in capital investment in only the next eight years.[i] If even a fraction of the 50% renewable goal for 2032 is to come from distributed solar systems in the District, it will require approximately $1.98 billion in capital investment over the next 17 years.[ii]

It is implausible that this investment will come entirely from public grants, yet the private investment needed is not coming quickly enough. Green Banks, which use limited public dollars to leverage private investment, can build a bridge from today's market conditions to one where private investment flows.

Green Bank Benefits

Green Banks present numerous possible benefits to the District, as the District could meet its ambitious clean energy goals without the expense of grants. These benefits include:

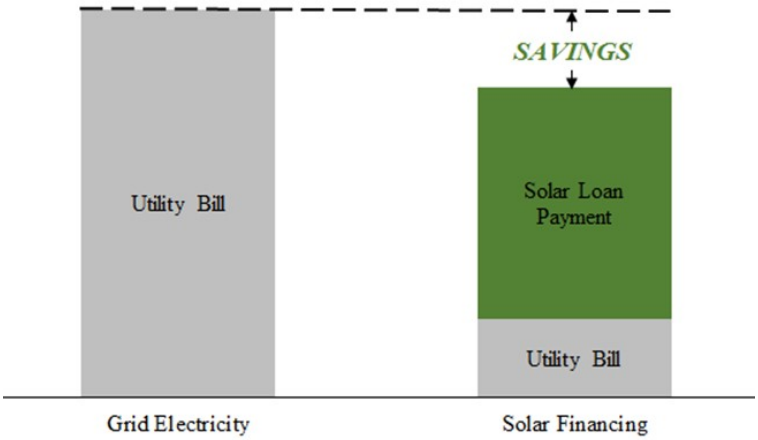
- Elimination of Upfront Cost – By offering 100% financing, in partnership with private lenders, Green Banks can eliminate the greatest barrier to consumer and business adoption of clean energy technologies.

[i] As of 2015 RPS reporting, it is estimated that 272 MW of new solar capacity still needs to be installed in the District by 2023. At an installed cost of $3 per watt, that means a total investment of $814 million.

[ii] Assuming 25% of the renewable electricity necessary to meet the 50% goal will come from solar PVs, and assuming the District successfully reduces its electricity consumption by 50%, it is estimated 662 MW of new solar capacity needs to be installed in the District by 2032. At an installed cost of $3 per watt, that means a total investment of $1.98 billion.

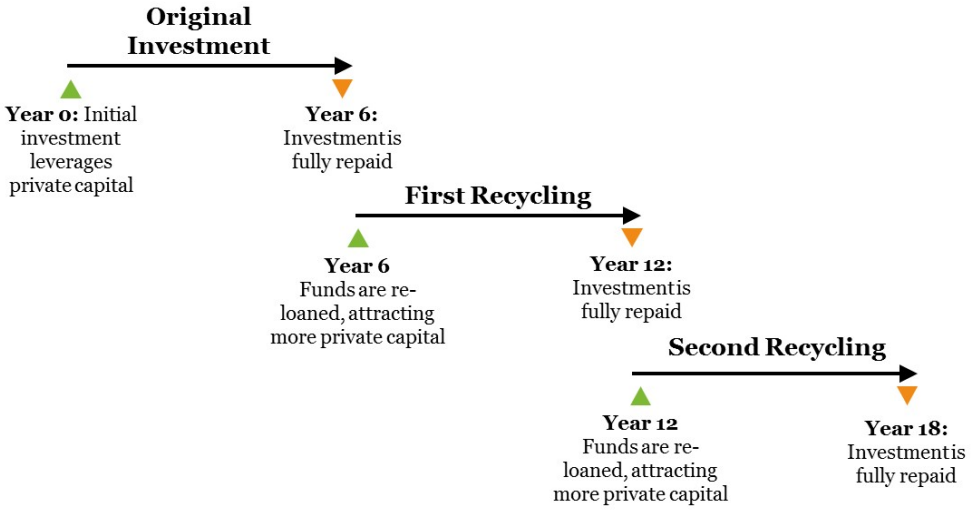
- Lower Energy Costs – Green Banks allow consumers to adopt clean energy and lower their energy costs. By improving the terms of financing Green Banks can lower the price of solar electricity. And total energy demand is reduced through efficiency. The result is total lower energy costs, with upfront payment.

Figure 2: Reduced Energy Costs through Green Bank Financing



- Preservation of Public Capital – Green Banks use public capital, but to provide loans and financing, not grants. Therefore taxpayer and/or ratepayer dollars are preserved through loan repayments. Green Banks are designed to earn enough interest to break even (cover their operating expenses), so that the pool of original public funds put into a Green Bank never erodes. Public dollars can be recycled and re-loaned into the future.

Figure 3: Hypothetical Green Bank Capital Recycling Model[1]



- Private Sector Leverage – Green Bank dollars get more "bang for the buck" because they are deployed in ways that leverage greater private investment than traditional programs. Green Banks achieve two forms of leverage. First, a Green Bank may provide only a portion of the project cost, while the private investor covers the majority of costs. This is the "upfront leverage," and

can be as great as 10 private dollars per single public dollar. But, because Green Bank dollars are recycled, that same public dollar will be repeatedly recycled and leverage more private capital.

- Economic & Job Growth – The increased investment sparked by a Green Bank increases GDP and creates jobs. More clean energy adoption means more installers and contractors need to be hired to actually install the renewable or energy efficiency technology. These are jobs that cannot be exported and therefore present an immense opportunity for local employment. The renewable energy sector is already proving to be an enormous driver of employment across the country, with solar employment growing at a rate 20 times faster than the national rate of job growth.[2]

- Market Standardization – Green Banks can help introduce standardized financing practices and documentation into the clean energy market. Increased standardization is critical for bringing markets to scale and increasing private investment. Standardized financing means less expensive underwriting and an easier access to secondary markets. Green Banks can play a central role in introducing standards.

- Market Transparency – In addition to financing, functions, Green Banks can be a centralized source of market information that increases consumer and business understanding of clean energy opportunities. A Green Bank website can be a hub of information on market basics, help consumers understand different programs, learn about installers and receive estimates of their own potential savings

- Program Coordination – Green Banks can also play an important role of coordinating public clean energy programs that operate across different agencies. Often, as is the case in the District, public programs to support clean energy deployment are operating within different public or quasi-public bodies. To ensure those programs operate at maximum efficiency and create a single point of contact for customers, it can be beneficial if one agency is tasked with coordinating and aligning programs across agencies.

Barriers to Private Financing

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

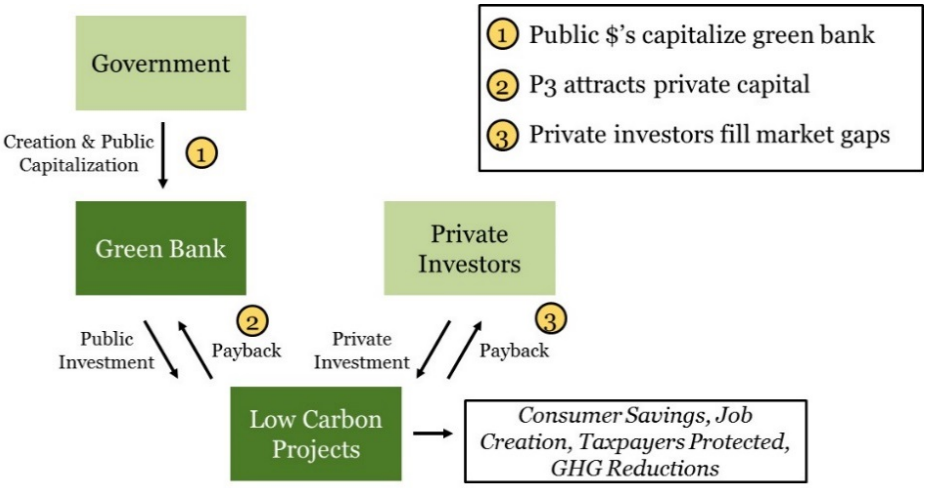
Private financing gaps exist for several reasons.

- The first is that there is a relatively short track record for clean energy financing, and therefore there is little data for lenders to rely on. Without data, banks are left with high amounts of uncertainty over how well different types of projects perform and how often borrowers repay their loans. This uncertainty leads to either hesitation to enter the market or unfavorable lending terms.
- The second cause of financing gaps is that many clean energy projects, especially those suitable for the District, are small and fragmented. Efficiency upgrades and rooftop solar projects are inherently small investments and geographically dispersed, with varying credit among project off-takers. These types of investments are relatively expensive to underwrite for a private lender, making the loan potentially uneconomical to offer.
- A third cause of financing gaps is the lack of capital market liquidity and maturity. If a commercial bank provides a loan for an energy efficiency project, it is unknown to the bank if it will be able to sell that loan to another lender or if it will have to hold that loan on its balance sheet, tying up capital. Mortgage and auto lenders don't have this difficulty, because there are highly liquid secondary markets for home and car loans. These kinds of secondary markets are just now forming for clean energy technologies.
- And the final cause of private underinvestment relates to human and organizational behavior. In order to begin lending into a new market, a bank has to hire new staff, learn about the risks and processes of a new market, and determine a precise "box" of what kind of project and credit they are willing to lend to. This process takes time, commitment and money, all of which will only come with a greater understanding of market potential and risks.

Green Bank Organization

A Green Bank is effectively a public fund used to offer financing and support the growth of clean energy capital markets. The Green Bank institution that manages the fund is typically directly part of government, contracted by government, or is a quasi-public entity. The Green Bank fund is traditionally capitalized with public dollars (though other alternative capital sources can be considered).

Figure 4: Green Bank Basic Flow Chart



The Green Bank, through government direction and internal governance, determines how the capital should be invested in the jurisdiction to grow clean energy markets and attract private investment. Green

Banks invest in partnership with private lenders in projects. Private lenders would not invest into the Green Bank itself, but rather in a specific project alongside a Green Bank. Green Banks are able to attract private lenders through broad engagement and building partnerships. Lenders may range from local credit unions and community banks to large institutional investors. Different lenders are well suited for different kinds of investment structures, but in all cases the Green Bank must actively seek out and solicit partnerships. For instance, a Green Bank that seeks to encourage lending for single-family home energy efficiency retrofits may partner with local lenders who know that community. But if a Green Bank wants to build a warehouse facility or pool of funds to originate loans itself, it may seek out an institutional investor to help seed that warehouse. To date the most successful Green Banks or similar clean energy financing programs are ones that actively seek out private lending partners. Less robust public financing programs that rely on private lenders to enter the market without encouragement and engagement (financial or otherwise) are often left with minimal lending activity.

The structure and ratio of public to private capital are determined through programmatic design and individual project conditions. Green Bank management works closely with private lenders to understand their needs and hesitations to entering the clean energy project finance market. That way financing products can be designed that specifically address those obstacles and allow private investors to move into the market. Green Banks look to use as little capital as is needed to draw in investment at scale.

Target Markets

Green Banks finance the deployment of mature, clean energy and green infrastructure technologies that can support loan repayments. This includes renewable technologies like solar PV, wind, geothermal, fuel cells and bio-energy. This also includes a wide range of energy efficiency technologies. Green Banks could also finance the deployment of micro-grids, energy storage, clean transportation infrastructure and smart-grid technologies.[iii] In each case, the Green Bank would be investing in a project installation of the technology itself, not the technical development of that technology by a company. Also, Green Banks typically do not provide corporate loans to companies in the clean energy space, regardless of whether they are building new cleantech or installing mature clean energy technologies. The reason Green Banks focus on deployment of mature technologies at the project level is that they have a low risk profile and can naturally generate the cash flow needed to pay off a loan. For instance, an energy efficiency project can typically save more money than is owed on a monthly loan repayment. Therefore, underwriting that project is relatively easy since the creditworthiness and income of the borrower is not the only basis for assessing loan risk. If the Green Bank were to invest in a company, though, the risk assessment would be quite different, where the repayment would be based on the company's ability to generate cash flow through business operations in order to pay off the loan. This is inherently a much riskier loan. Even a typical home mortgage or car loan is riskier, because the ability to repay these loans is dependent on

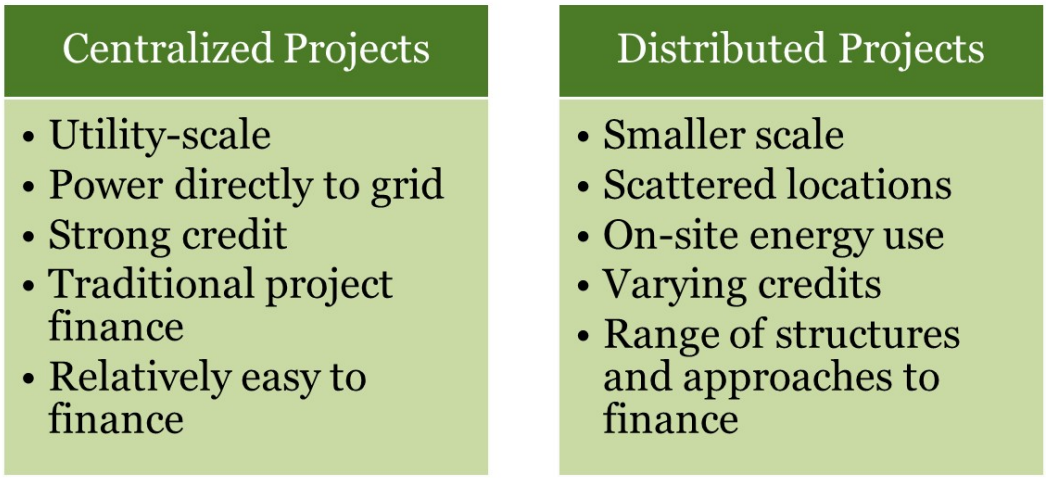
[iii] A Green Bank could theoretically also invest in water or other green infrastructure projects. However, Green Banks are perceived to be (and in reality are) low-risk lending authorities because the projects they invest in, by their very nature, generate the cash needed to repay the loan. Other forms of green infrastructure investing may not necessarily have this quality. For example, an energy efficiency loan will produce savings greater than the loan repayment as a result of the technology itself. Therefore the project relies on no external cash stream or legal enforcement mechanism to generate cash for the loan repayment. A loan to reduce water consumption may save enough on water bills to generate cash sufficient for the loan. But other green infrastructure lending, like public drainage projects, would rely on other enforcement mechanisms to collect the cash for repayment. The District could choose to build a Green Bank that finances both kinds of project, but this difference in repayment self-sufficiency means that bank may be assuming different kinds of risk profiles.

employment income or other sources of cash that are need intrinsically generated as a result of the purchase itself. By focusing on low-risk deployment projects, Green Banks can ensure that public capital is preserved, enabling revolving lending practices. This also eliminates any debate about "picking winners" or other political arguments that may come with offering high risk loans to businesses.

Among the list of mature renewable energy and energy efficiency technologies identified, it is up to each Green Bank to determine the technologies that are most suitable for its market that struggle to find private capital. For instance, a Green Bank may determine that there is a significant wind resource in its geography, but find that wind projects are able to find ample capital at reasonable rates through traditional private capital markets. Therefore wind would not need Green Bank support. Or a Green Bank may decide that its topography and landscape is not well suited for a given technology (like large-scale wind in the District).

Typically, the technology applications that are well capitalized by private investors are large, utility-scale renewable energy projects like wind and solar. These rarely require Green Bank support. Instead, Green Banks have focused on two categories of projects. One area of focus is on distributed energy projects. This includes roof-top solar and other on-site generation, as well as energy efficiency. The second focus of Green Banks has been on utility-fed, medium-scale renewables projects with less common technologies like anaerobic digesters, bio-energy projects, and fuel cell parks.

Figure 5: Challenges of Financing Distributed Energy Projects



Distributed energy projects have become a primary focus of Green Banks because these projects tend to have the greatest difficulty finding reasonably priced private capital. As described above, the relatively small and disperse nature of building upgrades and small renewable energy installations is unappealing for private lenders. Therefore Green Banks can play a big role stimulating investments in these projects and creating more robust markets. There are a few distributed clean energy markets that have access to reasonably priced private capital. Homeowners with high-credit scores and well-directed roofs can get financing for roof-top solar through a third-party installer like SolarCity. (This criteria unfortunately fits a minority of energy customers and buildings in the District.) And large industrial companies with high credit-ratings from major rating agencies can finance a building upgrade through an energy service

company (ESCO). Otherwise, projects in nearly all distributed energy markets, across technologies and sectors, may struggle to find capital through private markets.

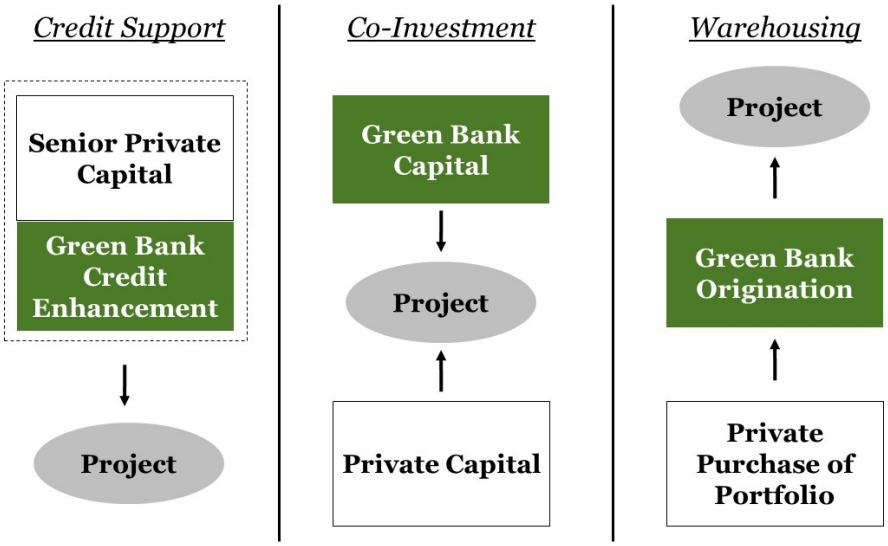
Green Bank Financing Techniques

Green Banks can offer a wide range of types of financing to leverage private capital, but they can generally be put into three categories.

Credit Enhancements

The first category is credit enhancements. A credit enhancement is a tool offered by a Green Bank with the goal of increasing private lending activity and/or improving the terms of private financing. Green Banks accomplish this through multiple means, but loan loss reserves and loan guarantees are most common. This technique is suitable for a market where private lenders may be interested in entering the market but are hesitant due to perceived risks. A credit enhancement can either pull that lender into the market, and/or encourage that lender to offer more favorable lending terms. Under a loan loss reserve structure, a Green Bank will put aside capital to cover a certain portion of a lender's losses, up to a capped amount of dollars. A reserve can be in the first loss or second loss position in relation to the lender. This structure provides a lender assurance that some portion of potential losses would be covered, while also giving the lender incentive to assess risk appropriately because most losses are still borne by the lender. These kinds of investments can achieve high leverage ratios, stimulating many dollars of private investment per public dollar of investment.

Figure 6: Green Bank Financing Techniques



Co-Investment

A second type of Green Bank investment is direct co-investment in a project. Co-investment involves direct Green Bank investment in a clean energy project alongside a private investor. Unlike credit enhancements, where public dollars are not actually invested in the project technology, co-investment can take multiple forms and structures of actual project investment. A Green Bank may provide senior debt, subordinated debt, or equity in a project, which is then paired with multiple potential forms of private investment. For instance, a Green Bank and private bank may each make a 50% debt investment in a project. Or, a private investor may offer 80% of the debt needed for a project, and the Green Bank

makes a 20% subordinated debt investment. This structure both fills a financing gaps and acts as a credit enhancement for the senior debt. The leverage achieved on these co-investments depends the precise product structure, and by its nature requires the presence of a private lender willing to at least make some level of investment in a project.

Warehousing & Securitization

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

Together, these forms of investment draw-in private investment, giving private lenders comfort and experience in the market while preserving public capital. Over time, these partnerships will give private lenders the information and familiarity needed to provide financing with reduced or no Green Bank support, while still offering terms that are reasonable and attractive to borrowers.

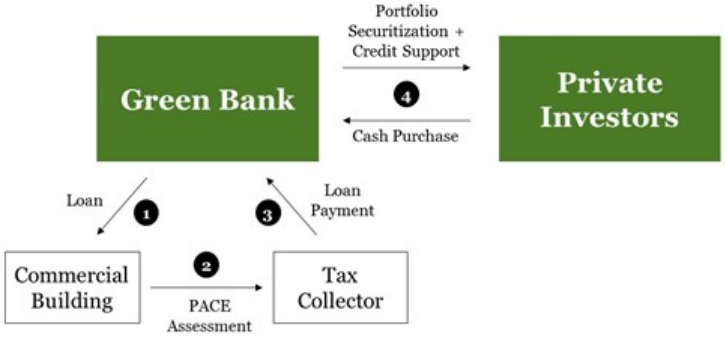
Other Green Bank Financing Methods

In addition to using Green Bank capital to finance projects, Green Banks can also help implement the use of innovative new financing structure. These include Property Assessed Clean Energy Financing (PACE) or on-bill repayment (OBR). In both cases, Green Banks can play the role of program administrator, deal originator, program marketer, or capital provider. The precise role played by a Green Bank in each market depends on the existing laws, statutes and programs in place. A District Green Bank could work closely with or take over responsibility for administering the existing DC PACE program.

PACE financing is a structure through which a building owner repays an energy upgrade loan through property taxes via a new lien on the building. PACE liens typically sit senior to all other non-tax liens on a building, including the mortgage, significantly reducing repayment risk. In any state that has passed legislation and any municipality that then allows PACE, technically a PACE loan can be made by any lender. The lender would provide a loan to a building owner to implement energy efficiency, for instance, and then the tax-collecting agency would place a new lien on the building equal to the loan repayment. That repayment is collected by the taxing agency and remitted to the lender. Though simple in concept this is difficult to execute and has struggled to attract private lenders in many states. A Green Bank could step in to provide the loan capital in order to kick-start a market (as was done in Connecticut). A Green Bank could also offer a credit enhancement to entice private lenders into the PACE market. Many jurisdictions,

like the District, have relied entirely on private lender origination and/or underwriting of PACE deals, which can lead to slow market growth or intense operational burden on the program administrator. A District Green Bank could provide capital to the District program, or offer credit enhancements to the lenders already working with PACE who may not be able to offer capital at long enough terms.

Figure 7: Simplified PACE Structure with Green Bank Lending



On-bill financing or repayment (OBF/OBR), like PACE, is a financing structure designed to increase the likelihood of loan repayment.[iv] It is a structure through which an energy upgrade loan is repaid through the customer's utility bill. Similar to PACE, this structure creates greater security for the lender because historically utility bills have a very high rate of repayment. On-bill financing has additional benefits, too, because it addresses the split incentive between building owners and tenants. By attaching a loan to a utility meter, rather than the customer, a tenant can reap the benefits of efficiency, repay only the portion of the loan that is due while still a tenant, and then hand the remaining payments to the next tenant who continues to benefit from the efficiency. This has the power to open up many new markets for efficiency financing that otherwise would be unsuitable. Like PACE, a Green Bank could act as a program administrator and/or a lender for on-bill programs.

A District Green Bank could enhance or create either of these structures to enable more financing for clean energy. A Green Bank could be paired with the District PACE program to inject badly needed capital into the market. And a Green Bank could create, administer and finance an OBR program that is well suited for the rental properties in the District both of these programs have the benefit of low transaction costs because they utilize existing collection systems, and have increased security because of the legal payment enforcement mechanism. The District will have to address key questions regarding expansion or implementation of both programs. For example, if the District were to expand PACE to include residential properties, would the lien be senior or subordinate to the mortgage. Recent federal regulatory rulings may push the District to use a subordinate position, however all market evidence suggests the senior position is effective and the subordinate position is entirely ineffective at attracting lenders. For on-bill repayment, the District will have to address concerns over whether or not a utility can shut off electricity for those borrowers who may pay their electric bills, but don't make the full loan repayment that is attached to those bills.

[iv] On-bill financing (OBF) typically refers to programs where the utility itself uses its own capital to issue the loans. On-bill repayment (OBR) refers to the programs that allow non-utility lenders to issue loans, where the utility merely acts as a collection platform.

Generating Demand for Clean Energy Products

In addition to animating investment in clean energy, Green Banks can also help stimulate demand for clean energy products. Adoption of clean energy technology like efficiency and distributed generation rooftop solar has been slow, despite the fact that these investments pay for themselves through savings. The lack of financing to pay for upfront cost plays a major role in the slow uptake. But demand is also low because clean energy technologies lack a robust, transparent and efficient market.

When compared to the ease of purchasing consumer goods, as one would on Amazon for instance, the clean energy purchase process is immensely complex with little information available to consumers. In addition, clean energy technologies are yet to be intrinsically desired the way homes and cars are. For those products, a consumer decides that s/he wants to make the purchase, and the financing is what makes the purchase possible. In clean energy markets, the availability of financing, in and of itself, does not necessarily create the desire for the good itself. Therefore any Green Bank financing would have to be offered in a way that stimulates demand and facilitates the creation of efficient market structures.

This has resulted in the common refrain that, "capital isn't the problem – it's the demand." This is a reference to the notion that plenty of capital is available and ready to enter the market, but the lack of consumer demand is the reason that markets are not growing quickly enough. The reality, though, is more complex, as offering capital for clean energy financing is not a binary condition. A bank or a government program may ostensibly make capital available, but because there is no robust market for clean energy technologies, the multitude of activities and parties needed to bridge the distance between supply of capital and demand for technologies does not exist. Capital made available in a vacuum, or at unusable terms, is ultimately not very useful.

This series of activities needed to connect capital supply to customer demand includes marketing; dedicated origination channels; partnerships with contractors; contractor training on how to sell their services with financing; coordination of financing and services with other subsidies; coordination of multiple contractors on multi-measure projects; and many others. In addition to this list of activities, often the capital made available for financing is not well-suited for the purposes of clean energy investing. For instance, a loan may be offered:

- with a short-term that prevents deep retrofits;
- at an interest rate that prevents a project from being cash flow positive;
- with a loan size that prevents deep retrofit projects;
- that doesn't cover 100% of the cost, and offers no assistance to find other lenders;
- with credit restrictions that shut-out a majority of the market.

Together these kind of financing and program design failures leave customers with an appealing offer, where they must cover costs themselves or where their total monthly energy costs increase. This long list of market and financing deficiencies results in low demand for clean energy technology. Consumers do not have the time, knowledge or interest to navigate a complex purchase process, learn about different technologies and program options, and seek out possibly inadequate financing entirely on their own. Green Banks can play a critical role in stimulating demand by both offering suitable financing *and* delivering products to customers through turn-key program design. A Green Bank cannot be built on the flawed clean energy financing premise that, "if you build it, they will come." Rather a Green Bank can design financing programs in coordination with delivery mechanisms, access to information, and

consumer marketing techniques to overcome past demand shortages. Whether the Green Bank itself is directly engaging in this market creation activity or doing so in partnership with multiple private partners will depend on precise product and organizational design. But *no matter the design, a* Green Bank *should strive to ensure customers are presented with simple offers that are cash flow positive.*

Green Bank Examples

To date, five states operate Green Banks in the United States. Nearly a dozen other states are also at some stage of Green Bank exploration or development. There is also one official county Green Bank, and at least four countries outside the U.S. have national Green Banks. Each of these Green Banks has a slightly different model and approach, tailored to suit the institutional landscape, legal requirements and market objectives of that jurisdiction. Some Green Banks are directly part of government, while others are quasi-public. They draw on a range of public capital sources, and have varying legal authorities. Some Green Banks are established with a specific list of financing programs already defined that they must implement, while other Green Banks are less structured, offering capital in response to requests from market actors. Similarly, a District Green Bank would have to be designed and structured to fit the specific local needs and conditions. However, all Green Banks are tied by a common set of principles, which include:

- Offering financing, rather than grants
- Leveraging public capital to increase private investment
- Recycling and recapitalizing funds to redeploy dollars and maximize investment

Table 1: Summary of Green Bank Institutions

Institution	Eligible Technology	Key Products	Source of Funds	Initial Capital	Structure/Oversight	Staff
Connecticut Green Bank	• Solar, fuel-cell, geothermal, biomass • Energy efficiency	• C-PACE • Smart-E loan • Solar Lease II • Solar Loan	• Utility bill surcharge • RGGI funds	~$35M per year	• Independent quasi-public • Board of Directors, appt by Governor & Legislature	33
Hawaii Green Infrastructure Authority	• Solar (primary focus) • Energy efficiency	• Solar leases for LMI and non-profit sector, paired with on-bill recovery	• Bond issuance backed by ratepayer fee	$150 M	• Independent quasi-public • PUC oversight	2
New York Green Bank	• Renewable energy • Energy efficiency • Clean transportation	• Issued RFP for private sector financial intermediaries	• Utility bill surcharge • RGGI funds	$218.5 M	• PSC oversight • Division within state energy office (NYSERDA)	12
California CLEEN Center	• Efficiency (first priority) • Renewable generation	• MUSH market efficiency • Commercial market efficiency	• Pre-existing bonding authority of the state IBank	~$40M	• Division of CA Infrastructure Bank • Board of Directors, appt by Governor	~5
Rhode Island Infrastructure Bank	• Renewables • Efficiency • Grid and demand-side upgrades	• Commercial & Residential PACE Program • Efficient Buildings Fund for muni's	• RGGI • ARRA • Ratepayers • QECBs • Bonding authority	~$7 M	• Independent quasi-public • Board of Directors, appt by Governor	12
Montgomery County Green Bank	• Renewables • Energy efficiency • Grid and demand-side upgrades	• TBD	• Settlement from utility merger negotiation	$20 M (TBD)	• Independent non-profit • Board of Directors, partial Council approval	TBD

In addition to these domestic Green Banks, the United Kingdom, Australia, Japan and Malaysia all operate national Green Banks. The UK Green Investment Bank and the Australian Clean Energy Finance Corporation (CEFC) are particularly noteworthy for their scale. They have each already invested billions of dollars, leveraging many multiples of that in private investment.

Connecticut Green Bank

The Connecticut Green Bank was created in 2011 as the first state Green Bank in the U.S. Originally named the Connecticut Clean Energy Finance & Investment Authority, it was created through bi-partisan legislation that was initiated by newly elected Governor Dannel Malloy.[v] The new Green Bank institution was born out of the existing grant-making institution, the Connecticut Clean Energy Fund. The Fund was repurposed and turned into a deployment financing entity. The Green Bank was created as a quasi-public agency, with a board of directors that are a mix of government officials and independent directors. The government officials include the state Treasurer, the Commissioner of the Department of Energy and Environmental Protection, and the Commissioner of the Department of Economic and Community Development. The board is charged with setting Green Bank Strategy, approving Green Bank products and initiatives, and approving loans.

The Connecticut Green Bank is capitalized by two sources, both of which were identified in the legislation. The first is a systems benefit charge that collects roughly $20 to $25 million dollars per year. This was an existing system benefits charge, already in place in the state prior to the creation of the Green Bank. Previously the entire ratepayer collection went towards state-managed grant programs. The re-allocation of those funds to the Green Bank represents only a portion of the total collection, with the remaining funds still going toward grants. The new split in funding between grants and financing was based on a desire to build market-based mechanisms for clean energy growth. This re-allocation of funds was also driven by a desire to maximize private leverage from public funds and get the greatest “bang for the buck” for each public dollar. The second source of Green Bank funds are the state’s proceeds from the sale of emission allowances through the Regional Greenhouse Gas Initiative (RGGI) Program. The Green Bank receives 100% of the states RGGI proceeds. In total, this adds to a total annual infusion in the Green Bank of approximately $30 million. This repeated and perpetual capitalization means that the Connecticut Green Bank’s balance sheet, and capacity to issue loans, continuously increases.

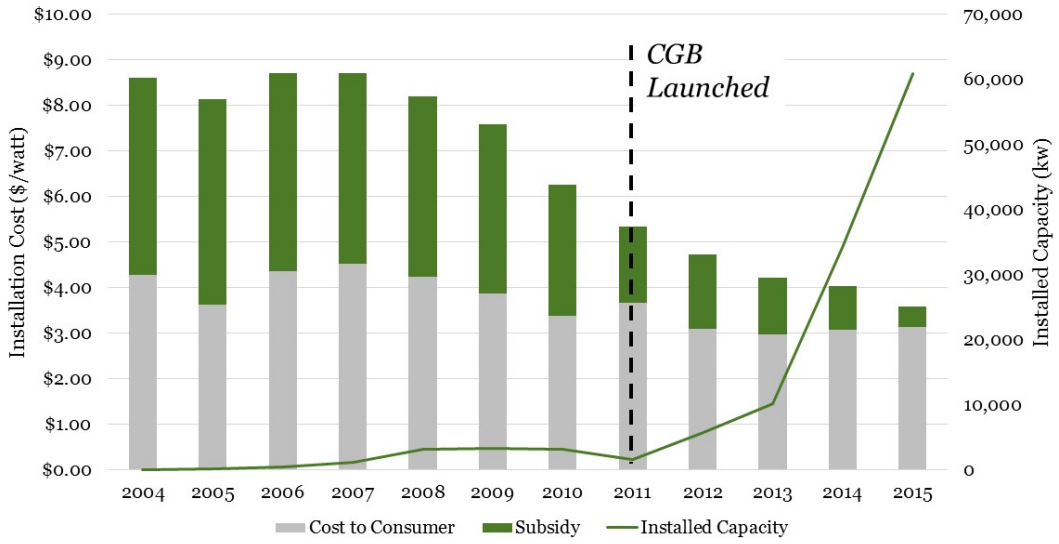
In addition to these public capital sources, the Connecticut Green Bank is authorized to issue its own bonds based on its own balance sheet. The Bank also has limited ability to issue bonds that are supported by a state bond reserve fund. This is not equivalent to full faith and credit, but does enable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

In addition to its broad financing authorities and capital sources, the Connecticut Green Bank was given two key statutory requirements in its enabling legislation. The first is that the Bank must manage the execution and ultimate wind down of the state’s residential rooftop solar rebate program. Though this grant-making role is distinct from the Bank’s broad financing mission, the ability to manage the ramp down of grant levels and then increase financing under a single coordinated strategy has proven highly

[v] PA 11-80, the public act creating the Connecticut Green Bank, passed the House by a vote of 139-8 and the Senate 36-0.

effective for market growth. As seen in the chart below, as the Bank lowered grants consistently through multiple steps, the increased availability of financing drove unprecedented market growth.[vi]

Figure 8: CT Residential Solar Market Installation Costs, Rebates, and Capacity[3]

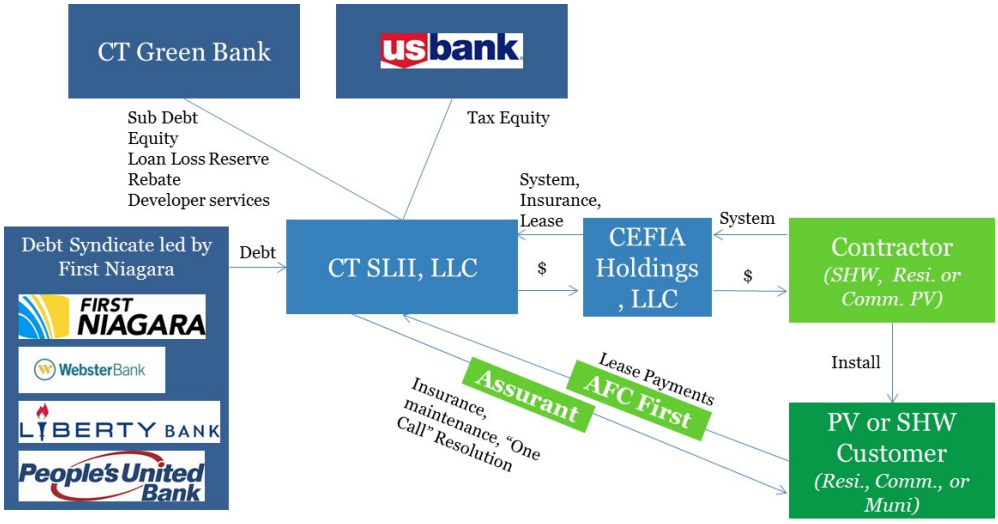


Connecticut offered three different financing solutions for the residential market to support solar installation. The first was a unique, state-sponsored solar tax-equity lease fund that could be used by any installer in the state. Similar to financing products offered by companies like SolarCity the CT Solar Lease 2 was a public-private partnership structure that brought $50 million of lease financing to the market, with a 5-to-1 private:public leverage ratio. The Green Bank itself created and owned a special-purpose vehicle through an equity investment. The Green Bank also provided subordinated debt, as well as a loan loss reserve credit enhancement with remaining ARRA stimulus funds. The senior debt was provided by a syndicate of private banks, and the tax equity was provided by U.S. Bank. This kind of tax-equity fund enables homeowners to put solar on their roof at no money down, and pay a low monthly price by taking advantage of federal tax benefits for solar.[vii] This financing tool was deployed through local installers, who otherwise would have been unable to offer financing to consumers. This tool enabled local installers to compete with national companies that had their own financing, and opened up the market for consumers who did not have the $20,000 or more of cash on hand to buy solar.

[vi] In fact, the chart shows that the net cost of solar faced by the consumer, after the rebate, has actually remained fairly constant in CT over the last decade. This is because the decline in the gross cost of installation was absorbed by the state in the form of reduced rebates. Therefore the spike in market adoption is attributable to new financing tools that allowed consumers to adopt solar without paying that remaining net cost of installation upfront.

[vii] A tax equity investor effectively invests cash in exchange for the federal Investment Tax Credit and the accelerated depreciation tax benefits enjoyed by solar. This tax value only comes through a tax-equity based structure, and allows consumers to pay a lower price for the solar power than they would if they owned the solar themselves.

Figure 9: CT Solar Lease 2 Financing Structure[4]



In addition to the Solar Lease, the Green Bank created the CT Solar Loan Product for consumers who wanted to directly own their own solar panels but did not have the cash on hand for the installation. Through this structure, the Green Bank seeded a loan fund with a $5 million investment. This was deployed through an origination partnership with Sungage. This fund led to two noteworthy transactions that demonstrate how a Green Bank can transform markets. The first was that the Green Bank sold its $5 million loan portfolio to Solar Mosaic, the crowd-funding solar investment platform. This was the first secondary-market transaction of this type in the nation, where individual investors in California could own solar loans in Connecticut. The second noteworthy event was that Sungage, upon proving the market viability and demand for solar loans, was quickly able to raise $100 million of private capital from Digital Federal Credit Union to replace the Green Bank capital once it was expended. In only a year and with only $5 million of public capital invested, the Green Bank effectively demonstrated the value of solar investment to a private lender, crowding-in capital as desired. The Green Bank effectively shut down this program, allowing Sungage to serve the market with private capital.

The final residential solar product offered, that can support solar, efficiency or other technologies, is the Smart-E Loan. Through this structure, the Green Bank provides a standard-offer loan loss reserve, to multiple local lenders and credit unions to support their loans into the residential market. These banks were either offering capital at high rates and short terms, or not making loans into the space at any terms. And those that were willing to lend into this market were not actively building deal flow with contractor partnerships or other methods. In exchange for receiving the benefit of the Green Bank's loan loss reserve, the banks agree to offer capital at specific terms and rates that don't exceed a certain cap. These terms are designed to compensate banks appropriately for risk, but ensure that projects can be cash flow positive for borrowers. This structure has been used for residential roof-top solar, as well as bundles of deeper energy upgrades that include multiple efficiency technologies.

In addition to managing the wind-down of the solar grant program, the Green Bank's enabling legislation also directed the Green Bank to administer a state-wide PACE program. Through Commercial PACE, CT offers whole-building commercial energy retrofits. The whole-building approach to energy upgrades has long been viewed as the most effective way to significantly curtail energy consumption, but the projects

are hard to execute and finance. They include multiple energy efficiency technologies and can also include roof-top solar when appropriate.[viii] The Connecticut Green Bank is able to finance these projects through its Commercial Property Assessed Clean Energy, or C-PACE, program.

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

Many PACE programs have struggled to attract private capital because of program complexity and small investment scale. Connecticut initially struggled with this same problem, having designed a robust administrative platform, but unable to draw in private capital to fund the PACE loans in a meaningful way. However, the Connecticut Green Bank was able to kick-start the market by originating and underwriting PACE loans using its own public dollars. By taking the first step when private lenders would not, the Green Bank was able to build scale by aggregating projects. Loans are offered at approximately 6%, which is low enough to expand the addressable market and make projects cash flow positive, but high enough to attract private investors who want to buy the loans from the Green Bank. After building a portfolio large enough to attract private investment, the Green Bank sold 80% of the PACE loan portfolio through an auction, drawing in $24 millions of private investment.[5] This was the first commercial efficiency securitization in the country, attracting specialized and institutional investors to participate in the market. Without Green Bank investment and coordination, the market would have remained dormant.

Now that the Green Bank has demonstrated the mechanics and potential of PACE, private investors are preparing to enter the market at far greater scale. To satisfy the growing pipeline of projects, the Green Bank is raising an external warehouse of at least $50 million in private capital that will be used to originate loans. Those private dollars will be paired with public debt and/or credit enhancements, and the loans will then be securitized in public markets. After only one portfolio sale, the Green Bank has demonstrated market opportunity to draw institutional investors eager to originate the loans, reducing the need for public investment. Recent securitizations of residential PACE loans in California suggest that this new private capital will come with ever lower interest rates.[6]

After four years of operation, the Connecticut Green Bank is now a mature financial institution that has sparked remarkable growth in the state's clean energy markets. In FY2015, the Green Bank sparked $365 million in total clean energy investment in the state, while achieving a private:public leverage ratio exceeding 5-to-1. This stands in sharp contrast to the market condition prior the Green Bank's creation. In the eleven years of operation of the prior Clean Energy Fund, a total of $350 million was invested during that whole time period. And of that total, approximately half of the funds were public dollars, and nearly all were in the form of grants. Under the Green Bank, markets have grown quickly through greater private investment. And the public dollars that are used are returned to the Green Bank through repayments on

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

financing. The Connecticut Green Bank is now developing new products to expand its market coverage to include the low-to-moderate income (LMI) sector and clean transportation.

Figure 10: Connecticut Green Bank v. Connecticut Grant-Making Authority[7]

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

New York Green Bank

New York Governor Andrew Cuomo announced his plan to form the New York Green Bank in January 2013 during his State of the State address. His plan was to build a $1 billion financing institution to fill financing gaps in the New York clean energy capital market. It was determined from the outset of the process that new legislation would not be needed to create the financing entity. Legal analysis determined that the state's energy office, NYSERDA, had all the legal authorities a Green Bank would need to provide financing. In addition, New York wanted the Green Bank to be directly part of government. Therefore it was determined that the New York Green Bank (NYGB) entity would be a division within NYSERDA. This action could be taken simply by administrative decision.

Separately, the Governor decided that the best source of funding for the NYGB would be similar to those chosen in Connecticut. The NYGB would be capitalized by redirecting a portion of the ratepayer surcharge funds collected annually to support grant programs. The NYGB would also receive the state's RGGI proceeds. The funding plan laid out by NYSERDA in the summer of 2013 called for a five-year capitalization structure, with multiple infusions of capital summing up to $1 billion, after which no further funds would go into the NYGB. The allocation of the RGGI proceeds could be made through administrative action, but redirecting the ratepayer funds to the NYGB required approval by the Public Service Commission (PSC). NYSERDA produced a detailed business plan and explanation of the importance of financing to support its petition to the PSC.[8] This led to PSC approval of NYGB funding in December 2013, initially allocating $165.6 million in ratepayer dollars.[9] Combined with the annual $45 million in RGGI proceeds, this brought the NYGB's initial capitalization to $210 million.[10]

The NYGB is now a fully staffed entity, operating as a wholesale clean energy finance lender (as opposed to Connecticut, which operates more as a retail lender). Rather than design specific financing products and programs, the NYGB is looking to the market to learn what financing is needed. In February 2014, the NYGB issued an open-ended RFP seeking applicants for funding that could demonstrate that they could not find private funding elsewhere, and that NYGB deal participation would produce "market transformation." Many renewable energy and energy efficiency technologies are eligible to receive funding. Similar to Connecticut, the NYGB can offer funds in many different forms, including senior loans, subordinated loans, credit enhancements, warehousing and securitization.

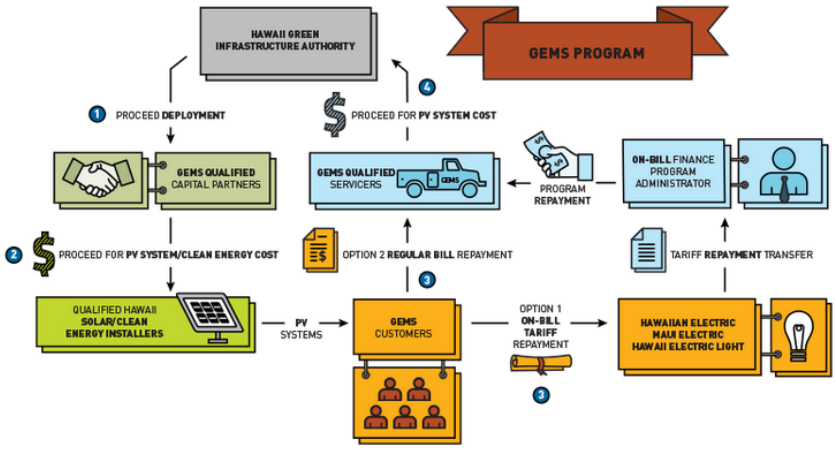
To date, the NYGB has received $734 million in proposals and has an active project pipeline of $338 million.[11] The first set of NYGB investments were announced in the fall of 2015.[12] $49 million of public capital was used to leverage $178 million in private capital. Three deals were announced addressing different market segments. $25 million in debt was provided to a NY-based solar installer to support a solar leasing warehouse. $4 million in construction financing was provided to a distributed wind installer to support over 160 distributed wind installations in rural New York through a lease structure. And $20 million in credit enhancing capital was provided to enroll the state in the multi-state Warehouse for Energy Efficiency Loans program, which provides home energy upgrade financing.

Hawaii Green Infrastructure Authority

Hawaii's Green Bank institution is called the Green Infrastructure Authority (GIA), which was created through legislation. The GIA was placed within the state's Department of Businesses, Economic Development and Tourism (DBEDT), which operates the state's energy office. The GIA is minimally staffed, relying on third-party contractors to administer its financing program. The GIA's first program, approved by the public utility commission in 2014, is the Green Energy Market Securitization (GEMS) program. GEMS provides solar lease financing to underserved market segments, particularly LMI households.

Hawaii has experienced a residential solar boom as the cost of solar has fallen and is highly competitive with expensive grid electricity in the state. However, solar adoption and the associated economic benefits were concentrated among high-income households. 27% of households earning $90,000 or more had solar, but only 6% of households with less than $60,000 in income had solar. This was a clear gap in private financing markets that had serious economic welfare consequences. GEMS is designed to fill that gap, leveraging public capital in an innovative way.

Figure 11: Hawaii GEMS Financing Structure[13]



1. GEMS Hawaii Green Infrastructure Authority provides funding to deployment partners, such as financial lenders and clean energy developers.
2. Customers (non-profits, homeowners, and renters) apply for loans and when approved, qualified clean energy installers receive the capital needed to install photovoltaic systems and other clean energy improvements.
3. GEMS customers can opt to repay their loans directly, or through their utility. Either option provides lower electricity costs than what customers paid prior to installing their clean energy improvement.
4. Repayments can be used to fund other clean energy projects, and in this way, the cycle is on-going and self-sustaining.

The GEMS program is funded with an existing and redirected ratepayer surcharge. Ratepayer dollars are collected by GIA through the utility. Rather than wait for the collections to reach scale, the GIA issued a $150 million bond that will be paid off with the future ratepayer collections. Because bond repayment is linked to utility collections, and not individual lease repayments, the bond received a AA-rating and a 2.99% taxable-rate. These funds are then combined with private tax-equity capital to create a solar lease fund. To further reduce the rate lessees will be charged, the solar leases will be repaid through on-bill repayment mechanisms that were established in parallel to the GIA's creation. The lease repayments will go back into the GIA fund, and can be revolved. By combining multiple elements of strong clean energy financing policy (public-private leases, leveraging ratepayer funds, and on-bill repayment), Hawaii was able to build a program that is low-risk and open to a broad segment of the population.

California CLEEN Center

In the fall of 2014, the California Infrastructure and Economic Development Bank (IBank) announced the creation of the new California Lending for Energy and Environments Needs (CLEEN) Center. The CLEEN Center will act as a Green Bank to initially support municipal and commercial building efficiency upgrades, before expanding to finance broader clean energy markets. For much of 2014, a bill to create a new stand-alone California Green Bank advanced through the state legislature. As a result of negotiations between Governor Brown and the bill's lead sponsor, it was decided that the existing state IBank would house the new Green Bank entity.

As described in the business plan, the objective of the CLEEN Center's programs is to "drive down the cost of EE projects and retrofits, leverage existing public programs, encourage private investment and earn investment returns for the IBank and partner with market intermediaries."[14] This statement encompasses the broad set of objectives typically held by a Green Bank. The CLEEN Center's first two programs will be the Statewide Energy Efficiency Program (SWEEP) and the Commercial & Industrial Energy Efficiency Programs (CEEP). The programs will fill market gaps where viable efficiency projects are unable to access reasonable financing, specifically targeting the municipal, university, school and hospital (MUSH) market, as well as the Commercial & Industrial (C&I) market. The CLEEN Center is also designing a specialized LED street lighting program that will enable municipalities to swap out old street lights for LEDs while remaining cash flow positive throughout the term of the loan. Through each of these programs, the CLEEN Center will offer senior or subordinated debt, or credit enhancements to support private investment.

The funding source for the CLEEN Center is the IBank's existing pool of cash raised by issuing bonds. The CLEEN Center sits under the existing Infrastructure State Revolving Loan Fund (ISRF). This is the IBank's largest program and is entirely funded through IBank bond issuances. Bonds are issued to recapitalize this program nearly every year, and at a very large scale. For instance, In May 2015 the IBank closed on a ISRF 2015A Series bond in the amount of $125 million, at 3% interest rate (rated at AAA). Presently, the IBank has roughly $200 million in cash assets available for lending, most of it for the ISRF program that includes the CLEEN Center. Finally, the IBank does have equity on hand (cash that does not have to be used to repay bond holders.) The IBank will use those equity dollars to create loan loss reserves and other credit enhancements to enable more private investment.

Rhode Island Infrastructure Bank

When Rhode Island Governor Gina Raimondo assumed office in January 2015, she very quickly followed through on her campaign promise to create a Rhode Island Green Bank. Rhode Island had an existing set of state and utility-run rebate programs, and had attempted to build a residential PACE program. A new

Green Bank, though, would increase financing across new clean energy markets, and importantly drive investment in infrastructure and job grow.

Rhode Island determined that the best path to creating its Green Bank required legislation. And rather than build an entirely new institution, the Green Bank would be built upon an existing entity with a track record of success. The state's Clean Water Financing Authority (CWFA), which had financed water projects in the state for many decades, was tapped to become the Green Bank. The CWFA would be given expanded authorities to address clean energy markets, and be renamed as the new Rhode Island Infrastructure Bank (RIIB). This new organizational structure was passed into law in June 2015 as part the Governor's fiscal year budget legislation.

The RIIB was assigned responsibility for two specific financing programs in the legislation, which are to become the first Green Bank products in early 2016. RIIB has responsibility for designing, administering and possibly financing both commercial and residential PACE in the state. RIIB chose to follow the Connecticut model with a single, state-wide PACE administrative authority. Though the RIIB hopes that private investors will originate and underwrite PACE loans, the RIIB is able to provide credit enhancements to those lenders should it be necessary. The RIIB is also authorized to make PACE loans itself should private investors not step in, though new capital sources would need to be identified to serve that function.

The RIIB was also tasked with designing and implementing an Efficient Buildings Fund (EBF), which will finance energy upgrades for municipal buildings in the state. RIIB was given general authority to design the optimal financing structure to serve this market, which has been broadly underserved. This program was given priority because reducing energy bills in public buildings will reduce government budgets at a time when the state needs to maximize the value of all public dollars. The state's Office of Energy Resources (OER) is tasked with developing criteria for viable projects and building a list of priority projects, which will be used to guide EBF financing decisions.

RIIB activities are funded through a combination of RGGI proceeds, system benefit charges, remaining federal ARRA funds, and a small amount of re-directed operating funds. The RIIB also has the authority to issue state qualified clean energy bonds (QECBs). In sum, these funds are intended to both serve as an equity portion of a broader bond issuance, as well as support a larger agency operation. The bond issuance, the proceeds of which will finance the EBF program, is estimated to raise $20 million. RIIB, like the CWFA before it, is a quasi-public agency with a board of directors, where the chairman is appointed by the Governor. The legislation that created the RIIB also directs the formation of a green infrastructure strategic advisory council, which will advise RIIB's board on industry advances and potential program opportunities/improvements. Council members include RIIB's executive director, RIIB's chairman, and heads the office of energy, transportation, health, housing, commerce and environmental management.[15]

Montgomery County Green Bank

In June 2015, Montgomery County, MD became the first county in the U.S. to create an official Green Bank. The Green Bank was created through County Council legislation, which was passed unanimously. The Green Bank has been given a broad mandate and set of tools to fill financing gaps and accelerate the growth of the county's clean energy markets. The county, which had already begun to create its own PACE program, saw a Green Bank as critical to meeting its own clean energy goals and opening access to all customers. The county is currently administering a public working group process that will more precisely inform the operations and focus of the Green Bank.

Montgomery County's Green Bank was created using a fairly unique structure. The county did not want to directly operate the Green Bank itself within the government, but was also unable to establish a separate quasi-public without state-level legislation. So instead of directly creating the Green Bank, the legislation precisely defines a mission and set of functions to be performed by a purpose-built 501(c)(3) non-profit that would be the county's Green Bank. The county Council would designate the non-profit entity as the county's Green Bank for a specified term, during which time it would operate under the governance and legal definitions of the Green Bank as written in legislation. This structure has similarities to both a quasi-public structure and an external, third-party administered structure. The primary initial source for the bank is intended to be approximately $20 million of funds the county was to receive from Exelon as a result of their merger with the local utility, Pepco.

Chapter 2 – Current District Market Conditions, Activity & Needs

This Chapter reviews the current clean energy market and financing needs. This includes a measurement of the clean energy market potential and the existing set of public sector financing activities design to support the achievement of that market potential. Finally this Chapter identifies the specific market gaps in the District that remain that could be served by a District Green Bank. The Appendix to this report also provides greater detail on the basic energy market and policy landscape in the District, and provides a more thorough accounting of all clean energy policies and programs.

Serviceable Addressable Market for Clean Energy

One of the key inputs to any Green Bank design process is the addressable market size. By knowing the market size, a government can adequately estimate the total amount of public and private investment needed. Though there are many engineering assessments that identify the maximum technical potential for a clean energy technology in a given region, it is often more helpful to measure market size in terms of what is economically (or politically) feasible. This measurement can be called the Serviceable Addressable Market, or SAM.

The table below outlines the current market penetration, in terms of installed capacity, and the economic potential for multiple clean energy markets in the District. The SAM is measured in terms of energy capacity and potential investment capital required to achieve the market potential. The figures were calculated based on energy potential studies from multiple reports, as well as estimated costs of installation for each of the listed technologies.

Table 2: Analysis of Economic Potential of District of Columbia's Various Clean Energy Technologies[16]

Selected Technologies	Total Current Installed Capacity	Total Potential Market	Total Unfilled Potential Cost
Solar PV	19 MW	585 MW	$1,677 M
Wind	0 MW	0 MW	$0 M
Electric Efficiency	191 GWh/yr	2,213 GWh/yr	$930 M
Thermal Efficiency	286,872 MMBtu/yr	3,845,186 MMBtu/yr	$490 M
Bioenergy Electric Generation	0 MW	8 MW	$26 M
CHP	14 MW	295 MW	$354 M
TOTAL	***N/A***	***N/A***	***$3,477 M***

The market potential of for solar PV and building efficiency upgrades represent the biggest opportunities for investment in the District. The solar and efficiency projects that have already been implemented are a small fraction of the total economic potential for each class of technologies—the economic potential of solar and efficiency are orders of magnitude above their current uptake. Combined heat and power in the

commercial and industrial sectors also represents a significant opportunity for investment. And taken together, the combined economic potential across all the evaluated technologies is nearly $3.5 billion.

Past District Financing Assessment

This Green Bank Report is not the first time the District government has investigated the need and potential value of additional financing programs to support clean energy markets. The 2008 Clean and Affordable Energy Act called for an official report to be produced by the PSC. And more recently the District Office of the Chief Financial Officer (OCFO) produced a white paper on the topic of a District Infrastructure Bank, investigating potential models and applicability in the District.

2009 District PSC Report on Clean Energy Financing

The District recognized the importance of long-term financing for clean energy in 2008 when it passed the Clean and Affordable Energy Act. This broad legislation that, among other things, established the DC SEU, expressed the desire to understand more about the financing structures that could be implemented. The legislation directed the Public Service Commission to, "open an investigation into mechanisms to make long-term affordable financing available to energy consumers."[17] This directive led to the Commission Report on Solar, Renewable and Home Improvement Financing, completed on September 23, 2009.

In the Report, key stakeholders were asked to submit comments and feedback on several potential financing structures, funding sources, and administrative approaches. Stakeholders included Washington Gas & Electric, Pepco, the Office of Public Counsel (OPC), and DOEE. In its comments for the Report OPC stated, "The single most daunting barrier to the creation of a sustainable energy infrastructure, both in the District and the world at large, is the up-front cost."[18] The OPC also cites federal Green Bank legislation that had been introduced by Chris Van Hollen and was under consideration at the time as an indicator of both federal interest in clean energy financing and a potential source of funding for a financing program.

The stakeholders also provided more specific programmatic recommendations. Both utilities submitted comments against on-bill repayment systems, where the utilities would collect loan payments through their billing system. They cited both technical difficulties and a desire to underwrite loans with bank financing, rather than utility (ratepayer capital). Despite this pushback on financing responsibility, Pepco did acknowledge the need for financing, suggesting that loans with rates between 2 and 4% and terms from 3 to 15 years were appropriate and necessary. Comments across parties pointed to either DOEE or the newly formed SEU as the most logical administrators for the program. And funding sources considered included the Sustainable Energy Trust Fund (SETF) ratepayer surcharge or the Alternative Compliance Payments collected as part of the District's RPS.

The Commission report concludes with recommendations of two possible financing structures. The first is a program relying on private lenders, with public funds used as interest rate buy-downs to ensure the capital is offered at favorable terms. The second recommendation is public revolving loan fund, where repayment is secured by a special assessment on the owner's property bill. (This is an early incarnation of PACE, though the name was not yet applied.) Due to the utility push back, no form of on-bill financing was recommended. However, the report did establish that financing is a critical element to market growth in the District, and began discussions of possible program structures. And not long after the report was submitted, the Energy Efficiency Financing Act of 2010 was passed, officially creating commercial PACE financing in the district.

DC OCFO Infrastructure Bank White Paper

In September 2014, the OCFO published a White Paper on the topic of a District Infrastructure Bank. The analysis is highly relevant to this Green Bank Report, as the creation, capitalization and activities of a Green Bank are effectively equivalent to an Infrastructure Bank, just with a focus on green projects.

The White Paper identifies two potential organization structures – a bank that is directly part of government or one that is a separate legal entity. It then provides a detailed analysis of the possible capitalization methods of an infrastructure bank, including an initial public capitalization, an ongoing capitalization from dedicated revenue stream like a tax, and the issuance bonds. Again, this construct of funding an infrastructure bank is exactly equivalent to a Green Bank (which is discussed in detail later in the report).

The Paper identifies three possible bonding structures

- bonds repaid by the full balance sheet of loans held by the Bank;
- bonds repaid by a tax dedicated to the Bank; and
- bonds repaid by revenue generated by specific projects financed by the Bank.

The White Paper points out that, in the District, the second type of bond, where a dedicated revenue stream is used to repay the bondholders, would cause legal challenges. Since the bonds would have recourse to taxes, it would effectively be backed by the District's credit and ability to collect the tax. Therefore this kind of bond would count towards the District's debt limit. The first type of bonding, backed by the general balance sheet of the Bank, would be feasible, though it would require the bank to have an initial capitalization from a non-bonding source from which it could make the loans that form the repayment pool. As the White Paper states, "Before it could leverage additional funding from loan repayment…the bank would need to have a diversified pool of high-performing loans."[19]

The White Paper also states that project-specific bonds are feasible, as well, assuming that projects don't require a guarantee from the city to be financed by private capital. "Project-specific financing…is a feasible option for the District to consider. The feasibility of this model assumes there are projects that attract lenders without requiring a specific guarantee from the District or other covenant that may cause the loan to be counted as District debt."[20] This statement is valuable because it confirms that a bond issued by a dedicated Infrastructure Bank, backed by a specific project that was originally financed by public dollars, *does not* trigger any District-specific legal issues. The bond doesn't have recourse to the District; it doesn't count towards the debt cap, and it doesn't violate the Home Rule act prohibition on lending the public credit for private projects. This is highly instructive for how a Green Bank could be established and capitalized in the District.

A final constructive piece of guidance form this White Paper pertains to the value proposition and funding needs of an Infrastructure Bank. As noted in the analysis, some of the forms of investment that an Infrastructure Bank takes on could conceivably be executed under existing authorities and agencies. Therefore the OCFO argues that if a Bank is created, it ought to be based on the notion that a dedicated institution can execute the financing and achieve the objectives more effectively.

> The rationale for setting up a bank for such transactions should therefore rest upon an argument for increased expertise or efficiency as compared to current District processes. However, the expertise and efficiency goals may require that the bank be set up with a

> level of autonomy that may contradict policy makers' desire for sufficient input. Any proposal for a District infrastructure bank will have to carefully balance such competing considerations. Additionally, policy makers should plan on the bank receiving at least interim funding until it can generate fees to cover its operations.[21]

This critical insight about organization governance, autonomy, and funding needs directly informs Green Bank creation, as well.

Current District Programs & Finance Activity

Today, the District has a fairly streamlined policy and program apparatus for clean energy market development. The DOEE is the sole and central authority, designing energy strategy, guiding policy decision-making, and implementing various programs. This includes direct program implementation at the DOEE, as well as outsourced program administration through the SEU and PACE. The DOEE is primarily funded with District general funds, federal grants, the Renewable Energy Development Fund and the SETF. Most of the DOEE's direct funding programs are low-income assistance, relying on federal funds. SETF dollars are directly passed to the SEU, which is administered, by contract, by a consortium of entities led by the Vermont Energy Investment Corporation. Of SEU funds, 85% go to rebate and market development programs across sectors, and 15% of funds go to overhead. The DOEE does not currently offer any financing products itself, but it does oversee administration of PACE.[22]

DC PACE Current Status

The District's only direct clean energy financing program is the commercial Property Assessed Clean Energy (PACE) program, currently administered by Urban Ingenuity, a private third-party administrator under contract with the DOEE. DC PACE provides loans to commercial and multifamily properties for clean energy upgrades.[ix] Eligible measures include all savings-related measures that achieve a savings-to-investment ratio greater than one (including both energy efficiency and renewables, like solar). This ensures only projects that produce savings greater than the cost of the project are eligible for PACE.

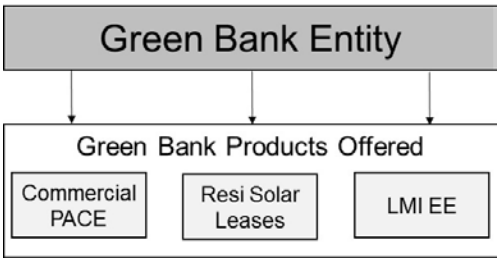
[ix] Clean energy includes both energy efficiency and renewables. In the Energy Efficiency Financing Act of 2010, "renewable energy systems" are a qualified form of "energy efficiency improvement." Also, residential buildings are legally eligible for PACE by statute, though the District has not implemented a program to allow residential PACE.

Figure 12: Relationship between Green Bank & PACE

Green Banks and PACE are sometimes mistakenly viewed as alternatives, where one must choose to implement one or the other. However, Green Banks and PACE are entirely symbiotic and operate effectively together. One is an institution, and one is a product potentially offered by that institution.

A Green Bank is a financing entity that can offer multiple finance programs or products. Operating a program typically includes administrative services, as well as providing capital for financing. PACE is a *kind of financing mechanism* used to finance building upgrades. The PACE mechanism requires both program administration and capital for making loans. Therefore a Green Bank could be well suited to offer PACE financing as one of its products, in the same way that a Green Bank could, for example, offer a residential solar lease financing product.

Illustrative Example



For example, the Connecticut Green Bank performs both of these functions. The state's commercial PACE program, C-PACE, is administered state-wide by the Green Bank, and the Green Bank also makes the PACE loans. C-PACE is the Connecticut Green Bank's most successful product, and has led to what is by far the most successful commercial PACE program in the nation. Rhode Island's Green Bank, the RIIB, only performs one of these functions. RIIB provides state-wide administration, but, like DC, loan capital comes from private lenders. The potential operational relationship between DC PACE and a District Green Bank is explored in more detail in Chapter 3.

Loans are paid back via an assessment on the building's property taxes. The assessment constitutes a lien on the property—loan applicants must certify that the assessment does not violate any existing lender agreements. The lien and the responsibility to pay back the loan through the property tax bill are attached to the property, and stay with the property if it is sold. This increases the security of the loan and can attract more capital at better terms. Therefore, PACE is an effective tool for the long-term financing of deep, multi-measure retrofits.

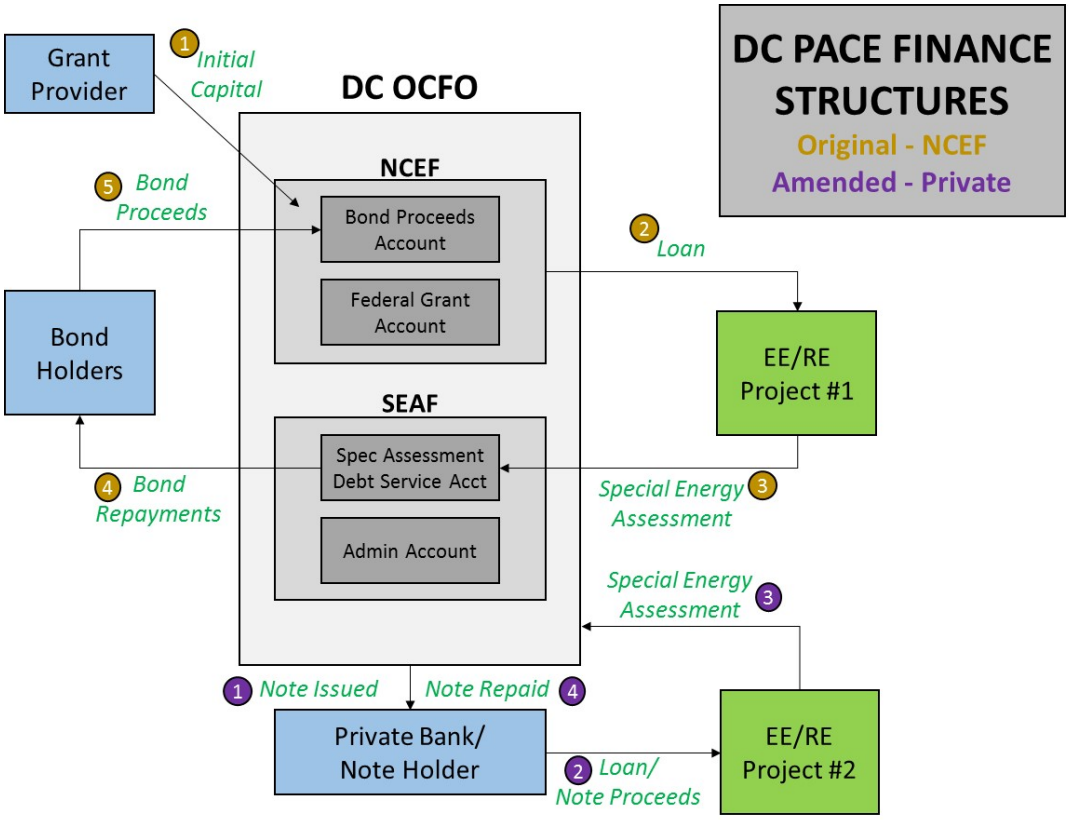
The District's PACE program provides financing for projects between $250,000 and $10,000,000 located in the District. The combined debt on the property (including the PACE loan) cannot exceed 90% of the property value. Though not stipulated in statute, UI has established eligibility and underwriting guidelines for PACE. This includes a maximum combined PACE and mortgage loan-to-value ratio of 80%; a minimum debt-service coverage ratio of 1.2; and a cap on the PACE lien of no more than 20% of property value.

When the PACE construct was initially enabled under the Energy Efficiency Financing Act of 2010, it was designed so that the government was the exclusive lender for PACE projects. Loans would be made by the newly created National Capitol Energy Fund (NCEF), drawing either on grant funds put in the NCEF or bond proceeds. The PACE loans would be repaid through special assessments into a separate fund, the Special Energy Assessment Fund (SEAF). The District would then issue bonds to be repaid solely by the special assessments, with the proceeds of the issuance going into the NCEF. In this way, the PACE system was

designed to be self-sufficient, with loans coming from the government, drawing on the proceeds of bonds sold to private investors. The Mayor can issue up to $250 million in PACE notes to fund PACE projects.[x]

This financing construct was amended under the Sustainable DC Amendment Act of 2012, at which point no PACE loans had been made by the NCEF and no bonds issued by the District. The amendment added a secondary financing structure, whereby a private lender can directly finance a project. The District directly issues a PACE revenue note to the lender, and the "proceeds" of the note issuance (i.e. the loan) are given to the project. The District collects the special assessment as loan repayment, and remits that payment to the lender/note holder. Each note issued counts against the $250 million bonding capacity authorized by the city. To date, this is the only financing construct used for PACE in the District.

Figure 13: DC PACE Legal & Financing Structure



The District's PACE program administration, through UI, was initially supported by $823,000 in public funds for start-up and program design. No other funds have been allocated either for program administration or for financing support. UI covers its operating expenses through closing fees, and capital is derived from private lenders. UI is charged with building the program structure, guiding building owners through the technical review process, and identifying suitable capital sources for each project.

[x] Like other many other PACE programs in the U.S., DC PACE is inextricably linked to the municipal bonding power of the District. Technically every PACE deal is financed by the District issuing a PACE revenue bond, which is then purchased by the project lender. There are is not actually a direct loan between the capital provider and the project. This is discussed in further detail in the PACE recommendations section of this Technical Report.

Using the direct private financing construct, DC PACE has operated with an "open-platform" financing structure. The District itself does not provide loan capital, and there is no designated private capital provider. Rather, UI enables any capital provider to participate and make a PACE loan. A project could be developed with a lender already attached, or UI can help the project find a lender through a solicitation process. UI effectively acts as an "honest broker" putting a given project out to bid to a set of banks and boutique PACE investors, and then collecting terms to present to the building owner. UI then helps the building owner decide which loan to take and whose capital to use.

Over time, UI has built a pool of capital providers who are regularly given the opportunity to fund projects. Capital providers range from small and medium local commercial banks to larger institutional investors specifically focused on PACE markets. Generally, local commercial banks offer lower interest rates but may not be able to offer terms longer than 10 years. The larger PACE-specific lenders tend to offer higher interest rates, with longer terms.

To date, three PACE deals have been completed in the District, totaling $1.28 million in financing. The most recent deals were completed in the summer of 2015, to install a solar system on a District gas station, and to provide an efficiency upgrade and rooftop solar for the Phyllis Wheatley YWCA. The YWCA project attracted national attention, as it was the first use of PACE on a public housing property that was financed by the Department of Housing and Urban Development (HUD). HUD's approval of the project set a critical precedent for the applicability of PACE for the low-income multi-family space.[23] UI has over $50 million in potential projects in the pipeline,[24] which still leaves the vast majority of the $250 million in PACE bonding authority untapped.

Table 3: DC PACE Deals Competed To Date

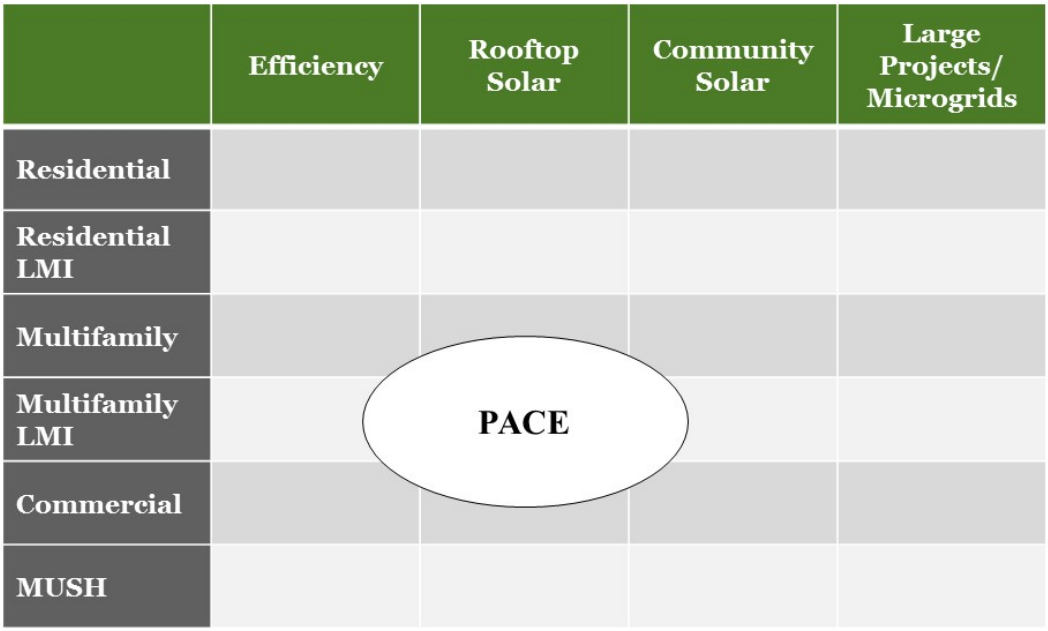
Building	Date	Amount Financed	Description
400 M Street	5/15/2013	$340,000	Efficiency, water, 37kw rooftop solar installation on affordable multifamily building.[25]
Georgia Ave BP Station	8/10/2015	$150,000	37 kw rooftop solar installation at gas station
Phyllis Wheatley YWCA	9/16/2015	$728,000	Efficiency & solar installation at low-income public housing

With only three deals complete PACE has grown slowly since legislation was passed in 2010. In its initial RFP to find an administrator, the DOEE targeted nearly 1,000 deals completed through three years.[26] Lessons from other PACE programs show that dedicated operating capital for program administration, and loan or credit enhancement capital to finance deals can be critical for achieving program growth. In addition, the District does not appear to have utilized the full bond-based National Capital Energy Fund lending construct as originally designed in the 2010 legislation. Possible solutions for program improvement and expansion are discussed later in Chapter 3.

District Financing Gaps and Needs

At present, DC PACE is the only publicly-supported financing activity that is holistically designed to meet market needs and produce economically attractive project outcomes. Though private capital is "available" from other lenders, there are few, if any, other purpose-built financing solutions that are reaching the market in a way that has led to meaningful clean energy adoption. The resulting gaps can and must be filled by the District in a way that support more private investment that is usable, attractive and accessible. Without programmatic support and public capital, it will be difficult for the District to drive the level of adoption needed to meet its clean energy and climate goals.

Figure 14: District Clean Energy Financing Product Mix



For example, rooftop solar financing is technically available in the District from private investors. However, the solar PV market will require nearly $814 million in capital investment in the next 7 years alone to meet the RPS requirements.[xi] The District is in no way on pace to meet this requirement. Despite the shortfall in investment, presently 100% of public dollars used to support clean energy market growth go towards incentives (such as rebates and grants) and related programs. There is no direct financing or credit enhancements offered, showing a mismatch between the District's energy objectives and the tools offered to meet those objectives. The current programs leave most of the critical market segments in the District unable to readily access capital to finance energy improvements. This includes the residential market and the municipal-university-school-hospital (MUSH) segment for efficiency and solar.

[xi] As of March 1, 2016, the reported capacity of solar in the District is 39.3 MW with 19.0 MW of that actually installed within the District. The solar carve-out in the District's RPS requires 2.5% of electricity to come from solar by 2023, which is estimated to equal 272 MW of installed capacity. This leaves 223.7 MW of capacity yet to be installed in 7 years. At a favorable expected price of $3.00/W, this sums to around $814 million. *See* Public Service Commission's "Monthly Update of Solar Generator Certification" on the DCPSC.org website.

In addition to deploying and attracting more financing, there is an opportunity for increased coordination and integration of efforts undertaken by DOEE, DCSEU and PACE.[xii] If more financing programs are created in the District through a Green Bank, mechanisms and structures that increase coordination will ensure that each public dollar is used most efficiently. This includes coordination of market growth policies, programmatic design, and project level implementation.

[xii] For instance, the SEU and PACE can work together on a project, ensuring that grant dollars are used to support projects with the deepest retrofits possible. Grants going to shallow retrofits not only make minimal progress toward the District's energy goals, but actually undercut the ability of financing programs to offer deep energy retrofits that produce cash flow positive savings. Energy conservation measures that can achieve significant reductions in energy usage typically have a long pay-back period. By pairing deep retrofit conservation measures with more shallow measure that produce quick pay backs help reduce the overall payback period of the project. This allows the project to be financed at terms of reasonable length (10-15 years) that still produce more savings per year than the financing repayments. If those shallow retrofits have already been performed as a result of grant funding, deep retrofit projects are unable to benefit from their quick payback, thus eroding the economics and attractiveness of a deeper project. Therefore any financing tools will have to be designed in coordination with existing grant programs and initiatives related to driving deep retrofits.

Chapter 3 – District Green Bank Recommendations

Based on the findings of this study, this Chapter provides specific recommendations for how the District should establish and operate a Green Bank. It addresses the following questions:

- What is the best legal structure for a District Green Bank?
- How much money does it need, and what would the impact be?
- Where would that money come from?
- How would it actually be created and funded?
- Once created, how would the District operate and staff the Green Bank?
- What should the District Green Bank do?
- How should it coordinate with other existing District initiatives?

This Chapter answers each of these questions in order, to provide a detailed guide that District policymakers can follow for Green Bank creation and implementation.

Summary of Recommendations

CGC recommends that the District create a Green Bank as an institution solely dedicated to driving more total investment in clean energy and green infrastructure. This study funds that the level of clean energy investment needed to meet the District's ambitious sustainability goals cannot be met by public capital alone. And private capital is not flowing into the District as quickly as necessary. Therefore, cost-effective public-private financing is needed to stimulate more overall investment.

The District should create a new quasi-public instrumentality, wholly-owned corporation of the government to operate as the District's Green Bank. With a Board of Directors appointed by the Mayor and Council, this structure ensures the Green Bank is aligned with the policy objectives of the District, while operating with flexibility, more like a private entity that can move quickly with markets. The suggested funding level for a District Green Bank is $100 million, spread over 7 years. This includes $40 million in initial capital and $60 million spread over the following 6 years This level of funding can drive over half a billion dollars of total investment in clean energy over the funding period, making significant progress toward filling the Serviceable Addressable Market (SAM) for clean energy (which is over $3 billion) and meeting the District sustainability goals.

The initial funding can and should come from multiple potential sources, identified in this Chapter. The Green Bank should also have a reliable, recurring funding stream, which is why it is recommended that the SETF be increased to generate an additional $10 million per year, with the new funds directed to the Green Bank. This stream of funding could be terminated after 6 years, when another $60 million of capital has flowed into the Green Bank. The Green Bank should also have the ability to issue bonds of various types so that it can recycle capital and raise additional funds. Creating this Green Bank will require the passage of legislation that enumerates the powers and authorities of the institution and identifies its funding sources. The legislation would also outline accountability and transparency requirements.

The Green Bank will need to hire dedicated staff, drawing on investment and banking professionals from the private sector. At start up, the Green Bank should borrow certain administrative functions from existing entities, like the DOEE. The Green Bank will need a CEO/Executive Director, a Chief Investment Officer, and other program staff. The overall operating expense at start-up should be less than $1 million per year. The Green Bank should be a breakeven entity, where the revenues earned from financing activity

cover all the costs of operating the Bank. However, as it will take time for the Green Bank to develop and launch products, and begin earning a return, the first few years of activity will result in operating deficits. The funds to cover this operating deficit should come from the overall capitalization of the Green Bank. The Board and staff together should develop a formal business plan, identify their priority markets and roll out products to serve those markets.

CGC recommends that the priority market of the Green Bank be distributed solar (through rooftop and community-scale) and building efficiency upgrades. Efficiency upgrades should focus on residential customers, offering whole-home solutions that includes solar, and commercial properties that may not be suited for ESCO-based financing. Within the residential, space, it is critical that the Green Bank develop solutions to specifically serve the low-to-moderate income space. The best financing structure available to serve this market is on-bill financing, as it enables financing for renters and allows for underwriting based on utility bill payment history. And finally, the Green Bank must engage in a range of coordinated market development activities that aim to stimulate demand. The Green Bank must do this in concert with the SEU, as rebates, financing and market development should be seamlessly aligned to lower barriers and ease customer adoption of clean energy. The DOEE should act as the bridge between the SEU and Green Bank, to ensure close communication around responsibilities and program design.

District Green Bank Legal Structure

CGC finds that the best legal structure for a District Green Bank is a new, wholly-owned non-profit corporation that operates as a quasi-public instrumentality of the District. This model is well suited for the institutional landscape and legal structures of the District, and is also the model used by the most effective Green Bank in the U.S found in Connecticut.

This section examines and compares three possible legal structures, include the quasi-public option, in order to highlight the benefits and costs of various options. These Green Bank structural options are:

- A direct part of government, as a division of the DOEE;
- An external entity, administered by a third party under contract with the DOEE, similar to the SEU
- A new wholly-owned non-profit public corporation, that operates as a quasi-public instrumentality of the District

A District Green Bank could be established under multiple potential structures, each possessing certain advantages and drawbacks from the perspective of government and the market. In addition to organization structure, governance and market orientation, the District must consider legal powers and potential restrictions that come from implementing certain structures. The District will also have to make political calculations to assess the benefits and risks of creating a Green Bank through various actions, such as legislation or regulatory action. In some cases the structure and associated legal process for creating that organization structure are linked to specific Green Bank funding sources. However, in most cases the nature of the organization's legal structure is distinct from the question of how the Green Bank would be funded.

No matter the structure chosen, the District should ensure that the Green Bank is well aligned and coordinated with existing District clean energy structures and has the flexibility to offer financing needed to meet identified gaps in the District's energy products.

The current clean energy program structure in the District is highly streamlined through DOEE, something the District should aim to preserve if it created a Green Bank. Currently, DOEE manages its own programs, and then manages the SEU and PACE through contracts. This ensures that program design and the interaction between DOEE, SEU and PACE are centrally managed, which is critical to building a policy environment conducive to market growth and public efficiency. Therefore a suitable structure for a Green Bank is one where the Green Bank financing functions are tied to DOEE.

New Division of DOEE

The simplest Green Bank structure for the District is for the DOEE to create a new Green Bank division to operate within government. In this structure, the DOEE would hire new, specialized leadership and staff to specifically operate the Green Bank. This is similar to the route taken to establish the NYGG. The NYGB is an internal division of NYSERDA, New York's state energy office.

The advantage of this structure is that it would give government total control over the Green Bank's operations. It would be easy to create alignment between DOEE's other activities and Green Bank activities. And it would minimize potential confusion that may exist over the role of different institutions.

There are disadvantages to this structure, though. As a direct part of government, the Green Bank may be limited in its use of debt, both in relation to the District's debt limit and related to Home Rule Act restrictions on the use of public debt for private activity. The Green Bank may also be limited in its financing flexibility which is critical to a Green Bank's success, and would likely have to comply with many regulations and rules related to doing business with the private sector. Rather than acting in close coordination with the market and operating close to the private sector, the Green Bank would likely be viewed as a traditional government office. This may inhibit the kind of collaboration and innovation the Green Bank seeks to foster. It may also be hard to attract the necessary talent and human capital to work for a government agency, as opposed to an external private entity. This may actually be more costly to operate a Green Bank under this model, as overheads due to public sector benefits may be higher.

External Entity Administered by Private Third-Party Under Contract

Another option for a Green Bank structure is contracting with a private entity to serve as a Green Bank. This would align with District precedent, most notably the SEU and DC PACE.

Rather than hire its own staff directly to design, manage and operate the SEU, DOEE chose to contract out those administrative services to a team that is purpose-built for the task. Legislation was passed that was given DOEE the job of designing an RFP, selecting a winner, and managing a private administrator for the SEU. A similar structure could be implemented to create and operate the District's Green Bank.

The potential benefit of this structure is that the Government, in the form of DOEE, still maintains direct control over the Green Bank operations without having to take on additional staff, overhead and daily management. This way, the chosen contracted administrator has the flexibility to hire necessary staff, set salaries and design the internal organization structure without be encumbered by potential public sector limitations. Through the contract design, DOEE can established performance metrics and objectives that the administrator is required to follow, ensuring Green Bank activity is aligned with the District's priorities.

This structure would also allow DOEE to maintain centralized and coordinated control across all of its energy programs, including the SEU, DC PACE and the Green Bank. The SEU could continue to focus on rebate programs, while the Green Bank provides financing. Even if PACE and the Green Bank remain

separately contracted activities, they would necessarily need to be highly coordinated. This could take several forms, as discussed previously in the PACE financing product section above.

There are drawbacks to this structure, though. Depending on the length of contract, the Green Bank may not have the appearance of permanence and stability the market would need from a financial institution. For instance, if the contract for administration is year-to-year, the Green Bank would be unable to make long-term investments, as presumably any performance incentives would be measured annually. And the operations of the entity and the staff might change drastically from year to year if the contract changes. Even if the contract is for five years, as the new SEU contract is expected to be, that likely will not achieve the organizational stability that is necessary to build market trust. As a financial institution, the Green Bank needs to be able to operate flexibly with a long-term investment horizon. One of the sources of value of a Green Bank is that its capital is very patient and flexible. The contract structure may force the Green Bank administrator to take a short-term view of activity. The administrator may also feel restricted in its activity by narrowly defined metric categories, which might force the entity to sacrifice long-term objectives to meet short term benchmarks.

Much like the SEU, this Green Bank structure, implemented through a contracted administrator, could be legally created through legislation. The Clean and Affordable Energy Act of 2008 specifically called for the creation of the SEU, described its general purpose and function, and tasked DOEE with designing and implementing the contract for outside administration. Similar legislation could be drafted for the express purpose of creating a Green Bank. However, it is still unclear if this structure would face similar restrictions to the internal option related to the Home Rule Act, which would limit public financing for private activity.

Quasi-Public Instrumentality, Wholly-Owned Public Corporation

The final potential structure is for the Green Bank to be a non-profit, wholly-owned public corporation established specifically for the purpose of housing a Green Bank. This is the structure CGC recommends. Also known as a quasi-public instrumentality of government, the Green Bank would sit between government and the private sector. Enabling legislation would be required, and would establish the structure, including issues such as bonding and lending authority, internal governance and structure of any Board of Directors. This instrumentality structure is most common across other state Green Banks in the U.S., and offers many benefits for both the government and the market participants. Like the structure described above, legislation would likely be required to create the entity.

Under this approach, the Green Bank would be created as a new stand-alone entity governed by a Board of Directors. This is similar to the Connecticut Green Bank, the Hawaii Green Infrastructure Authority, the California CLEEN Center, and the Rhode Island Infrastructure Bank. In each case, the Green Bank is a stand-alone entity that has the benefits of sitting close to the market, while also having strong government oversight to ensure alignment with policies and priorities. A quasi-public structure gives the Green Bank the flexibility to react quickly to market needs, a broad set of financing and market development tools as needed, and the institutional permanence and long-term view needed for a public financing institution.

A Board of Directors would provide governance and oversight, and should be composed of relevant industry experts and representatives of key stakeholder groups in the District. Board members could be appointed directly by the Mayor and/or by Council, and would likely include ex-officio members. The Connecticut Green Bank structure provides a good example of the kind of Board the District may want for its Green Bank under this structure.

The Connecticut Green Bank board has 11 voting members. 3 are ex-officio, including the state Treasurer, the head of the state energy and environment office, and the head of the state economic development agency. Four voting members are appointed by the majority and minority leaders in both houses of the state general assembly to defined terms. Those appointees must represent specific sectors or have relevant expertise. The Governor then appoints the final 4 voting members, also to defined terms and with specific representation and experience requirements. The Governor selects the Chairperson of the Board, a position presently held by the Director of the state economic development agency.

With this board composition, the executive controls 7 seats, with 3 ex-officio seats that can be changed at any time by the executive. Four seats are controlled by the legislative body. A similar structure in the District could give the Mayor's office confidence that the Green Bank would not stray from its mission of serving the District's energy and climate priorities, while also ensuring that all citizens that can be effected and benefit from the Green Bank are represented on the board. If the Director of DOEE was given an ex-officio position and appointed chairperson, this would also allow DOEE to maintain its crucial role as the central coordinator of all relevant District clean energy programs.

A quasi-public entity could be given specific metrics and targets for performance, similar to the contracted structure. However, because the Green Bank's compensation and budget would not be directly linked a defined contract, these kinds of specific targets may not be necessary. Instead, the Board could charge the Bank's leadership with achieving certain objectives. The quasi-public instrumentality would be capitalized, either upfront or over time with public capital, and it would be the responsibility of Green Bank executive leadership (appointed by the Board) to effectively manage the organization and cover its costs. Legislation to create this structure could include specific requirements for products that must be offered or markets that must be served. Rhode Island took this approach, specifically identifying commercial and residential PACE, and public buildings upgrade financing as initial products the Infrastructure Bank must offer. The District should take a similar approach to give the Bank definition and focus from the start.

Quasi-Public Examples

There are several precedents for this kind of quasi-public instrumentality structure in the District. For example, the District of Columbia Housing Authority (DCHA) is an independent public agency with an 11-member Board of Commissioners. The Board is a mix of elected representatives, ex-officio members, and Mayoral appointees that are approved by the Council.

Another example is the D.C. Housing Finance Agency (DCHFA), which was created by Council legislation but is a "corporate body which has a legal existence separate from the government of the District" and was established to "stimulate and expand the homeownership and rental housing opportunities" in D.C. by "issuing housing mortgage revenue bonds that lower the homebuyers' costs of purchasing homes and the developers' costs of acquiring, constructing and rehabilitating rental housing.[27] The DCHFA has the authority to issue bonds, notes and other obligations to execute the programs and responsibilities authorized by its statute. The DCHFA is also permitted to receive gifts, grants, appropriations, loans and other funds from public (District and Federal) and private sources. DCHFA is governed by a five-member Board of Directors, with Directors nominated by the Mayor and confirmed by the City Council. The method of creation and institutional authorities provide a good model for Green Bank creation. The only difference between the DCHFA model and the ideal Green Bank model is that the DCHFA is solely a conduit issuer, connecting private capital to projects. It does not have its own balance sheet and capital to invest.

Perhaps the strongest precedent is the District's Housing Production Trust Fund (HPTF). The HPTF is an agency of District government created by legislation in 1988 to provide various forms of financing to support low-income housing in the District.[28] It was not a fully functioning fund until an initial, one-time $25 million payment from the District into the fund in FY 2001. A permanent funding source was secured through the Housing Act of 2002, which dedicated 15% of the District's real estate recordation and transfer taxes to the HPTF annually. Now, the HPTF gets approximately $50 million a year from the recordation and transfer taxes. It also receives revenue from loan repayments, and occasional direct budget appropriations and donations. Recently, the Mayor and Council have expressed a desire to increase the annual funding level to $100 million, with funding above the tax collection coming through budget appropriation.

The HPTF operates in a way that is very similar to a Green Bank, as it is revolving loan fund, used for a specific mission-driven purpose, that lends alongside private investors. The public dollars put into the HPTF are used to make loans to housing developments that are unable to find sufficient capital in the market. The HPTF effectively operates as a gap financier, lending capital into projects in partnership with private investors, grant funding and potentially other public lending sources. Through the fall of 2014, the HPTF had invested $320 million in public dollars and leveraged an additional $794 million from private sources.[29] In an average year, the HPTF lends capital to 15 to 20 projects, and is approaching $100 million of lending activity per year. At present, the cash on hand is nearly $200 million, though a significant portion of this is already allocated for projects.[30]

The HPTF has a fair amount of flexibility in the kind of financing it can provide. There are specific rules on distributing funding across certain income brackets. But the nature of the financing itself is undefined, and up to the discretion of program administrators. Loans have varying interest rates, generally from 0% to 5%, and the term and rules of repayment vary based on the project economics. In some cases, loans are made in exchange only for residual cash flow, where only cash flow available after coving other expenses is used to pay back the loan. Other loans have balloon structures, where loans are not expected to be paid back for many decades or only upon refinancing. Projects can seek funding from the HPTF through multiple avenues, including a standard annual RFP process. Other kinds of projects can seek funding on a rolling, as-needed basis. Though the exact terms of the financing offered differs from what a District Green Bank would likely provide, the overall purpose, flexibility and revolving nature of the HPTF is very similar to a Green Bank. And the perpetual funding stream, which is used to increase the overall capital base, is the exact same funding structure used by the Connecticut Green Bank.

The legal structure of the HPTF is instructive for the Green Bank, though may not be the exact structure a District Green Bank would follow. The HPTF is a "paper agency" that resides within DHCD. The HPTF was statutorily established as "permanent revolving special revenue fund within the Governmental Funds of the District apart from the General Fund consisting of identifiable, renewable, and segregated capital."[31] This means it does not have its own staff, and relies on DHCD employees to operate HPTF programs. HPTF dollars are technically transferred to the DHCD for this purpose. The legislation setting up the HPTF called for the creation of a board of advisors, but they do not have decision-making authority.

Though the administrative structure of the HPTF is not quasi-public, the actual fund itself resembles a quasi-public, because the funds are segregated and can only be used for private-sector oriented activity. It also shows an example of how purpose-built quasi-public institution could be funded. For instance, the District could establish the Green Bank entity as a quasi-public, and then establish a "Green Bank Fund"

which is to be operated exclusively by the Green Bank entity. The most instructive takeaway from the HPTF, though, is the dedicated funding stream, its flexibility and the revolving loan structure. It also establishes a precedent that public dollars can be used to provide loans to support private projects.

Funding Level & Market Impact

CGC finds that the adequate level of funding for a District Green Bank is $100 million in public capital. Based on the initial leverage ratio achieved by other Green Banks in their financing products, the District Green Bank should be able to achieve a leverage ratio of approximately 5 private dollars per 1 public dollars. At this presumed leverage ratio, $100 million in public capital would drive an initial $500 million in private investment. And, because Green Bank capital is recycled, those same public dollars can leverage private capital multiple times. Therefore the lifetime financial impact of the $100 million investment would ultimately exceed $500 million.

For example, though the Connecticut Green Bank's capital base on its balance sheet is approximately $120 million, it has now animated nearly $1 billion in total clean energy investment in the state (including both public and private investment). With similar results in the District, a Green Bank could help achieve meaningful clean energy market penetration, with an estimated SAM greater than $3 billion, and achieve the District's sustainability impact goals.

To spread the cost of this $100 million investment over time, CGC proposes that the capitalization come to the bank over a 7 year time period. The Green Bank would receive an initial upfront capitalization of $40 million, with $10 million then invested annually over the next 6 years. When the total capitalization of $100 million is achieved, then the District can assess if any further capitalization is needed.

Table 4: Proposed Green Bank Capitalization Schedule

Level of Funding	Yr 1 Upfront	Yr 2	Yr 3	Yr 4	Yr 5	Yr 6	Yr 7
Annual New Capital	$40M	$10M	$10M	$10M	$10M	$10M	$10M
Cumulative Capital Base	$40M	$50M	$60M	$70M	$80M	$90	$100M

This model would follow the capitalization plans of both New York and Australia, which invested pre-determined amounts of capital annually into their green banks, with a finite end point. In Australia, their AUD 10 billion capitalization was spread over 5 years. And in New York, the $1 billion capitalization will ultimately be spread over 12 years, from 2013 to 2025. It is worth noting that the Connecticut Green Bank also receives funds annually (as opposed to a single upfront capitalization), but the amount of money going to the bank every year is not fixed, and the stream is indefinite.[xiii] The section that follows will provide a deeper analysis of the best source of funding, upfront and over time, for the District Green Bank.

The Green Bank can be expected to animate over half a billion dollars of local clean energy investment. This calculation relies on two key assumptions. The first is the leverage ratio the Green Bank achieves on

[xiii] The amount of annual capitalization is not fixed because the portion of capital collected from ratepayers depends on electricity sales, and the portion of capital that comes from RGGI depends on the auction clearing prices for carbon emissions allowances.

its investments. There are two critical elements that drive the overall institutional leverage ratio. The first is the product mix, and the second is time. The overall institutional leverage ratio is, by definition, the weighted average ratio of the underlying financing products. And product design is what actually drives leverage. For example, a Green Bank that has one product that is designed to leverage $10 private dollars per public dollar will have an institutional leverage ratio of 10-to-1. But a Green Bank that has two products, where each has equal capital and achieves a 10-to-1 and 2-to-1 leverage ratio respectively, will have an overall institutional leverage ratio of 6-to-1. As demonstrated by this simplified analysis, the overall leverage, and therefore private investment driven by the Green Bank depends on the makeup of the underlying products of the Green Bank.

It will be the responsibility of the Green Bank's Directors and leadership staff to ultimately define the exact parameters, and therefore leverage, the Green Bank achieves through its products. However, the overall institutional leverage ratios of other Green Banks are instructive. The most experienced Green Banks around the world are Connecticut, New York, UK and Australia. Their overall leverage ratios range from approximately 6-to-1 to 2.5-to-1. Again, these figures do not necessarily reflect a strategic decision to increase or decrease leverage, but are the summation of underlying financing activity. Based on these figures, it is reasonable to predict the District Green Bank could achieve a leverage ratio of 5 to 1, thereby driving over half a billion in total clean energy investment.

As stated above, the other element that drives leverage, and therefore market impact is time. Specifically, how long does it take the Green Bank to deploy all of its capital, and how quickly can it be recycled. For example, imagine the Green Bank received $100 million on day 1 and deployed it all in a single year. Therefore in 1 year it would have driven $500 million in total investment. Then, at the end of that year, it was able to fully recapitalize, and begin the second year of operation with $100 in cash back on its balance sheet. If this same activity was repeated annually, it could effectively stimulate $5 billion over a 10 year span, using the same $100 million (ignoring discounting for the time value of money). In this entirely illustrative and exaggerated example, one can see how the pace of deployment and timing of recapitalization greatly effects the overall impact of the Green Bank.

In reality in the District, the Green Bank (in the recommended scenario) would be capitalized over a number of years, and it is unlikely that each dollar of capital allocated to the Green Bank would be deployed immediately. This is especially true in its early years in the start-up phase, as products are designed and rolled-out. Therefore the precise impact, and timing of investment will depend on the operations, market uptake, and product design of the Green Bank.

Given this variability, and based on other Green Bank precedents, it is reasonable to assume that the Green Bank can drive half a billion of private investment over its first phase of operation while it is still receiving funding. This level of market investment can meaningfully penetrate the serviceable addressable market, which, across clean energy technologies, is over $3 billion.

In addition to making a meaningful market impact, $100 million in capital is sufficient to make the market take notice. It is important that the Green Bank is seen as a relevant and sizable tool of the District that is not just another program, but is a dedicated institution given the authority and purpose to bring scale to the market. A figure less than $100 million may make the Green Bank appear to be less significant in the eyes of private investors, and therefore not draw attention and interest. A figure less than $100 million will surely still lead to good outcomes, but the speed of activity and institutional gravitas will be lessened.

District Green Bank Capitalization Methods & Sources

CGC recommends that the Green Bank use a combination of capitalization methods and sources. The Green Bank should be given a significant upfront capitalization to build its capital base and cover initial operating expenses. It should also be given a stream of revenue over time to expand its capital base. And it should be given the legal authority to issue bonds in order to recycle and recapitalize the institution. By using all funding methods, the District Green Bank would draw upon the best practices of all existing Green Banks. The Green Bank should draw upon any and all funding sources available, several of which are specifically identified below. This includes a potential direct budget appropriation, use of settlement funds from the Exelon-Pepco merger, and the REDF resources. As an on-going funding stream, CGC recommends an increase in the SETF to collect funds that a dedicated to the Green Bank on an annual basis.

Green Bank Funding Methods

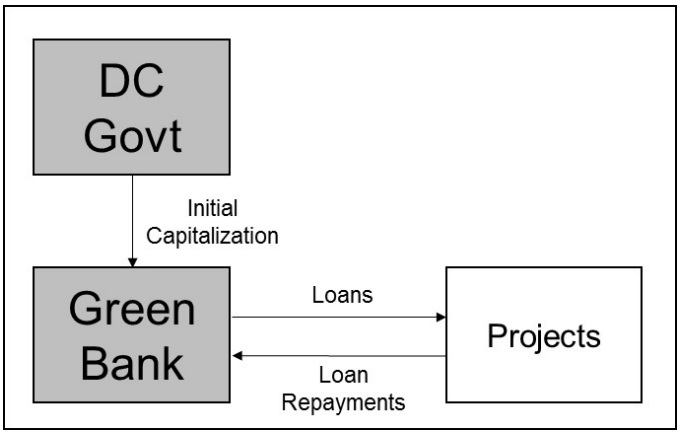
Independent of funding source, there are several methods the District could use to capitalize the Green Bank. It is important that the Green Bank have a strong capital base to ensure market impact, have certainty over its funding levels, and have the ability to recapitalize itself once it has loaned out all of its capital. CGC recommends that the Green Bank use all three methods of funding. The methods described in this section include:

- Upfront initial capitalization or "grant"
- Recurring revenue stream
- Bond Issuance

Upfront Initial Capitalization

The Green Bank could be capitalized with an upfront infusion of public money at its inception. If no other funds were authorized, or no bonding authority were granted, then the Green Bank would effectively operate as a revolving loan fund, relying exclusively on the repayment, over time, of the loans it made in order to recapitalize and make new loans. This structure is simple, but limits the capacity and velocity of lending. It is the responsibility of Green Bank leadership to manage the funds appropriately to always maintain capital necessary to cover operating expenses. The Hawaii Green Infrastructure Authority was funded in a similar fashion, with an initial infusion of $150 million with no plans for increased capitalization. The NYGB was funded with an initial capitalization of over $200 million, though this was part of a long-term capitalization plan with money pledged over time.

Figure 15: Single Initial Capitalization Model[32]



Recurring or Time Specific Revenue Stream

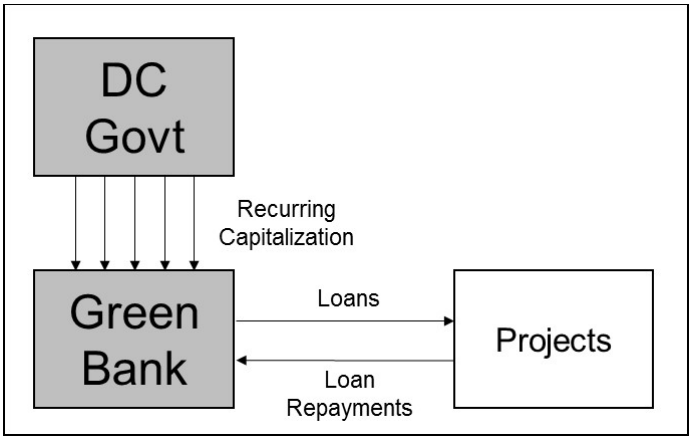
Another structure is for the Green Bank to receive capital over time from a dedicated stream of revenue. This could be a perpetual stream of revenue, where the capital raised from a tax, for instance, is indefinitely committed to the Green Bank. Or the stream could be directed to the Green Bank only for a set amount of time or until a specific amount of funds are invested in the Bank. This method of funding would allow the Green Bank to build up a significant capital base for lending, but without a large upfront cost to the government. The cost of capitalizing the Green Bank would be spread out over time. There are also operating benefits to this kind of funding stream, as the Green Bank gains flexibility and a willingness to take on investments and market development activities with a long time horizon.

For example, the Connecticut Green Bank is funded through a dedicated revenue stream, which by statute flows to the Green Bank indefinitely. The Green Bank receives roughly $30 million in funding every year through on-going receipts from a system benefit charge. This structure ensures the Green Bank has liquid assets, and provides flexibility for the Green Bank to take on activity that may not generate returns for a long period of time. This funding structure also has given the Green Bank tremendous institutional stability and the ability to do long-term planning.

The NYGB receives funds over time from a dedicated revenue stream in the form of a system benefits charge, but only for a set period of time. The NYGB is meant to be fully capitalized to a level of $1 billion in public funds, but not all of that money is sent to the NYGB at once. Instead it is allocated to the NYGB over a period of time. Since its inception in December 2013, the NYGB has received $368.5 million in public capital. The remaining $631.5 million will be given to the NYGB through scheduled annual transfers from a system benefit charge, with the last investment coming in 2025.

And internationally, the Australian Clean Energy Finance Center is capitalized in a similar manner. It is to have a total capitalization of AUD 10 billion, but spread out over 5 years with fixed AUD2 billion annual installment payments.

Figure 16: Recurring Capitalization with Dedicated Revenue Model

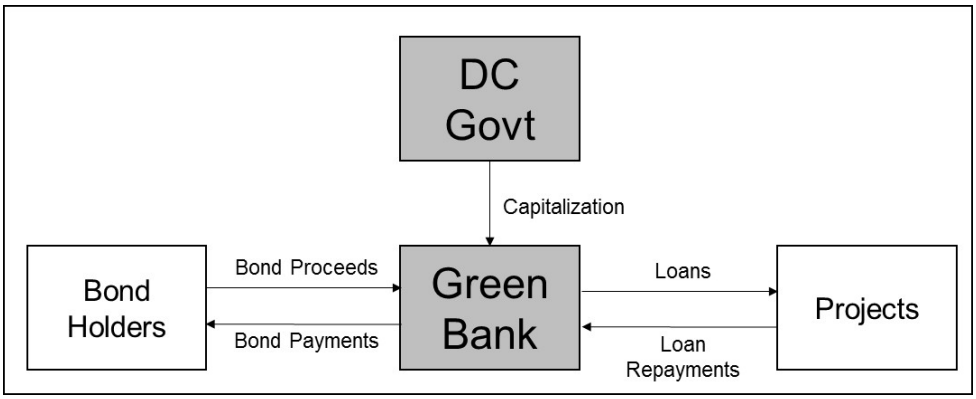


Bond Issuance

The final method for funding a Green Bank would be through bonds. Issuing bonds would allow the Green Bank to draw in private capital from institutional investors beyond the initial or on-going public capitalization. There are many potential permutations of Green Bank bonding in the District (explained in

more detail in the following section). By issuing bonds, the Green Banks can expand the amount of capital available for lending beyond an initial or recurring infusion of capital from public sources.

Figure 17: Bond Issuance Capital Expansion Model



The value of bond issuance is two-fold. Bonds allow the Green Bank to sell loans it has already made off of its balance sheet, and replenish its cash balance to then make more loans. This kind of recapitalization accelerates the velocity of Green Bank lending. Bonds also allow the Green Bank to raise a large amount of capital for lending in the event that only a small amount of initial or on-going public capital can be put in the Green Bank. If only a small amount of public dollars are available, rather than lend those dollars, the Green Bank can hold that public as an equity reserve to support a larger bond issuance. This kind of "leveraged finance" structure is similar to that used by other development finance agencies, and is outlined in the OCFO's Infrastructure Bank White Paper. Therefore, no matter the form, size and timing of public capital allocated, it will be critical for the Green Bank to have the ability to issue bonds to maximize the amount of lending.

The CT Green Bank issued a bond through private placement, selling a portfolio of commercial PACE loans to a private investor. This allowed the Green Bank to recapitalize its internal C-PACE warehouse and use those funds to make more loans. The Hawaii Green Infrastructure received its capitalization by issuing a bond that was backed with a stream of payments from ratepayers. The RIIB will fund a pool of municipal building upgrade projects by issuing a Qualified Energy Conservation Bond. NYSERDA, the NYGB's parent entity, sold a portfolio of residential and small commercial efficiency loans through a public bond issuance, with an innovative credit enhancement mechanism from the state's water financing entity. These examples all demonstrate the various ways that Green Banks use bonds and the crucial role they play for both institutional functionality and market liquidity.

Figure 18: Bonding Considerations & Limits for Green Bank

The three primary constraints Green Bank bonding may have to contend with are:

1) Does the Green Bank's debt have recourse to the District beyond the Green Bank and its projects?
2) Does the Green Bank's debt count towards the District's debt cap?
3) Does the Green Bank's debt violate the Home Rue Act's prohibition on "lending the public credit for support of any private undertaking

To minimize the complexity of creating a Green Bank and to give the institution the broadest latitude to operate, the Green Bank should be designed so that its bonds do not violate any of the constraints above. The Green Bank should be legally designed so that its debt is independent from the Districts, meaning it has no recourse to the District and not backed by the full faith and credit of the District. If there is no recourse to the District and the bonds are not issued on behalf of the District, the Green Bank's debt should not count against the District's debt cap. And prior precedent indicates that Green Bank-style lending would not be considered lending public credit for private undertaking.

The Energy Efficiency Financing Act of 2010 authorized the issuance of bonds to fund PACE loans, providing clean energy upgrades to buildings. The legislation defined the bonds as "special obligations of the District payable solely and only from the amounts deposited in the [PACES Bonds] Accounts. The bonds shall be without recourse to the District." Therefore, by definition, the project-specific bonds only had recourse to the projects and the PACE bonds accounts, not the District. The legislation further specified that "[f]or purposes of calculating the District's level of debt, the Special Assessments do not constitute revenues derived from taxes, fees, or other general revenues of the District." This further clarifies that, because the District is not pledging any future revenue, the bonds do not count against the debt limit. This language can be borrowed when creating the Green Bank to ensure that its debt is considered independent of the District's and does not have any recourse against the District.

Finally, the Act says:

> The bonds shall contain a legend, which shall provide that the bonds are special obligations of the District, are without recourse to the District, are not a pledge of, and do not involve, the faith and credit or taxing power of the District (other than the Special Assessment), do not constitute a debt of the District, and do not constitute lending of the public credit for private undertakings as prohibited in section 602(a)(2) of the Home Rule Act.

This language makes clear that PACE bonds, supported fully by project repayments, are not obligations of the District and do not violate the Home Rule Act. Similar text can be used to ensure Green Bank debt does not violate any of the three constraints identified above.

Source: D.C. Law 18-183; D.C. Code §§ 8–1778

Green Bank Funding Sources

Based on this outline of the methods for funding a Green Bank, the following section identifies specific sources of capital and bonding structures that a District Green Bank could draw upon. CGC recommends that the District consider any and all of these funding sources, particularly for the upfront capitalization. The best source of funds for the upfront capitalization is the one that is most accessible, with the least amount of restrictions placed on the use of the funds. It is also possible, and likely prudent, to try and draw from multiple funding sources. Nearly all domestic green banks are funded from multiple sources or streams of revenue. The District should similarly consider what combination of sources are most suitable. The options considered in this section are:

- Upfront initial capitalization or "grant"

    - District budget appropriation
    - Using CIF dollars from the Exelon merger settlement
    - A one-time draw from the District's reserve funds
    - Potential federal resources
    - Foundation grants
- Recurring revenue stream
    - Increasing the SETF and devoting the new revenue to the Green Bank
    - Committing the dollars in the REDF to the Green Bank
- Bond Issuance
    - General bonding authority
    - Project-specific bonds
    - Bond backed by revenue stream
    - PACE NCEF bonds
    - Industrial Revenue Bonds

This section addresses each of these sources in detail, organized in the categories of methods of funding.

Upfront Initial Capitalization

Listed here are several potential sources of funds the District could explore for upfront, initial capitalizations. They would provide a one-off infusion of capital into the Green Bank

District Budget Appropriation

The District could simply appropriate funding to the Green Bank through its annual General Fund budgeting process. This can often be challenging if there is a budget shortfall or when there are many competing interests vying for new funding. However, this would be the most direct method of funding. The District could allocate a portion of its capital projects budget to the Green Bank, as that would effectively be a way to route funds dedicated to infrastructure to a specific set of infrastructure projects. As the OCFO's White Paper on Infrastructure Banks wrote:

> If the District also sought to capitalize an infrastructure bank and then lend out that capital, it would not be raising any additional funding for infrastructure in the short term. It would, however, be changing the process and criteria for allocating infrastructure dollars. The District's current process for approving capital budgets (i.e., adoption by the Council and approval by the Mayor) would be substituted for the lending procedures adopted by the bank and its board.[33]

Therefore the District has imagined an infrastructure bank capitalized with this source of funds.

Merger Settlement Funds

On March 23, 2016, the District PSC formally approved the merger between Exelon and Pepco. The settlement agreement as part of the merger included the creation of a $72.8 million Customer Investment Fund ("CIF"). According to the final order of March 23, those funds are to be used as follows:

Table 5: Use & Size of Merger Customer Investment Fund[34]

Use of Funds	CIF Allocation (millions)
Customer Base Rate Credit, as a credit to offset rate increases for Pepco customers approved by the Commission, until the credit fund is used up	$25.60
One time direct bill credit	$14.00
MEDSIS Pilot Project Fund for grid modernization pilot projects	$21.55
Energy Efficiency and Energy Conversation Initiatives Fund for use with energy efficiency programs and projects targeted at affordable single-family and multi-family housing	$11.25
Forgive residential customer accounts receivables over 2 years old	~$0.40
Total	**$72.8**

The PSC has control and discretion over the precise use of funds within each of these categories. Both the grid modernization pilot project category and the efficiency for affordable and multi-family housing categories should be market needs that the Green Bank addresses in its financing activities. Therefore the Green Bank would be eligible, with PSC approval, to receive funding from these CIF categories.

The original settlement agreement submitted by the Joint Applicants to the PSC on October 6, 2015, specifically included a $10.05 million allocation from the CIF to the Green Building Fund (GBF).[xiv] The GBF is jointly managed by DOEE and the Department of Consumer and Regulatory Affairs (DCRA), and therefore is under the Mayor's control. Though the specific use of the funds was not identified in the submitted settlement agreement, DOEE did go on record during the proceedings to specify that the intended use of the $10.05 million was to capitalize a District Green Bank.[35]

PSC Order No. 18109 of February 2016, rejected and amended the settlement agreement of October 2015, eliminating this GBF allocation from the CIF. However, this removal of funding was not based on opposition to the concept of a Green Bank. Rather, the Order cited a history of the Mayor and District Council transferring dollars from funds dedicated for sustainability purposes into the general funds for the District. That led to the $10.05 million allocation for a Green Bank via the GBF being stripped out, and the allocation of all CIF funds was brought under the direction of the PSC, rather than the Mayor and Council.[36]

The final Order of March 23 specified that $21.55 million of the CIF be placed in an account to fund pilots to modernize the grid, and that $11.25 million of the CIF be placed in an account to "support innovative energy conservation or energy efficiency programs targeted primarily towards both affordable multifamily units and master metered multifamily buildings which include low and limited income residents that are sponsored or operated by the District or by qualified non-profit entities that support

[xiv] Joint Applicants includes the Office of People's Counsel, the District of Columbia Government, the District of Columbia Water and Sewer Authority, the National Consumer Law Center, National Housing Trust, the National Housing Trust-Enterprise Preservation Corporation and the Apartment and Office Building Association of Metropolitan Washington. *See* Motion of Joint Applicants to Reopen the Record in Formal Case No. 1119 to Allow for Consideration of Nonunanimous Full Settlement Agreement and Stipulation, or for Other Alternative Relief ("Motion to Reopen"), at 3, 4 and, and Exhibit A page 4.

and enable targeted energy-efficiency programs."[37] A District Green Bank would likely address both of these needs, and therefore still be able to receive CIF merger dollars under PSC oversight.

District Reserve Funds

Like many governments, the District maintains reserve funds or "rainy day funds" to protect the budget from major economic downturns or unforeseen events that might negatively impact the District's ability to collect revenue and cover its expenses. The District's "rainy day funds" are actually made up of multiple individual funds, which together hold over half a billion dollars.[xv]

At the end of FY 2015 on September 30, 2015, the Emergency Reserve Fund held $122.1 million and the Contingency Reserve Fund held $244.2 million.[38] These two funds were mandated by Congress as part of the Home Rule Act. By rule, the Emergency Reserve must equal 2% of general local expenditures minus debt services costs, and the Contingency Reserve Fund must equal 4%.[39]

The third fund is the Fiscal Stabilization Reserve was created by Council in 2010 to provide added fiscal protection. At full funding it must equal 2.34% of local expenditures minus debt service.[40] At the end of FY 2015, the fund contained $174.9 million.[41] In the case of all three funds, there are specific rules in place that govern the events and needs that can trigger a draw down from the funds, and matching rules to ensure that any shortfall in the fund as a result of a drawdown is filled with new funds. The Contingency Cash Reserve and Fiscal Stabilization Reserve "may be drawn down by the Mayor to provide for nonrecurring or unforeseen needs that arise during the fiscal year. They also may be used to cover unexpected revenue shortfalls." And the Emergency Cash Reserve "may only be drawn down to provide for unanticipated and nonrecurring extraordinary needs of an emergency nature."[42]

It would be difficult to argue that a Green Bank fits the within the allowed set of reasons to draw down from these funds. Therefore, allocating dollars from any of the reserve funds would require a specific legislative exception. This might be particularly challenging for the Emergency and Contingency Cash Reserve, as they are mandated by Congress.

But the Fiscal Stabilization Reserve is under District control. And, as of the end of FY 2014, the District Auditor found that the Fiscal Stabilization Reserve was overfunded by approximately $24 million.[43] The DOEE could specifically seek an exception to the Reserve Rules to draw on these funds to capitalize a Green Bank. And by only seeking excess funds above the required level, this draw would not trigger any new need to replenish the fund.

Not only is the funding concept plausible because of the excess funding, it is also attractive because it investment in the Green Bank could produce a higher return on investment. Unlike using the reserve funds to pay for other one-off expenses, putting these dollars into the Green Bank would be an alternative investment for the funds. In FY 2015, the Emergency Cash Reserve Fund earned $176,812 on an investment of $116 million. This represents annual return of 0.15%.[44] By investing a small portion of these funds in the Green Bank, the District would instead be supporting the local economy, reducing GHG emission and increasing their return on investment. Depending on the institution, Green Bank loans are often made at interest rates well above even 2%. Rather than considered a one-off draw down of the

[xv] This analysis only examines the Emergency, Contingency and Fiscal Stabilization Reserves. The Cash Flow Reserve is not addressed, as it is presently underfunded and not suitable for consideration. *See* District of Columbia General Credit Update March 10, 2016.

Fiscal Stabilization Fund, an allocation of the $20+ million of the surplus into the Green Bank would constitute a wise and socially-conscious investment by the District.

Federal Resources

The federal government offers several financing and grant programs that could support local Green Bank activity. The most promising potential path for funding a District Green Bank is the U.S. Department of Energy's Loan Program Office (LPO). The LPO is designed to give large (~tens of millions of dollars) loans and loan guarantees. It is also specifically designed to direct loans to "projects" (rather than programs) and those projects must be "technically innovative."

In August of 2015, LPO offered guidance that "LPO is supplementing the Solicitation to make clear that state-affiliated financial entities, including state Green Banks, may submit applications for Eligible Projects, including Distributed Energy Projects" and "state and state-affiliated entities may participate in Distributed Energy Projects as lenders or co-lenders, equity providers, or off-takers."

Historically, a project has been interpreted to mean a large, individual installation. But with this broader definition of project, a whole world of possible structures has opened up. A Green Bank may submit an application to the LPO to help fund a portfolio of multiple underlying installations, each of which is technically and financially similar so as to be considered part of a single portfolio. A suitable application of this structure for the District would be to finance multiple District-based micro-grids through an LPO loan or loan guarantee. Each micro-grid in the portfolio would consist of onsite generation, storage and islanding capabilities, with technology, financing structure, EPC contractors and off-take agreements structured similarly for each installation. The LPO has indicated that this kind of structure, especially with micro-grids installed at critical facilities like water-treatment plants and hospitals, would be eligible.

The LPO uses a two-step application process that would likely take 6 to 18 months to complete. LPO still has significant funds available ($4.5 Billion for REEE, $3 billion in loan guarantees), and the recent LPO guidance also included an announcement that $1 billion would specifically be dedicated to distributed projects. The LPO could be an attractive route for the District Green Bank to finance innovative projects through a unique and ground-breaking federal-local structure that also uses a public-private partnership.

Also, as a longer-term solution, legislative leaders are preparing to re-introduce federal Green Bank legislation. Bills have been introduced in 2009 and 2014, with the 2009 bill receiving broad bi-partisan support and passing the House of Representatives. The bill is likely to be re-introduced in 2016 and/or 2017, with a focus on supporting state/local Green Banks. In fact, new legislation is likely to establish a federal Green Bank to act solely as a pass through funding mechanism for state and local Green Banks, rather than to provide direct project financing. So a District Green Bank would be perfectly positioned to receive capital from the federal Green Bank, should legislation pass.

Foundation Grants

The District could also seek out Foundations that would be interested in supporting the Green Bank financially. Foundations could provide a grant directly to the Green Bank, which would be used for lending and any other Green Bank Activity. This would be equivalent to public capitalization, especially because neither capital source carries a cost of capital. Alternatively, a Foundation could make a program-related investment (PRI), where it seeks to earn a nominal return (e.g. 2%). That PRI could be made to the general balance sheet of the Green Bank, where it was up to the Bank to invest the capital and earn the return required. Or the PRI could be for a designated project or market segment. For instance, a Foundation

could make a PRI to fund a loan loss reserve to support Green Bank or private loans to upgrade homes for low-income households.

Recurring Revenue Stream

The District could tap into existing recurring revenue streams or create new ones. The proceeds from the revenue streams, like taxes or system benefit charges, would then be pledge to the Green Bank to continuously increase the capital base for the Green Bank.

Increase the Strategic Energy Investment Fund

The SETF, a system benefit charge that creates a regular flow of revenue for the District, would be an excellent funding source for the Green Bank. Other Green Banks have been funded with ratepayer surcharges similar to the SETF. Presently the SETF collects $20 million per year and is used to fund the SEU. This present level of collection is, on a per capita and per kWh basis, moderate-to-low compared to other states.[45]

Table 6: Comparison of State EE Program Funding Levels

State	2014 Electric Efficiency Program Spending (M)	% of Statewide Electricity Revenue	Rank (out of 54 states & territories)
US Median	*$50.5*	*1.09%*	*NA*
DC	**$13.5**	**0.99%**	**30th**
MD	$319.3	4.27%	4th
DE	$1.9	0.15%	46th
NJ	$201.5	1.96%	13th
NY	$314.0	1.33%	23rd
CT	$180.6	3.62%	7th
MA	$503.8	6.14%	2nd
RI	$81.1	6.81%	1st

The District could increase the overall amount of money collected by the SETF, and dedicate a portion of it for Green Bank funding. For example, the amount of annual revenue could increase from $20 to $40 million, with the additional $20 million put into the Green Bank. This funding stream could be indefinite (as it is presently, with new funds going to the SEU every year), or the increase can be temporary, with the collection falling back to $20 million in total after the Green Bank is funded for a set number of years. Alternatively, the SETF collection could increase by a smaller amount, like $5-$10 million per year, with the expectation that the stream of funds for the Green Bank would be indefinite. This structure would provide the Green Bank maximum flexibility in its operating model, with a perpetually increasing balance sheet to address the multi-billion dollar funding need.

Redirect a portion or all of the Renewable Energy Development Fund

The REDF is a small pot of funds that are used to collect utility ACP payments in the event of non-compliance with the RPS. ACP dollars are collected from electricity suppliers who fail to obtain the required amount of renewable energy credits, as stipulated by the RPS. In 2015, these payments amounted to $19,910,000.[46] This is the highest annual payment into the REDF, with prior years' payments ranging from $4,900 to $6,308,710. Historically these dollars have been used to fund the Solar Advantage

Plus program. Given the relatively low and unpredictable level of dollars in the REDF, the Green Bank likely would not be able to heavily rely on these dollars for major lending activity. However, the REDF could be a helpful supplement to cover operating expenses, particularly during start-up phase of the Green Bank.

Bond Issuance

In addition to directly appropriating funds to the Green Bank to be used as lending and operating capital, a Green Bank could supplement and expand its capital base by issuing bonds. With the ability to issue bonds, the Green Bank could more efficiently recycle its capital, draw in new private investors, and expand its ability to address market needs.

General Institutional Bonding Authority

If the Green Bank were created as a quasi-public instrumentality of the District, the Bank could be given its own, independent bonding authority. Legislation could be written so that the Green Bank's bonds have no recourse to the District, do not come with the District's full faith and credit, and would not impact the District's debt limit. (This is an advantage to the quasi-public structure, as this kind of independent bonding authority would be harder to implement through the internal, contracted structured.) If the District so chose, the Green Bank could also be provided limited reserve from the District to sit behind and strengthen a bond issuance. The Connecticut Green Bank, for instance, has its own bonding authority that is not backed by the state, however it was granted up to $50 million of bonding authority supported by the state's Special Capital Reserve Funds.

Tactically, bonding authority is critical for a number of reasons. If the Green Bank is able to lend out all of its initial capital, it will no longer have cash to continue lending. If the Green Bank can issue bonds, it would be able to sell those loans to private investors, and recapitalize its balance sheet to continue making more loans. The sale could be done through a private placement or a public securitization. Through either structure, the Green Bank is able to increase the rate of lending because of its bonding capacity. If the Green Bank has a sufficient balance sheet and equity reserve, it could also issue revenue bonds where recourse isn't limited to a specific set of projects. This would allow the Green Bank to expand its overall lending capacity in a fashion similar to that used by traditional development finance authorities. Under either bonding structure, the bonds could be labelled as "green bonds" potentially giving the Green Bank a slight pricing advantage in the market. (As all Green Bank activity is necessarily focused on clean energy activity, there would be no question that the use of the bond proceeds would allow the issuance to qualify as a green bond.)

Project Specific Bonds

The Green Bank could issue revenue bonds that are solely repaid by the repayments of loans to specific projects financed by the Green Bank. This would allow the Bank to sell loans off the balance sheet, replaced it with cash, and make more loans. The bonds would have no recourse to the District and would not count toward the District debt cap. These kinds of bonds are akin to the PACE bonds that are repaid exclusively by the Special Energy Assessments collected by the District as loan repayment. This kind of project-specific bond is viable for the Green Bank, because the Green Bank typically only invests in projects that can pay for itself through savings, assuring a strong repayment stream.

Bond Backed by Revenue Stream

Under certain constructs, it might be viable for the Green Bank to issue bonds that repaid exclusively by a revenue stream dedicated to the bank. Ordinarily, this kind of bond would be supported by a dedicated tax stream, collected by the government. However, that kind of construct would count toward the District

debt cap, because repayment relies on the District's ability to collect the tax.[47] The Green Bank should try to avoid any negative impact on the District's debt capacity. So rather than exploring a tax-based revenue stream, the Green Bank could bond against a utility surcharge-based revenue stream. Specifically, if the Green Bank is capitalized with an on-going stream of revenue from the SETF, the Green Bank could bond against that stream. That would allow the Green Bank to realize upfront the cash that it would take years to accumulate through the stream of SETF collections. The Green Bank could issue a bond to get the cash upfront, giving it greater flexibility and potential impact, with the bonds repaid through the SETF collected over time. This is the construct used in Hawaii to capitalize the Green Infrastructure Authority's GEMS program (discussed in a prior chapter). The Green Infrastructure Fee collected on all ratepayer bills was pledged to support the bond issuance, allowing the state to raise $150 million upfront to finance projects.

PACE NCEF Bonds

As described in the earlier section on the current status of DC PACE, the program was originally established under the Energy Efficiency Financing Act of 2010 with a construct of direct public lending to projects. The government would then sell those loans to private investors through a bond issuance, thus recapitalizing the NCEF which made the loans. This construct has never been utilized, and a Green Bank could be the ideal institutional framework to take advantage of the NCEF bonding tool.

It has been 6 years since the legislation was passed to create a PACE program, yet only 3 deals have been closed with $1.28 million in financing. There is broad evidence that commercial PACE works and is an effective tool for financing energy upgrades for a certain class and size of commercial buildings. The CT Green Bank, which has financed over $100 million in commercial PACE in 3 years has done so by using public capital to make the project loans. Capital is available on demand for borrowers, interest rates and terms are known, and there is a high level of certainty for applicants that they can get their deal financed. The Green Bank then aggregates those loans in a portfolio and sells them through bonds. This is effectively the same financial design that was envisioned years earlier in DC through the NCEF bonding structure.

This system relies on an initial capitalization from the District directly into the NCEF (as envisioned by statute). That capital could be used to make initial loans that build into a portfolio. The Green Bank (or the District) could issue bonds and recapitalize the NECF to recycle and re-lend the initial capitalization. And this structure need not compete with private lenders who want to make PACE loans directly, as has been done in the three deals completed to date. Just like in Connecticut, borrowers are not required to take the Green Bank loan. Based on strong evidence from other markets that this structure works, and the slow-growing market in the District, this structure could jump-start PACE in the District.

Industrial Revenue Bonds

The Green Bank could be authorized, likely through legislation, to use the District's Industrial Revenue Bond program to finance energy upgrades for commercial and non-profit buildings. The program provides access to tax-exempt financing, which can secure interest rates for borrowers up to 4% cheaper than other commercial loans. Any non-profit or manufacturer located in the District is eligible, and other commercial building may also be eligible. This could be an easy way for Green Banks to begin channeling private capital, at low cost, to projects in the District using an existing and well-practiced finance tool.[48]

Standing up the Green Bank

Once the District has identified the legal structure and funding methods and sources for the Green Bank, it must then create and stand up the organization. Much like starting-up a new business, the Green Bank

will need an operating plan that includes hiring staff, managing expenses, and establishing objectives and priorities. This section outlines some of the key steps the District government must take to create and operationalize the Green Bank.

Legal Formation & Capitalization

The first step the District must take are the legal actions required to create, authorize and fund the Green Bank. Creating the legal entity, assuming it is a quasi-public, will require legislation. The legislation should address the follow topic areas:

- Organization Placement & Structure – this section would define the legal nature of the Green Bank (in this case, a quasi-public instrumentality that is wholly-owned by the District).

- Organization Governance – this would address the exact Board composition of the Green Bank, how Directors are appointed, how long their terms are and if there are any required committees. This could also enumerate the specific responsibilities of the Board.

- Capitalization – this section would identify the exact source and amount of capital that would be given to the Green Bank.

- Bond Authority – this section would outline the process bonding powers (and limits) the Green Bank has. This section could specifically address how the Green Bank will comply with the Home Rule Act and Anti-Deficiency Act.

- Types of Investment – this section would enumerate the specific financing powers and authorities that the Green Bank has. The legislation could explicitly ease different financing mechanisms, or it could give a broad authority to use public capital to drive private investment in clean energy. (It is often wise to explicitly state that the Green Bank is authorized to co-invest in projects with the private sector.)

- Eligible Technologies & Projects – this section would define what technologies are eligible for Green Bank financing, and what constitutes an eligible project that can receive funds. For instance, the District may decide that EV charging stations are eligible for Green Bank financing, but not EV's themselves.

- Related Mechanisms & Powers – this section may also explicitly define the Green Bank's relationship to DC PACE and the SEU. It may also give the Green Bank a role or authority to create an on-bill financing program.

Legislation that covers these basic topic areas will ensure the Green Bank is well defined and will minimize the potential need to return in following sessions to amend the statute.

Depending on the source of funds used to capitalize the Green Bank, it may also be necessary for the District to pursue regulatory action. For instance, an increase in the level of ratepayer funds collected y through the SETF would likely require regulator action by the DC PSC, in addition to legislation. And if the Green Bank were to receive funding from the Exelon-Pepco merger settlement funds, regulatory approval from the PSC would almost certainly be required. Those funds appear to be under the exclusive

jurisdiction of the regulator, meaning that legislation passed by Council would likely not cause the PSC allocate these funds to the Green Bank.

Green Bank Operations

Green Banks are meant to be fiscally-sustainable, purpose-built entities of government focused on clean energy finance. As such, the organization must be staffed with a specific set of skill sets and experience, and needs to be financially managed to cover its costs. A Green Bank will likely go through multiple phases of development, resembling a start-up organization at first, and adding staff and functionality over time. Also, a Green Bank, like any other start-up, will likely incur greater expenses than revenue when first founded. Green Bank operation, staffing and fiscal management are tied to the funding level and loan volume. Little upfront capital restricts hiring. Longer loan terms means it takes longer for the Green Bank to be repaid, lowering the amount of cash available for operating expenses. The more quickly the Green Bank can sell its loans, the more cash is available on a regular basis to pay staff. The following sections explore these topics in greater detail.

Self-Sustainability

Recommendations:

- Dedicate a pool of funds for startup costs and staff salaries
- Expect high costs and lost returns for the first few years of operations
- Create lending terms that factor in some expected losses
- Balance market development activities, which do not directly produce returns, with return-producing financing activities
- Create goals and performance metrics that encourage the Green Bank to achieve a level of operations and return-generating financing that allows the organization to break-even

Funding a Green Bank is different from funding other typical government programs because Green Banks can ultimately pay most, if not all, of their own operating expenses. A typical clean energy program organization like SEU must receive annual infusions of cash, in perpetuity, to cover both operating expenses and program expenses. A Green Bank does not require this form of funding because it offers financing, which can generate returns that cover operating expenses.

A Green Bank can reach a point of fiscal self-sustainability over time. At creation, the Green Bank does not yet have loan volume to create return and cover operating expenses. Therefore at the start, a Green Bank needs a dedicated pool of funds to hire staff and cover other upfront costs. For example, when the NYGB was created, the NY PSC specifically ordered that $13.3 million of the $165.6 million of initial public capitalization could be used for start-up operating expenses.[49] Over time, as loan volume increases, the NYGB can generate more returns, reducing the need for this kind of set aside of public funds. But it demonstrates how a Green Bank, at its founding, needs to identify either an upfront source of funds or an on-going stream of funds that can support start-up costs in the Green Bank's infancy.

Any returns will be off-set by losses experienced on Green Bank loans and financing. Losses are to be expected, like in any financing activity, which means rates and terms offered must account for those expected losses. Across nearly 1,500 loans, the Connecticut Green Bank has experienced zero defaults, and six late payments.[50] This low rate of loss means a Green Bank can recover operating expenses through its financing activity, while still offering rates that enable market growth.

Market development programs like Solarize do not directly generate returns, though they may improve market conditions and increase loan volume. If the Green Bank takes on multiple market development programs that do not directly generate a return, the Bank will have higher operating expenses and will draw down its capital. Returns from other financing programs may be able to cover the costs of the lending programs and some of the costs of other market development programs. However, if a significant number of market development activities are pursued, Green Bank managers will need to cover those costs with the public capitalization funds. (This is why having an on-going annual revenue stream is extremely beneficial for market development purposes.)

No matter the funding source, the Green Bank should aim to be a break-even operation in the long-run. It should cover its operating expenses through repayment of loans with interest rates. As a start-up operation, significant upfront investment is typically needed to hire staff, and program development and roll-out will not occur on day 1 of operation. Therefore it may take some period of time for the Green Bank to reach sustainability. This will ultimately depend on the volume and velocity of lending, how long it takes the Bank to be fully repaid on its loans, and the Bank's ability to sell loans off of its balance to get new capital for lending.

Staffing

Recommendations:

- Hire people into vital roles first: CEO, CIO, legal
- Outsource vital administrative responsibilities: accounting, communications, human resources
- Stagger additional hiring according to growth of Green Bank

A Green Bank is ultimately defined by its executives and staff. The people that make up the Green Bank define its culture, interpretation of Green Bank purpose, and form(s) of market engagement. Therefore staffing models and hiring criteria must be considered from the outset. Filling the Green Bank CEO position with an experienced commercial banker with deep finance experience versus a clean energy market expert familiar with the barriers to growth can produce vastly different institutions.

The NYGB Business Development Report, which was the basis of the NYGB creation, pointed to four general capability sets needed by a Green Bank: energy capabilities, finance capabilities, business development capabilities, and operational capabilities.[51] Some of these capabilities can be developed over time, and some can be borrowed or out-sourced.

The legal structure of a Green Bank and its relationship to the District government impacts staffing decisions. Below is a table that outlines several potential structures of a Green Bank, and how hiring decisions can be made in each case.

Table 7: Green Bank Staffing Plan By Entity Structure

Role	Restructuring Existing Organization (e.g. CCEF)	New Structure withinin Existing Organization (e.g. NYSERDA)	Entirely New Structure (e.g. Montgomery County)	In House or Out Source
CEO	Immediate	Immediate	Immediate	In House
Operations	Immediate	Immediate	Year Two	In House
Legal	Immediate	Year Two	Immediate	In House
CIO	Immediate	Immediate	Immediate	In House
Finance Manager	Year Two	Year Two	Year Two	In House
Human Resources	Immediate	Immediate	Immediate	Out Source
Accounting	Immediate (In House)	Immediate (Out Source)	Immediate (Out Source)	Variable
Marketing	Year Two	Immediate	Year Two	In House
Communications	Year Two	Immediate	Immediate	Out Source
Business Development	Year Two	Immediate	Year Two	In House
Receptionist	Immediate	Year Two	Year Two	In House

For an entirely new Green Bank, the positions and functions necessary for the first year of Green Bank operation are chief executive officer (or president), chief investment officer, legal, accounting, communications, and human resources. This requires a staff of at least six. The roles of communications, accounting, and human resources could be outsourced or shared with other organizations, at least for start-up phase of the Green Bank. The Green Bank can look to other, related government entities to manage certain back-office functions. For instance, DOEE could manage some of those functions on behalf of the Green Bank.

The chief executive officer provides the leadership and vision for the organization, manages the operation of the organization, and makes strategic decisions about where to allocate capital across the Green Bank's activities. The chief investment officer provides the financial expertise necessary to build the financial products, allocate capital across products, interface with private capital providers, and build partnerships with external organizations. Legal counsel ensures compliance with bylaws, adherence to District and federal law, authors and checks term sheets and contracts, and structures specific terms of Green Bank partnerships.

Other supporting functions are necessary but may be less integral to day-to-day strategic decision-making of the Green Bank. It may be more cost-effective for the Green Bank to utilize services from other parts of government, rather than establish new back-office functionality within the Green Bank. For instance, the Green Bank could take advantage of the existing accounting, human resources or information technology staff within the DOEE or other arms of the District government. It will also be necessary for the Green Bank to have communications staff, which could be within the Green Bank or outsourced at the outset, depending on the needs of the organization. A communications employee manages activities related to market development and consumer awareness. This includes partnership development, customer education, website creation, public document creation, branding, logos, and general marketing. As the Green Bank grows, some or all of these functions may be brought internal to the Green Bank, as organizational economies of scale can be realized.

Depending on the initial capitalization, the Green Bank may add additional supporting roles from the outset. This includes other finance and business development staff to support product design and demand generation. Ultimately the exact staffing model and level is highly dependent on the amount of capital available to the Green Bank, and the degree to which the Green Bank is fiscally self-sufficient.

Overhead

Recommendations:

- Provide a dedicated pool of dollars for the Green Bank's fixed costs
- Plan on spending at least $800,000 for the Green Bank's operational costs in the first year
- Depending on initial hires (which in turn depends on initial capitalization), annual operation expenditure could rise to $2 million in the second year of Green Bank operations

Green Banks play a unique role in the markets in which they operate—they have a public purpose but they are revenue-oriented market actors—and they have characteristics of both public and private institutions. There are relatively few existing Green Banks, and most of them are less than 5 years old. As a result of the unique role and dearth of data on salaries and other costs, projecting the costs associated with the operations of a Green Bank is somewhat difficult.

There are several main components of a Green Bank's overhead in the first few years: staff salaries, professional fees (for outsourced work), marketing costs, rent/utilities/maintenance, insurance, telephone/communications, IT operations, office supplies, and travel expenses. Below is an illustration of possible expenses of a District Green Bank might see in its first year of operations. These estimates are based on Connecticut Green Bank data and the probable size of a District Green Bank. Importantly, these estimates for year 1 expenses are based on the staffing requirements of a minimum viable Green Bank.[xvi]

Table 8: Green Bank Cost Estimates for Year 1 of Operations

Expense	Budget
CEO – Salary	$130,000
CIO – Salary	$140,000
Legal – Salary	$110,000
Marketing	$185,000
Consulting fees	$30,000
Professional fees	$35,000
Rent/Utilities/Maintenance	$26,000
Telephone/Communications	$8,000
Depreciation FF&E	-
Office expense	$6,000
IT Operations	$10,000
Training/education/subscriptions	$5,000
Travel/meetings	$2,000
Insurance	$40,000
Accountant services	$25,000
Web services	$50,000
TOTAL	**$802,000**

Green Bank operational costs are fixed, for the most part. In other words, a district Green Bank will require approximately $800,000 to run the bank in the first year, regardless of how much financing activity the Green Bank produces. If the Green Bank receives an initial capitalization of $40 million with annual

[xvi] Estimates of Green Bank costs are based on the Connecticut Green Bank's financial information.

payments of $10 million for the next six years, as is recommended, it may be prudent to hire additional staff earlier in the start-up phase of the Green Bank. Hiring a Finance Manager, Operations Manager, Marketing Manager, Business Development Manager, Receptionist, and an in-house Communications Manager would speed up the Green Bank's path to a fully operational status. Doing so, however, would likely increase the Green Bank's annual operational expenditures to $1.5 or $2 million.

It is conceivable that non-salary operational costs will be slightly higher in year 1 than years 2 and 3, as a result of one-time start-up costs such as office supplies and website design. Some of these costs could be defrayed to the extent that Green Bank is able to leverage the DOEE's existing resources and capabilities.

Business Plan

Creating a business plan should be one of the first tasks the Board and executives should accomplish after the creation and staffing of the Green Bank. A business plan, is second in importance only to the legislation that creates the Green Bank and its organizing documents. The purpose of a business plan, or comprehensive plan, is to guide the operations of the Green Bank and provide a framework for decision-making for the organization's leaders. The business plan also provides and important reference for Board members, Green Bank partners, and outside stakeholders about the scope of activities in which the Green Bank will engage, and its manner of engagement.

A Green Bank's business plan should map out many of the details of the Green Bank's mission and goals, product strategies, positioning, capital and pricing strategies, risk management approach, performance metrics, organization, resource requirements, and implementation plans. The Connecticut Green Bank publishes a new "Comprehensive Plan" every two years, and the New York Green Bank updates its Business Plan on annual basis.[52] The CGB and NYGB's business plans provide excellent models for Board members and executives of future Green Banks that wish to compose a business plan.

Green Bank Activities

Once the Green Bank is established and operational, it has to make strategic decisions about what markets to focus on, what financing support to offer, and how to build the markets to generate demand. This section addresses each of those issues, and outlines strategies the District Green Bank could consider to prioritize activities for early success.

Target Market Segments for the District's Green Bank

CGC recommends the Green Bank primarily focus its activities on distributed generation solar PV and building efficiency. The District's distributed solar and building efficiency markets together represent over $3 billion in investment need. Solutions should be developed for both the residential and commercial sector. Distributed solar solutions should include both roof-top and community-solar projects. In the residential space, the Green Bank should serve both homeowners and renters. It is also crucial that the Green Bank support low-to-moderate income households, whether they own or rent their homes.

In addition, the secondary focus of a District Green Bank should be medium-scale renewable projects with less common technologies like anaerobic digesters, micro-grid projects, and fuel cells that provide on-site generation and feed into the grid. This category can also include community-solar, a market where financing and deployment structures have not yet become standardized.

Distributed energy projects tend to have the greatest difficulty finding reasonably priced private capital. The relatively small and dispersed nature of building upgrades and small renewable energy installations

makes underwriting expensive for private lenders. Small projects that can be standardized and bundled are appealing and financeable. But projects that vary from site to site and have varying credits, like residential energy efficiency, tend to have the most underserved markets. Green Banks can play a key role stimulating investments in these projects and creating more robust markets.

There are a few distributed clean energy markets in the District that have access to reasonably priced private capital without public support. Homeowners with high-credit scores and well-directed roofs can get financing for roof-top solar through a third-party installer like SolarCity. And large industrial companies with high credit-ratings from major rating agencies can finance a building upgrade through an energy service company (ESCO). Accomplishing these projects alone will not allow the District to meet its ambitious energy goals.

Yet only a small minority of energy customers and buildings in the District meet the criteria to access the private capital that is currently available. Nearly all distributed energy markets across technologies and sectors still struggle to connect supply of capital and demand for that capital. A Green Bank can expand the number of building-owners that can finance clean energy projects.

Figure 19: Other Green Infrastructure Markets

In addition to clean energy, a District Green Bank could also invest in non-energy related green infrastructure, like stormwater and water. This is up to the discretion of policymakers, who can ultimately choose to have a Green Bank finance whatever kinds of projects are necessary in the District. Certain kinds of green infrastructure are underinvested in, just like clean energy. There are important structural differences between clean energy investing and other kinds of green infrastructure investing that is important to be aware of. These differences don't preclude non-energy investments, but can inform how an organization would need to be structured and marketed to the public.

Part of the value proposition of Green Bank investments in clean energy is that the technologies are low-risk and are naturally cash flow positive. If financing is structured correctly, an efficiency or renewable project will naturally save more money than is owed on the loan. This cash flow positive nature is not only appealing to the borrower, it also greatly decreases the risk of the loan, because no external funding sources or collection mechanism are needed to give borrowers a clear and easy path toward repayment. (A mortgage, for example, does not share this quality. A mortgage lender must rely on a source of funds external to the loan, like income from employment, to ensure the borrower has enough money to pay back the loan.) The fact that clean energy loans pay for themselves makes Green Banks fairly low-risk investment structures for government.

This condition is not always true with other forms of green infrastructure investment. Some loans to install technology to reduce water consumption may have this same benefit, where the loan allows the borrower to accrue savings on water bills that exceed the loan payment. But many other forms of green infrastructure projects may not have this quality. This means that loan repayment requires the reliance on another funding source to be able to pay back the loan. And repayment also often involves an external enforcement mechanism created through law or regulation that forces repayment collection. Or repayment of a loan may rely on usage, like a road toll, for instance.

There is a natural marriage between clean energy investment and other green investment. The District should think about sustainable investment in a holistic fashion. But if it is to combine energy and non-energy related investment in a single institution, it will have to carefully consider how that will impact the organization structure, the capitalization structure and the financing activities of the Green Bank.

Financing Strategies for District's Green Bank

CGC recommends that the District Green Bank employ the following operating and financing strategies in order to effectively serve the target markets:

- Create standard-offer products for contractors to minimize origination and underwriting burdens
- Create diverse portfolio of products to serve different segments and sectors of the market
- Use small-scale pilot projects to try out innovative financing structures
- Build product portfolio slowly, focus on a few at the beginning, collect data, learn from activity
- Build products that serve underserved segments of the market, including segments that have limited access to capital

Products Designed for Early Success

Limited resources and a need for high-profile "wins" early in the life of the Green Bank constrain the number of products that can be offered at the outset. Yet resource limitations and the need for product diversity must be balanced. Starting with two or three products targeting different segments and sectors, with at least one of the products targeting "low-hanging fruit" is necessary for the Green Bank to build up a balance sheet and earn cache among other market actors. Collecting data on every project and every product from the outset will provide a good basis for the Green Bank to learn from its own activities and develop new products accordingly.

Standard-offer products

In distributed energy markets, the primary sales force for clean energy technology and the associated financing are contractors. For contractors to use and offer financing, it must be simple to understand, and it cannot complicate their sales process. Standard-offer products allow contractors to originate multiple deals that meet pre-set criteria, allowing the Green Bank to use contractors to build its deal pipeline and avoid using its own limited resources. Standard-offer products have fewer transaction and administration costs. Standard-offer products also allow private capital providers to understand and agree to uniform underwriting criteria that meet their own internal standards. Capital providers are more likely to provide capital at scale to fund portfolios of projects when they are secure in the knowledge that a portfolio of projects funded by the Green Bank will all meet a given set of uniform underwriting criteria. This kind of consistency is what enabled the CT Green Bank to sell its portfolio of Commercial PACE loans, which were all underwritten using the same criteria.

Portfolio Diversity

Diversity in the product offering is important. Any given product has many factors that could contribute to high or low uptake. If unforeseen factors or circumstances result in low uptake in one product, it is good to have other products with high uptake. This would ensure a steady flow of revenue from loan payments, good press, and continued authority in the market.

Product Pilots

Pilots are a good way to increase diversity and test out successful financing strategies. Pilot projects are a good means of avoiding committing resources to products that do not perform well in the market. Pilots allow the Green Bank to try out a new or unique financing product in the District context. A pilot can give the Green Bank useful information about what works in the market without overcommitting resources or taking on too much risk.

The Connecticut Green Bank (CGB), for example, has deployed a pilot product for financing solar and efficiency upgrades in low and moderate income households using alternative underwriting criteria instead of a FICO score.[xvii] (To qualify for the product, a customer's credit quality is measured by utility-bill repayment history, as that is a better corollary to whether or not an energy loan will be repaid.) The success of this pilot will give the CGB important market data on demand, the efficacy of alternative underwriting criteria, default rates, and the size of the underserved segment.

Another CGB pilot was created to provide forgivable pre-development loans for energy upgrades in multifamily properties to help get projects off the ground. Financing clean energy projects in multifamily buildings is notoriously complicated, and with this pilot, the CGB will be able to test out an innovative solution to solving the puzzle of multifamily. The data and lessons provided by these pilots will help the CGB decide which products should be further development, how, and what level of resources they need to maximize their efficacy.

Initial Product Offerings

It is important for the Green Bank to have some early successes. Therefore it will be prudent for the Green Bank to initially roll out a product where demand and uptake is more easily assured. Certain markets can be much harder to penetrate, like low-to-moderate income households. Products serving these markets have a better chance of success if they are offered after the Green Bank has moved beyond its 'startup' phase and into its 'operational' phase.

Experience and data, a stronger balance sheet, a portfolio loans, a diverse product offering, steady sources of capital, and a good reputation can improve the chances of success for risky or non-traditional financing products. To illustrate this point, the Connecticut Green Bank first offered a residential solar lease product (at a time when none was available in CT) and a whole-home upgrade loan product. It did not offer its first financing product for the low to moderate income community until its fourth year of operation. Connecticut's low-income product uses an innovative, alternative underwriting criteria that considers homeowner utility bill payment history, not FICO score. It may have been more difficult for Connecticut to offer such a non-traditional product if it didn't already have such a strong track record, dependable sources of capital, strong relationships with various partners, and a reputation for excellence.

Financing Products for District Green Bank

Based on the Financing strategies referenced above, we recommend that the District's Green Bank consider establishing the following products:

- Enhance commercial PACE with public capital for financing and more administrative support
- Develop a flexible whole-home residential EE and solar upgrade product
- Implement on-bill financing to address low-to-moderate income and split-incentive for renters
- Develop a whole-home upgrade solution for low-to-moderate income homeowners
- Support community solar development with financing and roof-top aggregation
- Purchase residential solar RECs with upfront purchase and sell to utilities
- Launch residential PACE once there is federal regulatory clarity

[xvii] This product is offered in partnership with PosiGen.

Commercial PACE Financing

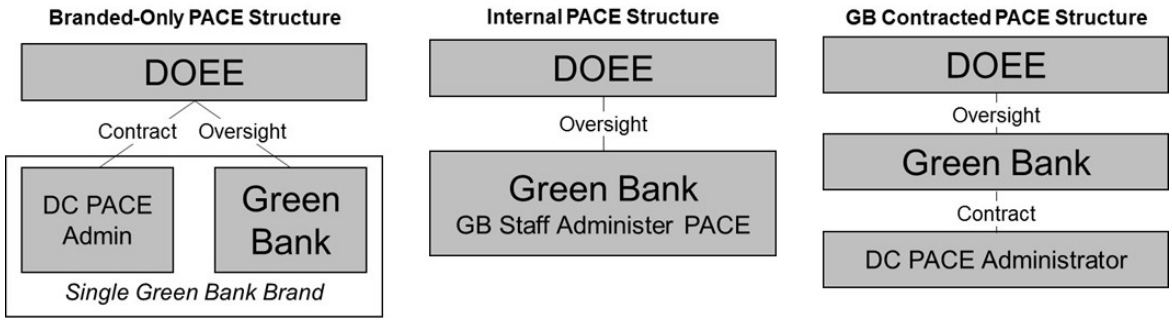
Green Bank & DC PACE

As stated previously, it is critical that the DOEE maintain a streamlined operating model and consistency across its clean energy programs. Presently, DC PACE, the only clean energy financing product currently offered by the District, is administered by a private third party, UI, under contract with the DOEE. If a Green Bank is created, no matter the precise structure, there is a potential for market confusion. DC PACE would become a standalone product offering administered by one organization, while the Green Bank is a whole financing entity that providers all other finance products *other than* PACE.

Therefore the creation of a Green Bank will require careful consideration of how the Green Bank and DC PACE will relate to one another, both structurally and financially. This section outlines several options and recommendations for that relationship.

Structural Options

Figure 20: Green Bank and PACE Program Structure Options



Internal

The DOEE could choose to fully integrate DC PACE administration into the Green Bank organization. DC PACE would be administered directly by Green Bank employees. This would ensure the greatest amount of coordination and alignment between PACE and the rest of the Green Bank's activities. The Connecticut Green Bank is a good model for this structure. All aspects of PACE – marketing, deal origination, underwriting, lending, lien administration – are executed by Green Bank staff. This structure has led to the most successful commercial PACE program structure in the nation, but it an also be expensive. Success has come partly because, due to the inherent complexity of PACE, the Green Bank has had full program control. The Green Bank has been able to tweak aspects of the program as necessary, train contractors, adjust financing terms and deploy internal resources in response to market needs. The Green Bank has invested heavily in this program, and is now the national leader in commercial PACE.

Contracted

The DOEE could continue to have PACE administered by a third-party contractor as it is today, but have the contract executed between the third-party and the Green Bank, rather than the DOEE. If the contract structure remained as it is today, coordination between the Green Bank and DC PACE would require the DOEE to act as a go between. If the contractor with the PACE administrator was directly managed by the Green Bank, the PACE would be structurally directly under the Green Bank umbrella, but still rely on the external expertise that currently manages the program. One of the benefits of this structure is that, from the market perspective, PACE would be a product *of* the Green Bank, rather than an alternative to that Green Bank. But it would achieve this market simplicity without losing the market know-how and talent

held in the current PACE administrator, UI. This would most closely resemble the PACE structure used by the RIIB, which is responsible for the PACE program, but has contracted administration to a private entity.

Branded-Only

If the DOEE does not want to adjust the current administrative structure of PACE in order to create more internal coordination between DC PACE and a new Green Bank, the DOEE could continue to directly administer a contract with an external party. However, it will still be critical that from the market's perspective the PACE program is viewed as a part of the Green Bank, not an alternative to it. As described in earlier in the Report, PACE is a type of financing mechanism, and is one of many kinds of financing products that can be offered by a Green Bank institution. As such, it will be confusing to the market if there is a new institution purpose-built to offer clean energy financing products, while a single, one-off product remains entirely separate and apart from that new institution. As such, even if PACE is separating administered, DOEE should provide uniform branding, a single website, and fully integrated marketing for the Green Bank and PACE. For instance, the Green Bank website should provide info on a number of programs, including PACE. PACE branding, logos and descriptions should be consistent with that of the Green Bank, so that market participants understand that PACE is part of the DC Green Bank, even if it is not technically administered by the Green Bank.

Financial Relationship

Presently, there is effectively no direct financial support from the DC government to the PACE program. All PACE loans depend on the District's ability to issue special assessment revenue notes tied to each project and purchased by the PACE lender. But this is more of a legal mechanism, not direct financing. There is no public capital provided to support program administration, to directly lend to PACE projects, or to mitigate risk for PACE lenders. With the creation of a Green Bank, the District could consider new forms of financial support for PACE to boost market adoption and attract more private investment.

Operating Capital

The District could boost the reach and capability of the DC PACE administration by directly funding its operations. District funds could pay for more marketing, which includes advertising across multiple media, deeper development of channel partners, relationship building with capital providers and other activities to create more awareness and access to information. Increased funding could also support more staff to enable PACE deals to be processed more quickly, or it could support a more robust technical assessment process to give greater assurance of savings to the capital providers and the borrowers. Examples from other jurisdictions show that building a successful PACE program requires a significant investment in direct, personal market development and creation of highly-capable systems for quickly processing PACE deals. District funding of PACE administration could support implementation of these activities.

Credit Enhancement

The District could use public capital as a credit enhancement to mitigate risk and attract more private investment into PACE. This could both improve the terms of financing to make more projects economically viable, and create a new incentive for private capital providers to make PACE loans. The credit enhancement could be offered in the form of a loan loss reserve, or loan guarantee. In this structure, public capital would be set aside in a fund, available to pay lenders under certain conditions in the event of a default. The reserve would likely have limits on taking the first or second dollar of loss, the share of each dollar of loss absorbed by the reserve, and the total amount of loss the fund would pay for. In exchange for the benefit of this risk mitigation, a private capital provider would agree to offer capital at

terms that are attractive to borrowers and increase the market size. Lower rates/longer terms lower the total amount of investment required for each project, lowering the denominator in the savings to investment ratio, and, therefore, directly increase the number of projects that are economically viable.

The credit enhancement could theoretically be used as a direct subsidy to lenders in the form of an interest-rate buy-down. However, this method of credit enhancement is not self-sustaining – it is more akin to a grant. The loan loss reserve has the benefit of preserving capital, as capital is only spent when there is a loss, and earning interest on that capital when it is unused. Under this structure, if there are no losses, no public capital is used, as opposed to the interest rate buy-down, in which the public capital is spent no matter the loan performance.

The District could also look to a foundation or an impact investor to fund this credit enhancement. An increasing number of foundations and mission driven investors are looking to make program related investments to support clean energy finance. A Green Bank could work with foundations to develop and secure this kind of program related investment to leverage more direct private lending through PACE.

Project Loan Capital

The District could use public capital to directly offer PACE loans. Presently, the DC PACE program is designed to allow any private lender to make a PACE loan, but no public capital is committed or made available for PACE financing. By making capital available itself the government could inject more capital into the program, make it more accessible than current sources, and potentially lower the cost of capital.

Under the present PACE structure, private lenders are sought to fund PACE deals. Projects that come into the pipeline that don't already have finance attached are effectively put out to bid to a group of private lenders who have stated their interest in PACE. UI then collects the terms offered by each lender and helps the project identify the best source of capital. If there is a large market of capital providers, and with many participants (like in Lending Tree for mortgages), this creates competition and can push down the cost of capital. However, the DC PACE program still has a fairly small set of private lenders participating. In addition, the current structure can be administratively complex and time-consuming.

If the District made its own capital available for loans, that capital could be offered at standardized terms, under standardized conditions, and made available on-demand. Any project that met certain technical and/or underwriting conditions would always qualify for a loan from the public fund, at the same terms, with no uncertainty. That could greatly reduce the speed of closing deals, and make the program far more attractive to participants. It also creates far more certainty for project developers that they know, for certain, that they can find capital for their project.

This structure has been used successfully in Connecticut, where a lack of private origination led to the Green Bank's decision to make its own capital available. What began into a $20 million allocation for a loan fund quickly grew to $40 million, which has now led to over a $100 million in projects. The Green Bank originates loans, collects the debt on its balance sheet, and then sells the debt on the back end to private investors. In this way, private capital is leveraged at the end of the transaction, rather than the beginning. The standardized, streamlined process for delivering capital on demand could speed up and grow the market in the District.

A slight alternative to this structure would be a co-lending model, where the District's capital is blended in with the private capital. If the District capital is offered at a lower cost than the private capital, the

blended interest rate and term that reaches the end borrower would be lowered. The advantage of this structure is that if a Green Bank only provided capital for 50% of the project cost, for example, the Green Bank funding would go twice as far. And it would still provide private lenders the experience and market access needed for them to gain comfort in the market, and ideally increase participation.

Pre-Development Loan Fund

In addition to directly lending to PACE projects, a Green Bank could establish a pre-development revolving loan fund to cover some of the upfront costs that must be taken on my project developers. These costs, including audits, engineering assessments and customer acquisition, must be borne entirely by the project developers off of their own balance sheets. If the business is not well capitalized, a shortage of funds may prevent developers from pursuing viable project opportunities. The Green Bank could establish a low-rate revolving loan fund to cover these costs and provide the necessary runway for projects to move from initial interest to underwriting. The fund could be designed with an interest rate high enough to ensure the level of the fund never declines, or the Green Bank could accept that the fund balance would likely decline over time because not all projects will be completed. In this case, the fund could eventually be phased out, or the Green Bank could regularly replenish the fund to maintain a stable balance.

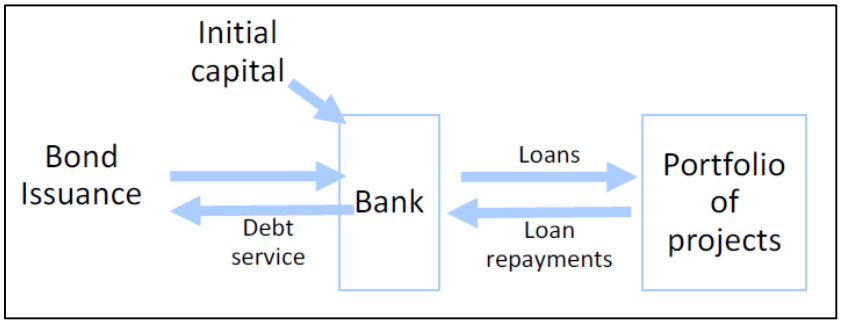
PACE Bonding

A Green Bank could run DC PACE through a leveraged, bonding model to create an efficient mechanism for attracting and deploying institutional private capital for PACE. Under this structure, just like the lending model described above, the Green Bank would receive "initial public funding" to seed a loan fund. The Green Bank would then make those loans, collect the PACE notes, and then sell the bundle of notes through securitization bonding process. The bonds would then be purchased by private institutional investors, recapitalizing the loan fund for the Green Bank to continue to support PACE projects. For example, in simplified terms, an initial $20 million of public capitalization of the loan fund could turn into $100 million of PACE lending after 5 cycles of loans and securitization.

The District appears to have envisioned this kind of structure in a number of ways. The National Capitol Energy Fund, created through the Energy Efficiency Financing Act of 2010, was built to receive "the proceeds from the sale of a bond," and the funds may be used "to make energy efficiency loans to property owners for the initial costs of the installation of energy efficiency improvements," which "shall be repaid by the revenues generated by the Special Assessment."[53] The Mayor may, "accept grant funds for a public or private source," "deposit the grant funds into…the National Capitol Energy Fund," and "use grant funds for a purpose for which monies in the National Capitol Energy Fund may be spent."[54] Under this language, the District (or any other source) could provide the initial capitalization for a PACE loan fund as a "grant" into the National Capitol Energy Fund. Those dollars would then be used to make energy upgrades, repaid through PACE. Those PACE obligations could then be sold through a bond issuance to recapitalize the National Capitol Energy Fund.

The OCFO Infrastructure Bank White Paper imagines such a structure. The concept described above is identified as "Leveraged Infrastructure Bank" structure, where "initial capital provided by the government," is "leveraged through a public bond offering." In this case, as described in the White Paper, the debt would be "supported by a diversified stream of loan repayments due to the bank."[55]

Figure 21: Leveraged Infrastructure Bank Model from DC OCFO White Paper



It is important to note that this leveraged infrastructure bank model, outlined in the OCFO's White Paper, is an excellent characterization of a Green Bank as a whole. It captures the difference and importance of both the public capitalization, used to make loans, and the bonding authority, which allows the Green Bank to be recapitalized with private funds. Also, in this context, the word "leverage" is used to describe the construct of using initial public capital to raise private funds through a bond issuance. This is different, though related, to the notion of leverage used in other parts of this report, where public capital was being used to finance a specific project in a way that "leveraged" private investment into that project. A Green Bank would be wise to use both forms.

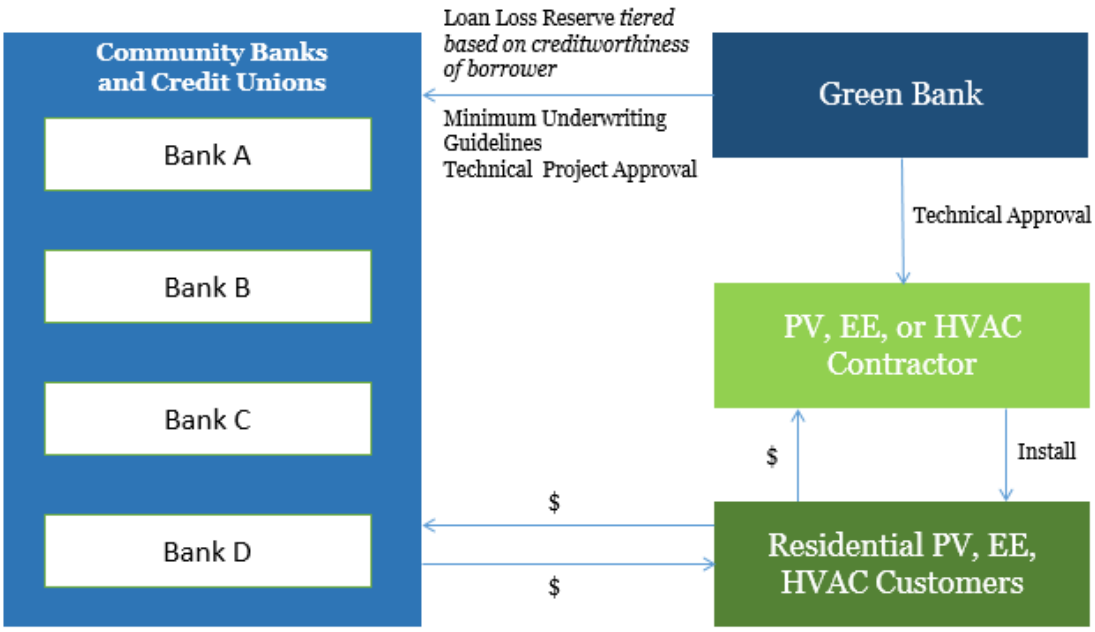
Residential Whole-Home Upgrade Financing Product

The District Green Bank should offer a whole-home upgrade residential financing product. By bundling multiple efficiency technologies and distributed solar into one financing product, technology adoption is greatly simplified for consumers, and the District can achieve deeper savings per project. A simple, yet flexible product for financing whole-home measures would allow homeowners to implement deeper efficiency measures than possible without financing. And contractors would have a useful sales tool that would allow them to increase project sizes, without translating to a bigger upfront cost for a customer.

A capital efficient way to support whole-home upgrades is by using public dollars to leverage private lending, specifically by using a loan loss reserve. This could be modeled on the Connecticut Green Bank's Smart-E Loan program. In this model, the Green Bank offers a standard loan loss reserve to any and all commercial banks that want to get the benefit of this risk mitigation. In exchange, the lenders market and make capital available for deep, multi-measure projects. And they agree to do so at terms that are more favorable than would otherwise be available. This ensures that the benefit of the credit enhancement is shared between the lender and the borrower. Implementing this program would require several steps:

- Identify a commercial lenders;
- Providing standard minimum underwriting guidelines for them to underwrite projects;
- Selecting a set of measures eligible for financing;
- Establish a loan-loss reserve with Green Bank capital to de-risk the lending from the commercial lenders;
- Training contractors to understand how the product works and how to use it as a sales tool; and
- Produce standardized technical assessments materials in advance to allow lenders to quickly determine if projects are viable.

Figure 22: Whole-Home Upgrade Reserve Based on CT Smart-E Loan



To have access to the project pipeline and the Green Bank credit enhancement, the commercial lenders would have to use the Green Bank's minimum underwriting requirements, as well as offer a the range of terms and rates determined by the Green Bank. For example, the Green Bank could designate a minimum FICO score necessary for a homeowner to be eligible and require that the lenders offer terms of 5, 7, 9, an 11 years (and vary their interest rates accordingly). The lenders would underwrite the loans, and they would be protected from the default risk by the Green Bank's loan loss reserve. The Green Bank would stipulate that contractors should take advantage of all available efficiency and solar incentives (such as those provided by the SEU and those being contemplated in other parts of this report), and would only finance the after-incentive project cost. The Green Bank would train and contractors to use this product.

This product is attractive from several perspectives. Evidence from Connecticut and other states suggest that leverage ratios of 5-10:1 are possible with this structure. And because public capital is not lent, and only drawn from in the event of default, this product structure preserves public capital. The product gives contractors an important sales tool, allows homeowners to save money with energy efficiency without paying upfront costs, and allows local lenders to gain experience lending in the clean energy space. The product's flexibility allows contractors to adapt it to different projects, and allows homeowners to choose terms to suit their preferred repayment schedule. And the product's structure allows the Green Bank to use limited public dollars to leverage private capital.

On-Bill Financing

The Green Bank could help implement, administer and/or finance an on-bill repayment/financing program in the District. The idea of on-bill financing in the District was first raised by the PSC in 2009, as discussed earlier in this report. The utilities expressed hesitation around entering into financing, and concern that their bill collection systems would have to undergo potentially costly upgrades to collect loan repayments in this way. Seven years later, though, on-bill financing and/or repayment has been further established as an effective tool to not only increase lending security for building upgrades, but also as a way to expand

market access to renters, low-income households and others who otherwise cannot secure financing or lower their energy bill.

The Green Bank could play multiple roles in the creation of an on-bill program. Creating an on-bill program often requires heavy coordination efforts among regulators, utilities, potential third-party lenders and policymakers. The Green Bank could play this central role, helping to design the program with an eye toward marketability. Design parameters include borrower eligibility, underwriting guidelines, technology eligibility and repayment terms.

If the program is designed for the loan funds to come directly from the utility, the Green Bank could still provide market development and contractors training services to ensure adoption. If the program is designed to be open platform, with loans come from multiple private investors, then the Green Bank could facilitate engagement with those lenders to bring them into the program. The Green Bank could also provide a credit enhancement, if necessary, to support that private lending. Finally, the Green Bank could also directly provide loan capital into the program if private capital is unavailable, or if the utility objects to using their capital in this way.

The on-bill loan should be treated as a direct tariff on the meter, which would allow the loan to stay with the meter and transfer from tenants/owners when people move. This overcomes the principal-agent problem that typically prevents renters from adopting efficiency and gaining access to financing. A special category of the on-bill program could be specifically designed for lending to low-income households, with underwriting criteria based on utility bill repayment history rather than FICO score.

The on-bill solution, though often resisted by utilities, is an ideal tool for expanding market access to those typically excluded from the clean energy market. Utilities should be justly compensated for the additional cost incurred for implementing this program.

It would be wise for the District to consider creating specific consumer protection rules if it does help implement on-bill financing. This can be done to ensure that consumers are only taking on projects that save them money, and also do not greatly increase debt burdens. For instance, the Green Bank could implement a bill neutrality rule, which would require all projects financed on bill reduce electricity bills or keep them the same. Bills could never increase. (This is equivalent to the CT Green Bank's requirement that savings-to-investment ratios on commercial PACE projects exceed 1.)

The Green Bank could also provide assurances or mitigate the risk of power shut-off, in the case of tariff-based financing. In some jurisdictions, if a customer does not pay the on-bill financing portion of the utility bill, the power to the customer could be shut off. The Green Bank should consider rules or mechanisms to ensure this either cannot happen, or can only happen in extreme circumstances.

Low-to-Moderate Income Home Upgrade

Low-to-moderate income homeowners are being left behind the in the clean energy transition. Private financing providers and contractors do not target this market segment because they can be harder to reach and may not qualify for financing. Though this free market behavior by private actors is understandable, it leaves it up to government and a Green Bank to ensure that all citizens can access cheap and clean energy. This need is particularly acute in the District.

Serving low-to-moderate income homeowners typically requires focused programs and products. Expanding program eligibility or lowering financial underwriting requirements is often insufficient, as

program participants and contractors will still target and market to high income households. Tailor-made solutions are needed. This includes financing and market development mechanisms specifically suited to needs of this targeted market segment. For instance, rather than underwrite based on FICO score, loan qualification should be based on utility bill repayment history (as is done through the Connecticut Green Bank's low-income product). And because LMI households typically have a higher energy burden than high income homes, programs should target maximized energy savings. To achieve this, programs could include a minimum bundle of efficiency measures to produce deeper savings. And homes adopting solar should first have an efficiency retrofit to ensure the minimum size solar system is installed. The need for maximized energy cost savings means that LMI households may be suitable for lower interest rates.

In addition to these product attributes, the Green Bank should design a contractor engagement program to increase buy-in and commitment from market participants to serve LMI households. For instance, contractors might be given financial incentive to serve this community. And the Green Bank could work with contractors to ensure that program application and participation is entirely seamless. LMI households typically have less disposal time available to address energy needs. Therefore the Green Bank and its partners have to take the burden of program complexity and administration off the customers' shoulders. By combining these product and program attributes, the District can create a solution that is comprehensive, turn-key and economically attractive for LMI households. It would be wise, too, for a LMI product to be paired with on-bill financing, to ensure rental LMI households can also be served.

Community Solar Financing Product

The Green Bank should focus on expanding access to clean energy, and the community solar is perfectly suited to achieving that objective. Community solar allows for direct ownership or purchase of solar power for those that either do not own their own homes or whose roofs are not suitable for rooftop solar. A community solar project can either be a larger, ground-mounted project or, as allowed in the District, a collection of rooftops that are aggregated to form a single project. As long as the sites are within the District, any customer can subscribe, purchase or lease solar power through a community solar project.

The Green Bank could play several roles to support the development of community solar projects in the District. Group or virtual net-metered projects are typically difficult to develop and finance. The Green Bank could play a central coordinating role to both ensure projects can be built and financed, as well as help potential customers understand and enjoy the benefits of participation.

To ensure projects can be built and are economically viable for subscribers, the Green Bank can offer various forms of project financing. For instance, if there is a gap in financing for a project, the Green Bank could fill that gap with subordinated or senior debt. Or the Green Bank could offer a loan loss reserve to draw in cheaper financing. Community solar projects are only viable if they end up saving money for the subscribers on their energy bills. If the cost of financing is too, high, then the benefits may be eroded.

The Green Bank may also play a more direct role in financing whole projects if the value of the credit that subscribers receive for the virtual net-metering of their share of the project is particularly low. The lower the value of the credit, the lower the cost of capital on the project must be to produce economically viable solar. A Green Bank could take a flexible approach and rather than have a defined product, it could be guided by a targeted effective price of solar delivered to customers. The Green Bank, could then adjust its financing offering in order to hit that target price of solar.

The Green Bank could also provide targeted financial support low-FICO customers that meet certain alternative criteria (such as utility bill payment history) to buy shares in the community solar project. The Green Bank could provide a backstop for these customers by keeping various municipal buildings on the sideline of the project as "reserve buyers" for the shares in the community solar project. If a low-FICO customer defaulted on their payments, the Green Bank could transfer their solar share to a reserve buyer.

The Green Bank could also act as an aggregator of rooftops, which can collectively be grouped to form a "virtual" community solar project. The Green Bank could lease the roof space on buildings with access to good solar resources and make it available for individuals that do not own a roof suitable for solar panels to take advantage of the benefits of solar. Alternatively, the Green Bank may find that building owners would be willing to donate their roof space, at no cost, and claim a tax deduction. This would further reduce the cost of the project and lower the energy price to the end customer. This is also a function that is inherently labor intensive, and is unlikely to be undertaken by a for-profit developer. That would leave perhaps many suitable roofs unused.

SREC Aggregation & Utility Sale

The District's RPS has solar carve out, where 2.5% of retail sales must come from solar located within the District. To support this ambitious goal, the RPS statue allows for solar specific renewable energy credits, or SRECs, to be created as a compliance tool. By rule, the utilities that must comply with the RPS must either acquire the necessary amount of SRECs each year or pay the Solar Alternative Compliance Payment (SACP). Presently the SACP is set at $500 per REC, or $500/MWh, and the current spot market price for an SREC is just below $500.[56] This suggests that, despite a very high SREC value (nearly double any other market), there is still a tremendous shortage of solar generation (i.e. an undersupply of SRECs).

The unbelievably positive economics of solar at an SREC price of $500/MWh[xviii] indicates a tremendous market inefficiency, where potential solar owners either do not believe that the SREC prices will be stable, or that they have no way of actually realizing the value of those SRECs. This kind of SREC price usually draws in a flood of developers who see a ripe market. But the SREC price has been above $450 for over three years, indicating a hesitancy from new market entrants.

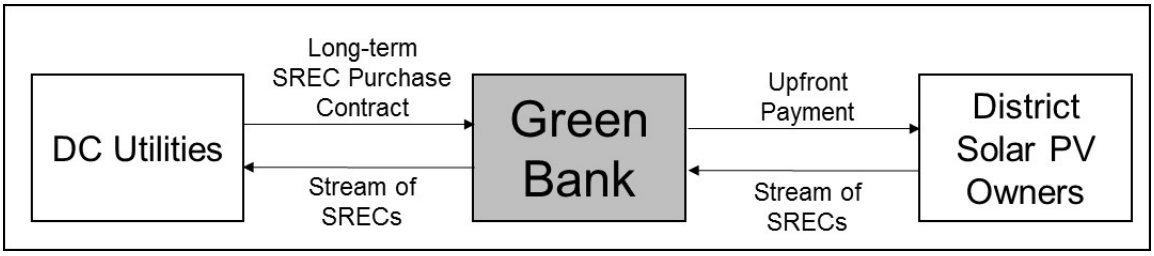
This inefficiency could be solved if the Green Bank played the role of REC aggregation by offering long-term purchase contracts for SRECs. Any solar owner (either the end customer or the third-party owner) could sell their SRECs for a fixed price long-term contract, with full payment made upfront. The Green Bank, then, would turn around and sell those same SRECs to the utilities for compliance purposes. Ideally the utility would purchase the SRECs from the Green Bank under a long-term purchase agreement, as well. This could be effectuated by legislation.

Because the spot price for a SREC is so high, there is room for the Green Bank to purchase SRECS at a price far below market, while still providing tremendous benefit to customers. The Green Bank could then also sell the SRECS to the utility far below the SACP, allowing the utility (and ratepayers) to save money on RPS

[xviii] If a customer was actually able to secure an SREC price of $500/SREC on an annual basis, at an installation cost of $4.00/watt, the solar owner would literally be making a profit on consuming electricity. The levelized cost of electricity from this system would be approximately *negative* 30 cents. The SREC price would not only offset the cost solar electricity to make it cost competitive, it would turn solar adoption into a profitable businesses. The fact that the market isn't growing quickly and the SREC spot price stays high, even in this incredible market condition, indicates a total lack of faith by all market participants in realizing this SREC value.

compliance. For example, imagine that the Green Bank offered 15-year fixed price SREC contracts for residential solar at a price of $250/REC. If the Green Bank applied a 4% discount rate, this would result in an upfront, lump sum payment to the system owner of $2,780. On a system installed at $4.00/watt, after this SREC payment and the 30% Investment Tax Credit, the net installation cost of a 5kw system would fall to $11,220. Assuming a 14% capacity factor, this would produce a levelized cost of solar of 12.3 cents/kwh, below the current cost from the grid. Simultaneously, the Green Bank could sell the SRECS to the utility at the same $250 (or slightly high to cover admin cost) and save the utility nearly 50% off of the current spot market cost or the SACP. By acting as a market maker and filling the mismatch between investment horizons, the Green Bank would be able to provide secured value to solar owners, reduce upfront costs of installation *and* lower the cost of RPS compliance, to the benefit of all ratepayers. All that is required is an infusion of capital into the Green Bank in order to operate this program. Capital would always be preserved, and money would only need to be added increase the bandwidth of SREC purchases.

Figure 23: SREC Aggregation & Sale Model



This exact model was implemented by the Connecticut Green Bank through the 2015 "SHREC" Program. The Solar Home Renewable Energy Credit model is built on an existing solar rebate program operated by the Green Bank as a legacy program. Any residential solar installation in the state is eligible for a rebate in the form of an upfront payment. By rule, any customer receiving the rebate forfeits the RECs from the system to the Green Bank. This was never explicitly viewed as a REC purchase program. However, as the level of rebate declined, the Green Bank realized that it was effectively purchased RECs at a price below what the utilities were paying for RECs on the open market (~$50, which was the ACP). So the Green Bank helped pass legislation creating the SHREC program, whereby the Green Bank would continue to receive residential RECs at increasingly lower costs as the rebate declined. And the utility would enter into 15-year REC purchase agreements with the Green Bank to acquire the RECs at a price below market. Customers realize immediate, upfront value for their RECs, the utilities comply with the RPS at lower cost, and the Green Bank is made whole with no loss of capital.

Residential PACE Financing

Presently, the District does not allow PACE financing for residential buildings. In many states, residential PACE is not allowed, while commercial PACE moves forward, based on opposition from federal regulators. Specifically, the Federal Housing Finance Administration (FHFA) stated that the government-sponsored entities, like Fannie Mae, would not purchase residential mortgages from lenders if those mortgages had a PACE lien senior to the mortgage. This prohibition effectively shut down the residential PACE market in the country, though some states like California have moved ahead anyway.

In 2015, though, the Obama Administration has moved to create greater clarity among federal regulators of what kinds of residential PACE might be acceptable. The Federal Housing Administration (FHA) is expected to issue new regulations allowing PACE financing on FHA-supported homes. It is expected that

this guidance will also inform new clarification from the FHFA, hopefully enabling all states to move forward with residential PACE financing programs.

Pending federal clarity, the District should consider establishing residential PACE in earnest to open a new and effective financing tool for District residents. California, even under uncertain regulatory conditions has built a residential PACE market with hundreds of millions of loans. It can provide on-demand financing for homeowners seeking to improve their homes or deal with emergent replacement needs that are typically financed at expensive credit card rates. Residential PACE could be administered under a number of potential structures, similar to those outlined for the current commercial PACE structure. The most common structures in the U.S. involve vertically integrated residential PACE providers, who operate with networks of contractors, using a uniform platform and single financial offering. It is less common to have an open platform for loan competition in the residential PACE space.

If the District creates a residential PACE program, it may find it valuable or necessary to create a credit enhancement mechanism to support homeowners and/or mortgage lenders. Typically mortgage lender consent is not required for a residential PACE loan because identifying the actual mortgage holder can be difficult due to the issuance of mortgage-backed securities. Therefore, even if the residential PACE lien is junior to the mortgage (which it likely would be[xix]), mortgage lenders may still require extra assurance that they will not be impaired by the PACE loan. One possible solution is a loan loss reserve, similar to the one created by the California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA). Through this structure, in the event that a PACE home goes into foreclosure, if the sale price is not sufficient to cover both the PACE payments and the mortgage, the reserve will cover, "any losses to the first mortgage lender up to the amount of outstanding PACE assessments."[57]

It might also be prudent for the District to protect homeowners who receive PACE loans and then fall into financial distress due to an unforeseen downturn in home values. During the housing crisis of the last decade, the fall in home values led to a nationwide surge in home foreclosures, causing economic ruin for many households. It would be extremely bad, for many reasons, if the District government is seen as (or in reality) having a hand in accelerating those foreclosures due to an increased home debt burden from PACE. Therefore it might be wise for the District to create the equivalent of a catastrophe insurance product. This kind of event is certainly unlikely, but now that a significant drop in home values has actually been observed nationally, it would be prudent for the District to anticipate and provide assurance to homeowners that the District's own lending programs would not contribute to any kind of housing crisis.

Market Development Activities

CGC recommends that the Green Bank engage a number of market development activities in order to generate demand for clean energy technology, ease the process of customer adoption, and increase overall market efficiency. This activity should be carefully coordinated with the SEU, as it is also tasked with supporting clean energy market growth. Specific recommended action includes:

- Run "Solarize" campaigns to build demand with neighborhood engagement

[xix] It is expected that any federal guidance on residential PACE, either from FHA or FHFA, would require that state's create residential PACE statutes where the PACE lien is junior to the mortgage. This is different from most commercial PACE programs, like that in DC, where the lien is senior to the mortgage. To address this potential conflict, DC and other states require that the mortgage holder legally consent to having the PACE lien come in senior to their mortgage.

- Offer contractor training to build channel partnerships
- Provide technical assessments to calculate savings for owners/lenders
- Create a unified website for all programs to eliminate market confusion
- Actively market the Green Bank products, brand, and role in the District

The best financing product is only successful if customers actually use it. Therefore it is incumbent on the Green Bank to foster the mature market needed to build demand for clean energy and its financing products. Capital made available in a vacuum, or at unusable terms, is no more useful than capital that is never made available in the first place.

Presently there is a long gap between clean energy capital and demand for that capital that a Green Bank must bridge. Only through fully integrated, turn-key solutions can financing and clean energy technologies penetrate the market. This series of activities needed to connect capital supply to customer demand includes marketing; dedicated origination channels; partnerships with contractors; contractor training on how to sell their services with financing; coordination of financing and services with other subsidies and incentives; coordination of multiple contractors on multi-measure projects; and many others.

In addition to this list of activities, often the capital made available for financing is not well-suited for the purposes of clean energy investing. For instance, a loan may be offered with a short-term that prevents deep retrofits; at an interest rate that prevents a project from being cash flow positive; with a loan size that prevents deep retrofit projects; with the inability to cover 100% of the cost, but with no assistance to find lenders to cover remaining costs; and with credit restrictions that shut-out portions of the market.

This long list of market and financing deficiencies, not surprisingly, results in low demand for clean energy technology. Consumers do not have the time, knowledge or interest to navigate a complex purchase process, learn about different technologies and program options, and seek out possibly inadequate financing entirely on their own. Therefore, a Green Bank can play a critical role in stimulating demand by both offering suitable financing *and* delivering that financing to customers through turn-key program design. A Green Bank cannot be built on the flawed clean energy financing premise that, “if you build it, they will come.” Rather a Green Bank must design financing programs in coordination with delivery mechanisms, access to information, and consumer marketing techniques to overcome past demand shortage problems. Whether the Green Bank itself is directly engaging in this market creation activity or doing so in partnership with multiple private partners will depend on precise product and organizational design. But no matter the design, a Green Bank should strive to ensure customers are presented with simple offers that are cash flow positive with minimum customer effort required.

Limited resources, particularly in the startup phase of the Green Bank, may constrain the range of market development activities simultaneously possible. Many market development activities, unlike financing activities, do not provide a direct financial return to the Green Bank – they are more akin to a marketing expense. So Green Bank spending in these areas should be strategic and targeted to maximize the effectiveness of the measure without depleting the resources of the Green Bank. Focusing on activities that are vital for the success of the products being offered might be a good way to limited resources.

Solarize Campaigns for Demand Aggregation

One example of a targeted marketing program is the Solarize program in Connecticut. The Connecticut Green Bank partners with SmartPower to administer the Solarize program, which targets the residential solar market. Solarize is based on neighborhood and town-level peer-to-peer marketing. With support

from the CGB, neighbors put on events (open houses, barbeques) at the homes of community members that typically already have solar installed. Then, solar installers on CGB's list of approved contractors can submit bids (in the form dollars per installed Watt of solar) to the community, and the community then selects a contractor to serve the community. The Solarize model is successful because people are able to learn about solar in a face-to-face setting (how it works, the effect on utility bills) from their friends and neighbors, rather than a third-party salesman, and they have the assurance that any contractor working with the program has been vetted by the state Green Bank.

Solarize also encourages contractors to offer a Groupon-type model of progressively lower pricing tiers in their pricing bids. Essentially, contractors agree to set price tiers based on progressive number of installs per neighborhood or town. Local community members therefore have an incentive to encourage more of their friends and neighbors to sign up together to get to a lower tier of pricing. (For example, 50 people sign up for solar the price is set at $3.50 per installed, 75 people sign up, and the price drops to $3.00 per installed Watt.) Contractors and installers benefit from the Solarize program because they can target neighborhood and towns for installation, lowering the costs associated with sending work crews. Solarize connects contractors directly to customers that learn about energy upgrades from their neighbors, and are taking advantage of turn-key financing products from the state Green Bank. A harmonized marketing program backed by the Green Bank can help lower marketing costs of installers, allowing further savings to be passed on to consumers through the tiered pricing model.

Contractor Training

Contractors are effectively the sales force for any Green Bank financing product. Therefore it is critical for the Green Bank to have a close and positive working relationships with contractors, installers, and project developers that are bringing a pipeline of deals to the Green Bank. The Green Bank should not only foster a close relationship, but provide extensive training so that they understand the full capability, applicability and benefits of the financing programs. This should not be a one-time upfront training, but an on-going set of meetings and exercises to constantly update partners on financing products. This ensures contractors have the latest know-how, are updated with new market information, and are given new marketing collateral. The Green Bank should also work with contractors to develop tools and information technology systems that might allow for a seamless and fast customer approval process for financing.

Unified Website

The Green Bank should make all of its information available through a clear and usable website. The website should be designed to be market facing. It should not replicate other typical government websites. Rather it should be user-friendly, dynamic and clear, where the user can explore different solutions and offerings based on their position in the market. For instance, a residential customer should be quickly channeled to only look at residential products. This website should also contain models and tools that give customers and contractors the ability to determine the energy and economic value of a potential product. This kind of interactive platform can enable market participants to engage with clean energy options, understand financing and identify projects for Green Bank financing that are certain to be accepted. For instance, the Green Bank could put on its website a model for a building community solar project. The model would ask for several inputs and would tell the user that if the model produces a positive result then that project is assured financing. A platform like this would empower market participants and greatly reduce overhead costs of the Green Bank to vet projects.

The Green Bank's website should also be part of a unified, single-point-of-access site that is used for all DOEE programs. This integrated approach is discussed in greater detail in the Conclusion.

Technical Assessments

The Green Bank should provide technical assessments of energy projects to demonstrate to customers and lenders that projects are cash flow positive and save more than they cost. For larger projects, like large commercial building upgrades, this assessment should be tailored based on the specific energy conservation measures used in the specific project. Each project should receive an extensive energy and financial analysis that shows the expected cash flows, savings and returns under various positive and negative scenarios. For smaller projects like residential efficiency, the Green Bank should produce a model for standardized assumptions that is more flexible and easier to calculate to reduce overhead. No matter the size of the customer, though, s/he should be presented with third-party evidence that the project will actually result in savings for the end-user.

Active Marketing

The Green Bank must actively market and advertising its products and services. Like any other new business looking to generate demand, the Green Bank must dedicate a portion of its budget to marketing. In this regard, the Green Bank must operate more like a private operation than like traditional government. The Green Bank should advertise on radio, in local newspapers, in District mass transit. It should also co-market with other non-profits and government agencies that already have direct relationships with key segments of the market. The Green Bank should develop a strong and identifiable logo that is consistent across media. Green Bank financing is not merely meant to be available should customers want it. It is the mission of the Green Bank to reach out and bring in new demand. Marketing is an essential component of this mission.

Coordination with SEU

The Green Bank will have to work in close coordination with the SEU, as they are both designed to support clean energy market growth. The SEU is fundamentally oriented to providing grants and rebates, while a Green Bank is a financing entity. Therefore the SEU and Green Bank are principally complementary entities that provide different, though related services to support market growth. CGC recommends that the DOEE serve as the coordinating entity that links the operation of the SEU and the Green Bank.

However, in the area of market development, demand generation and information transparency, the SEU and Green Bank will need to be highly coordinated to ensure they are aligned and not duplicative. Today, the SEU engages in certain activities that would also be beneficial for a Green Bank. For instance, the SEU website provides a detailed and well-designed guide on LED light bulbs. This kind of information is important to provide to the market and does not need to be provided in two different places. A Green Bank website with similar, but different, information would be useful, but there are efficiencies to be gained by coordinating and sharing certain functions. This information-based website is just one example.

In addition to information, the SEU and Green Bank must coordinate engagement with other market participants, especially contractors. The two entities should work together to streamline contractor training, ensuring they have the best information on both rebates and financing to serve customers. And products themselves should be designed to work together. There should be no requirements or restrictions that might prevent a customer from accessing both rebates and financing for a project.

The DOEE is best-positioned to facilitate this kind of coordination. The DOEE should designate an employee, or potentially assemble a very small committee, tasked with managing clean energy market development. The role would be to coordinate and align the activities of the SEU and the Green Bank (which presumably would include DC PACE). This kind of coordination is difficult to execute on unless it is explicitly made a person's responsibility to do so. And that person must be empowered to scrutinize, re-design and share activities across the two entities.

In Connecticut, this coordination is achieved through the Joint Committee of the Energy Efficiency Board and the Connecticut Green Bank. The Energy Efficiency Board is the advisory group established to guide the design and implementation of ratepayer-funded energy efficiency rebate programs, administered by the utilities. As stated in the Green Bank's Comprehensive Plan, "The Green Bank…interplays with the…Energy Efficiency Board through coordination of our staff as well as a Joint Committee to continue to work to harmonize programs and initiatives to support the implementation of public policy goals."[58] The Joint Committee to coordinate rebates and financing was actually written directly into the CT statute through legislation.[59]

The NYGB also recognized the importance of coordination in its business plan submitted to the public utility regulator. It wrote:

> NYGB will also strive to coordinate and work opportunistically with key entities relevant to pursuing [state] objectives and policy goals including NYSERDA, the New York Power Authority ("NYPA"), the New York State Economic Development Corporation ("NYSEDC"), other State and local agencies as well as utilities and other similar market actors to maximize clean energy outcomes in New York. Through agency coordination and inherent synergies with these key players, NYGB's ability to play a role in crafting far-reaching and multiparty solutions to address clean energy market barriers and gaps may be heightened in certain circumstances. The ideal outcome is for dollars put to work by the State through its various energy and financing initiatives to be coordinated in pursuit of the optimal result: breaking down all barriers as necessary to achieve a synergistic outcome with more expansive impact.[60]

The District Green Bank can play a similar role, maximizing the impact of public funds. But this can only be achieved through a well-designed and executed plan for coordination with the SEU and any other relevant District entities.

Conclusion

The District has a clear and pressing need to stimulate more private investment in its clean energy economy in order to reach its climate and energy goals. The vast building stock, commercial and residential, must become far more efficient. And hundreds of megawatts of distributed solar must be installed in short order to meet the District's RPS solar carve out. The current set of programs and policies are insufficient to meet these goals, which will require over $3 billion of investment. Though private capital is not flowing rapidly enough, the public sector cannot bear the burden alone. Therefore the District should establish a Green Bank, capitalized with public dollars, to leverage private investment, drive demand and increase access to clean energy solutions. In combination with existing programs, the Green Bank can help allow District residents and businesses enjoy cleaner *and* cheaper energy.

Green Bank Recommendations

This report finds that the optimal structure for a District Green Bank is an independent, quasi-public, non-profit instrumentality that is wholly-owned by the District government. It should be governed by a Board of Directors that includes ex-officio Directors, like the Director of the DOEE, as well as Mayoral appointees. It may also be prudent for the District Council or confirm the appointments. The DCHFA provides a similar model of a quasi-public entity designed to support market development with public-private finance.

The report finds that a public capitalization of $100 million can drive over half a billion dollars of total investment in clean energy. The $100 million should be invested in the bank by the District over time, to lessen the immediate upfront cash requirement. A potential funding schedule is $40 million of upfront capital, and then a stream of $10 million annual infusions over the following 6 years. The exact use and allocation of this capital, across markets and products, should be determined by the Board and leadership.

The District should pull from a number of possible funding sources to capitalize the Bank. The District should prioritize funding sources that are accessible, reliable and have few restrictions on their use. Potential funding sources include general budget appropriation, merger settlement dollars, and federal resources. For on-going funding streams, the District should consider increasing the SETF collection from ratepayers to raise dedicated funding.

A Green Bank entity under this structure would require the passage of legislation. The legislation should grant the Green Bank the authority to provide financing in a wide range of forms to ensure operational flexibility. The legislation should also grant the Green Bank the authority to issue bonds. The bonds could be issued as general obligation bonds of the Green Bank, revenue bonds supported by revenue streams due to the Green Bank, or project bonds backed by specific assets financed by the Green Bank. The bonds should have no recourse to the District and not impact the District's debt cap.

As is the case with other existing financing entities in the District, the Green Bank should be legally created in a manner such that its long-term financing and borrowing comply with anti-deficiency rules. Finally, it should be made explicitly clear in legislation that the Green Bank's activity does not constitute providing public credit for private activity. The DCHFA and HPTF are strong precedents for these kinds of institutional and financing structures. And the NCEF, created to finance PACE projects, provides a good example of a bonding structure designed to be independent of the District that doesn't violate Home Rule prohibitions on usage of public credit.

And finally, the Green Bank should have the ability to issue bonds to recycle capital and increase lending capacity. This could be done through several potential bond structures, all of which should have no recourse to the District. This includes the use of industrial revenue bonds, project and asset-backed bonds and the use of NCEF bonds for portfolios of PACE projects.

The Green Bank should deploy a portfolio of financing and market development solutions, focused on the residential and commercial efficiency and solar market. Different products are likely needed to meet different sub-segments of the market. For instance, renters and homeowners need different financing structures. And the low-to-moderate income sector also needs tailored solutions that can address their specific needs and barriers to adoption. Some of the financing products address in this report include PACE financing, on-bill financing, whole-home solutions that include both solar and efficiency, and the creation of new community solar financing tools. Green Bank leadership should prioritize products, focusing on the greatest market opportunities and easy wins. The Green Bank should use pilots and other methods of experimentation to quickly test what does and does not work. The Green Bank cannot be afraid to fail, learn from its mistakes, and improve.

It is also essential that the Green Bank seek to build demand for clear energy, in addition to providing financing solutions. This means working closely with private lenders and investors, as well as the contractor community that is the true go-to-market channel for customers. This also means designing financing products with a holistic lens of the full set of steps and barriers involved that might prevent a customer from saying "yes" to clean energy. The Green Bank, therefore, cannot be afraid to devote resources to demand generation and market development.

Integration with Existing Programs

Given the adjacent activities of the Green Bank and the SEU, it crucial that the programs be highly coordinated and aligned. The DOEE should maintain direct control over a growing set of clean energy programs and market development services. This means the SEU, the Green Bank and DC PACE should all operate under a unified strategy, where each piece is aligned with the others to maximize the effectiveness of each dollar. The DOEE should also maintain administrative control over each aspect of what should increasingly become a single brand and entity from the market perspective. By presenting the program set to the market with a single name, website and interface, engagement with programs will become simpler and it will force internal coordination across program areas.

The first layer of integration to address is between DC PACE and the Green Bank. As PACE is a single type of financing structure serving a single market segment, where the Green Bank is a financing institution that houses multiple products for many market segments, DC PACE should be integrated into the Green Bank. It should be presented as *a product of* the Green Bank. Having multiple entities offering different financing products for different segments of the market will only creation market confusion.

From the market's perspective, consistent branding will be beneficial. However, this does not necessarily mean that the administration of the DC PACE program should change structurally. Rather, the current construct, with a contracted administrator (currently UI), can remain in place. The Green Bank, via DOEE, can be given responsibility for managing DC PACE, but then assumes the contracted relationship with UI, who continues to administer the program. It is not necessary that the task of administering DC PACE come in-house at the Green Bank. Internal coordination between the PACE administrator and the Green Bank, though, can be beneficial to DC PACE.

For example, to facilitate simple, easy to understand financing with fewer barriers to entry and transaction costs, DC PACE and the Green Bank should have shared branding and marketing. As the Green Bank will, in effect, be marketing DC PACE as a product of the Green Bank, the costs associated with marketing and consumer education would become shared. There are also natural financing synergies associated with integrating the two programs. As the Green Bank would provide various financial products across market segments and engage with many capital providers, the Green Bank could help PACE projects source capital. Or one can imagine a scenario where the Green Bank could supplement the PACE financing with another form of financing to expand a project or ensure a project is closed.

Beyond the marriage of PACE and non-PACE financing within the Green Bank, the clean energy incentives offered by the SEU should also be closely integrated with the financing resources and needs of the District. A consumer interested in clean energy improvements to their property may not know, in advance, whether they merely want incentives or financing or both. In the case of most consumers, they may not have any idea what is available to them in terms of financing or incentives. Contractors interested in qualifying for incentives may also be interested in learning about finance options, and vice versa. Spreading this information (and application processes) across two (or more) institutions or websites creates a more complicated process that will reduce uptake and fragment the market.

To minimize complexity and increase the uptake of all clean energy resources offered by the District, there should be a single online platform of all information, resources, and data relevant to clean energy upgrades. A customer or business looking for all information and tools, financing or incentives, needed to explore clean energy adoption should go directly to a single source of information. Connecticut provides an excellent model for this kind of integrated platform—all incentives, financing options, and other resources are available on a single website (such as Connecticut's energizeCT.com), conveniently arranged by building type and user type. Having a single brand, website, and depository for all clean energy resources dramatically reduces the barriers and challenges associated with increasing program uptake. It is conceivable that existing brands and websites are not suitable for hosting the resources associated SEU, UI, and the Green Bank. Fully integrating the customer- and contractor-facing side of these three organizations may require the creation of an entirely new brand and website.

In addition to streamlined branding and market engagement, internal coordination "behind the scenes" is critical. Contractors must be fully trained to understand the financing and incentive options available to customers. And they should know how to explain and sell clean energy solutions using both tools. Customers for larger projects should also be able to see a financial and/or energy assessment of the project that accounts for the financial impact of both incentives and financing. It is also essential that the District or its partners bear the responsibility of coordinating applications and access of financing and incentives. It cannot be left to customers to seek out these benefits on their own. Solutions must be offered in a turn-key fashion. This close coordination would have to be written into the contracts for DC PACE and SEU as requirements for successful fulfillment. Presently the SEU administrator is required to coordinate with DC PACE. Similar language would need to be added to support Green Bank integration.

Finally, over time, the District may find it prudent to adjust the budgets and levels of program allocation across financing and incentives in react to market conditions. As technology costs fall, for instance, incentives can fall, as well. Or incentive dollars can shift to programs that support "low-hanging fruit" to those that support deep energy retrofits. This way, when paired with financing, all public dollars are being used to maximum efficiency.

Appendix – District of Columbia Energy Profile, Policies and Programs

This appendix supports the Green Bank report, as well as the Carbon Pricing and Deep Greening Incentives Report submitted to the DOEE.

It summarizes the District's

- Current energy market profile;
- Energy-focused institutions;
- Clean energy-related laws and policies;
- Goals and targets related to clean energy and sustainability; and
- Programs operated by the District to support clean energy market growth.

This market information supports the conclusions drawn in the Reports cited above.

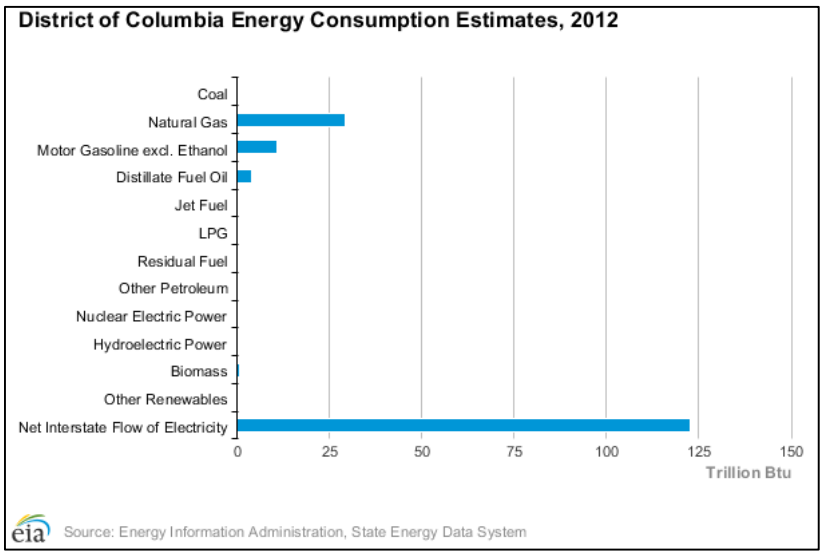
Current Energy Market Profile

Considering its size and density, the District's energy market is unique compared to other states. The District resembles a city more than it resembles any state in terms of its energy consumption and production. Nevertheless, the District has its own set of regulations and policies, just like any other state, that govern its power sector and ensure the energy consumed within its borders meets various requirements.

Total Energy Mix

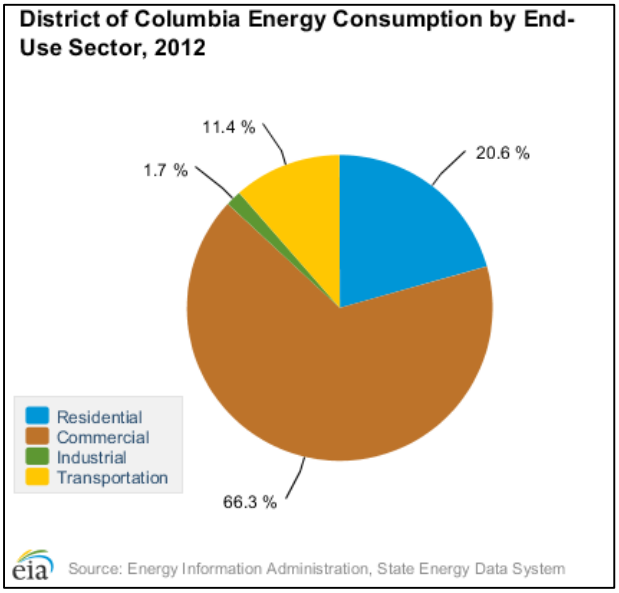
The District does not have any large energy production operations within its borders—no extraction or refining activities or utility-scale generation occurs within its borders. The District imports virtually all of its energy from neighboring states. There is some distributed generation in the District, primarily from solar photovoltaic systems. All the electricity used in the District, except that produced by the distributed generation systems, is imported from other states. The remaining energy consumed in the state is mostly for the purpose of heating buildings and driving vehicles.

Figure 24: District Energy Consumption by Source[61]



The commercial sector consumes roughly two thirds of the energy in the District, with all the other sectors combined consuming one third of the energy in the city. This is a result of the District's job base and commuter dynamics – there is no significant industry or manufacturing in the District, and many employees who work in the city live in neighboring states. So the District's built landscape, and relatedly, its energy consumption, is dominated by the commercial sector.

Figure 25: District Energy Consumption by Sector[62]



Electricity

Utility Structure

The Potomac Electric Power Company (Pepco) remains the sole provider of distribution services in the District.[63] All District residential and commercial customers can choose their electricity supplier among a group of competing retail electricity suppliers.[xx] Customers who choose not to enter into an arrangement with an alternative supplier remain with Pepco and are supplied under its Standard Offer Service (SOS).[64]

Pepco does not own any generation assets inside the District. District electricity suppliers acquire their electricity either by long-term power-purchase agreements (PPAs) with power generators or by purchases on the wholesale market of the PJM interconnection—an independent regional transmission organization. Pepco, as the distribution utility, delivers the electricity from the suppliers to their customers.

As of June 2015, the District was served by 30 electric suppliers.[65] As of mid-2015, 32.6% of non-residential customers (representing 84.5% of electricity usage) in the District have chosen a competitive electricity supplier other than Pepco's SOS. This indicates that the District's retail deregulation has created an active market for commercial customers. On the other hand, only 13.4% of residential customers (representing 14.5% of electricity usage) have chosen an alternative electricity supplier, though a growing number of residential customers are opting to get electricity from an alternative supplier.[66]

[xx] The *Retail Electric Competition and Consumer Protection Act of 1999* established customer choice with respect to choosing the supplier of electricity.

Import v. In-state generation

The District is geographically small and densely populated, and does not produce energy or generate electricity within its borders save for a few distributed renewable generation systems. The District imports almost all of its electricity, which is generated and supplied by a variety of power plants located outside of the District. Imported electricity supplied to the District comes from a mix of coal, natural gas, nuclear, and renewable generation sources (see next section for more detailed electricity fuel data).

All of these electricity generation sources operate and sell electricity through the PJM Interconnection. PJM coordinates and manages the wholesale electricity market for all or part of 13 states and the District, or nearly 61 million customers.[xxi] To meet demand across the grid, the PJM operator sources electricity from a variety of generation sources based on merit order, which is set by price and capacity characteristics and requirements to maintain grid reliability. When available, renewable energy is utilized by the grid and reduces the demand for electricity from baseload sources.

All electricity suppliers must comply with the District's Renewable Portfolio Standard (RPS), which requires suppliers to obtain a minimum amount of electricity from clean generation sources (see section on the District's energy policies for more detail on the RPS). All of the 30 electricity suppliers importing energy operate in compliance with the RPS, though five suppliers offer specifically-designed renewable energy supply options. Through these supply plans, customers can choose to receive from 50 percent to 100 percent of their electricity from renewable sources. [67]

Electricity Fuel Mix

In 2014 in its District service territory, Pepco's electricity fuel mix was 43.5% coal, 34.7% nuclear, and 17.5% natural gas. Renewable sources (including hydroelectric) comprise 4% of electricity generated.

Table 9: Pepco Energy Source (Fuel Mix) January 1 – June 30 2014[68]

ENERGY SOURCE (FUEL MIX) JANUARY 1, 2014 - DECEMBER 31, 2014	
Coal	43.5%
Gas	17.5%
Nuclear	34.7%
Oil	0.3%
Unspecified Fossil	0.0%
Renewable Energy	
Captured Methane Gas	0.3%
Geothermal	0.0%
Hydroelectric	1.0%
Solar	0.1%
Solid Waste	0.5%
Wind	1.9%
Wood or other Biomass	0.2%
Unspecified Renewable	0.0%
Total	**100%**
Renewable energy resource subtotal:	**4.0%**

[xxi] These states include Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, North Carolina, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia.

The generation mix of the PJM grid has been shifting in recent years, owing mostly to the closing of coal-fired power plants and the additions of new natural gas and renewable capacity. This shift may continue as certain coal-fired power plants in the PJM region retire or are shut down due to pending or anticipated federal Environmental Protection Agency (EPA) regulations, such as the Mercury Air Toxics rule and the Clean Power Plan. Furthermore, new supplies of natural gas are expected to come online in Eastern states and supply the power sector, which may enable a continuing shift away from coal and ease recent electricity price increases.

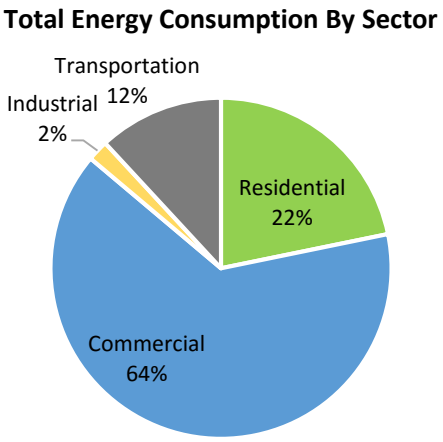
Distributed Generation in the District

The District has no utility-scale generation, let alone any utility-scale renewable generation. All in-District generation is therefore "distributed" in nature, meaning the power is generated at the point of consumption and/or is relatively small in scale. Effectively all of the District's distributed generation uses solar PV technology. There are more than a thousand listed solar systems that together constitute 16.3 MW of capacity.[69] As discussed at greater length in future sections, the District must dramatically ramp up the deployment of distributed solar installations to meet the Renewable Portfolio Standard 2023 target of 2.5% locally-generated solar electricity and the even more ambitious Sustainable DC goal of 50% renewable electricity by 2032.

Consumption by Sector

The commercial sector consumes the majority of energy and electricity in the District. The outsized consumption of the commercial sector, relative to other states, results from the relatively sparse industry in the city, and the fact that many people living outside the city commute into the city for work. As a result, much of the District's built environment and infrastructure is geared toward the commercial sector.

Figure 26: Total Energy Consumption by Sector[70]



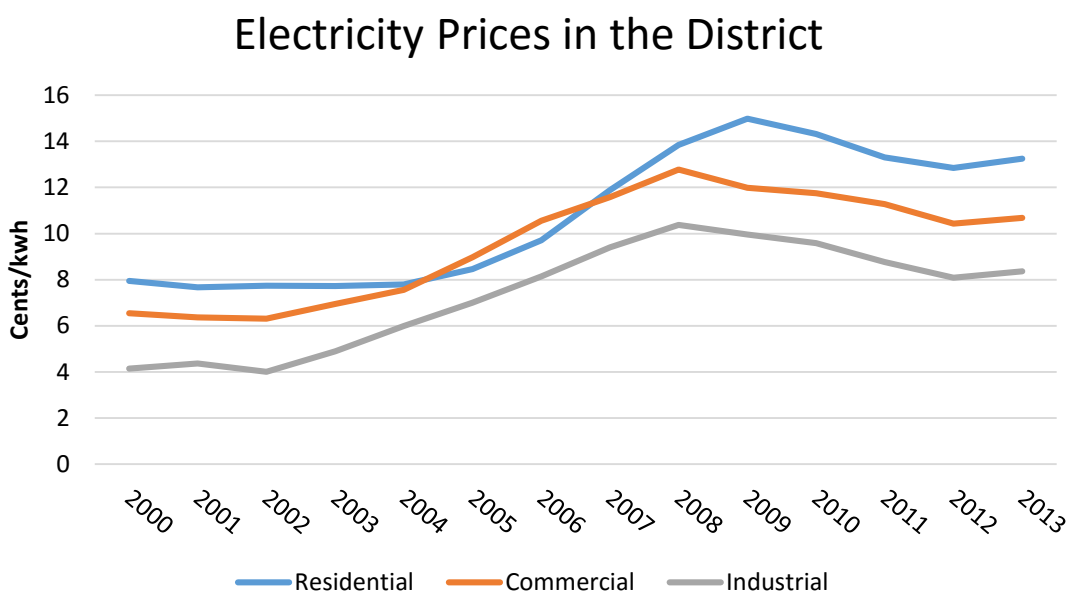
Electricity Prices

In April 2016, the prices for electricity in the District were slightly above the national average in all sectors.

Table 10: District Electricity Prices by Sector[71]

	Residential	Commercial	Industrial	All Sectors
DC	13.48	11.88	9.09	12.08
U.S. Avg.	12.43	10.09	6.39	9.81

Figure 27: District Historical Electricity Prices by Sector[72]



Electricity prices in the District reflect three separate charges for generation, transmission, and distribution and are set under the direction of the District of Columbia's Public Service Commission (PSC).

Generation charges represent the cost of physically producing electricity at a generation source. Given that the District's consumers can choose their electricity generator, there is competitive pressure for generators and suppliers to make their electricity more attractive to consumers, potentially by providing it at lower-cost or by highlighting its low carbon attributes. Transmission charges are set by the Federal Energy Regulatory Commission, while distribution charges are set through PSC ratemaking cases with Pepco. Provided that it meets the PSC's eligibility requirements, an electricity generator located outside of the District can supply electricity through a procurement process overseen by the PSC and Pepco. For example, through the procurement process, an eligible wind farm in Pennsylvania can enter into a PPA that guarantees a certain electricity price for generated electricity for a purchaser in the District.

The District of Columbia has also established a Municipal Aggregation Program (DC MAP) that allows for District agencies and certain other consumers to aggregate demand to negotiate lower electricity rates.[73]

Electricity Expenditure

The District's total expenditure on retail electricity in 2012 was $1.33 billion. The total expenditure on energy was $2.15 billion or $3,400 per capita. The District ranks 50th among the states in energy spend

per capita, meaning the per capita expenditures by District residents on energy is nearly the lowest in the country among all states.

Table 11: Energy Expenditures by State[74]

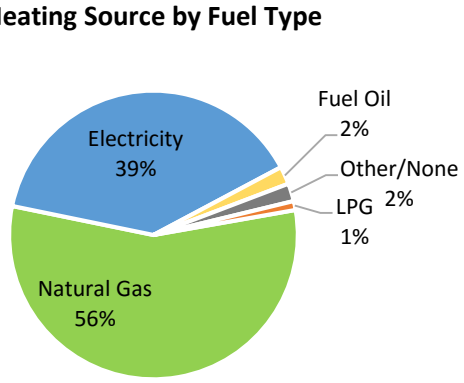
State	Retail Electricity (millions)	Total Energy (millions)	Energy Spending per Capita	State Rank
DC	$1,334	$2,152	$3,398	50
DE	$1,267	$4,014	$4,377	26
MD	$6,975	$22,595	$3,840	39
VA	$9,780	$35,135	$4,292	28
RI	$982	$3,748	$3,568	47

Thermal Energy

Heating fuel source for buildings

There are several heating fuels widely used in the District. Of the heating fuel consumed, 56% is natural gas, 39% is electricity, 2% is fuel oil, 1% is LPG, and 2% is none/other (such as wood).

Figure 28: District Heating Fuel Consumption by Type[75]



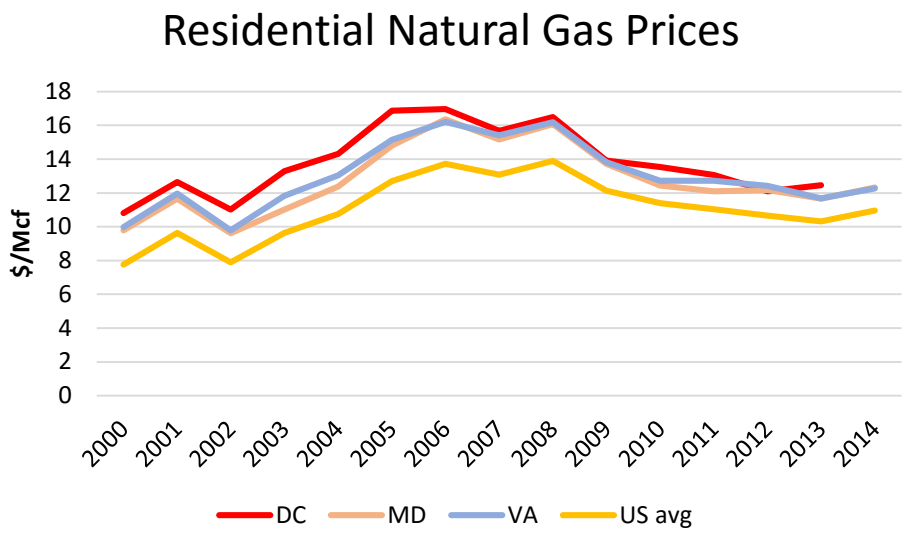
Natural gas utility structure

The natural gas market in the District is deregulated. Washington Gas Light Company ("Washington Gas") is a regulated utility that delivers natural gas to District customers. As they do for electricity, District customers can choose to buy their gas from competing retail energy companies. All consumers not electing to choose a new fuel services provider will remain a customer of Washington Gas's supply, by default. The PSC oversees the heating fuel market and imposes regulatory requirements for eligible suppliers to meet.

Natural gas prices

In 2010, the price of residential natural gas in the District was $13.53 per thousand cubic feet. The price has since dropped to a five-year low of $12.10 in 2012, and in 2013 it rose slightly to $12.45. The price of commercial natural gas in the District in 2010 was $12.26 per thousand cubic feet. The price dropped to a five-year low of $11.19 in 2012, and then rose to $11.64 in 2013. The residential price of natural gas since 2000 is plotted below, in comparison to the District's neighboring states.

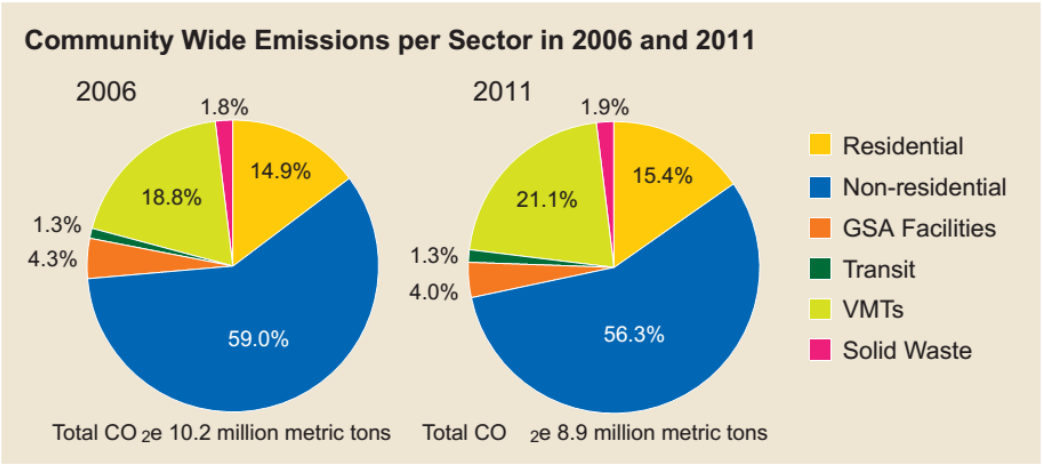
Figure 29: District Residential Natural Gas Prices ($/Mcf)[76]



Emissions

In 2011, the District was responsible for 8.9 million metric tons of CO2e (carbon dioxide equivalent) primarily from the non-residential commercial, transportation, and residential sectors.

Figure 30: GHG emissions (CO2e) by sector in 2006 & 2011[77]

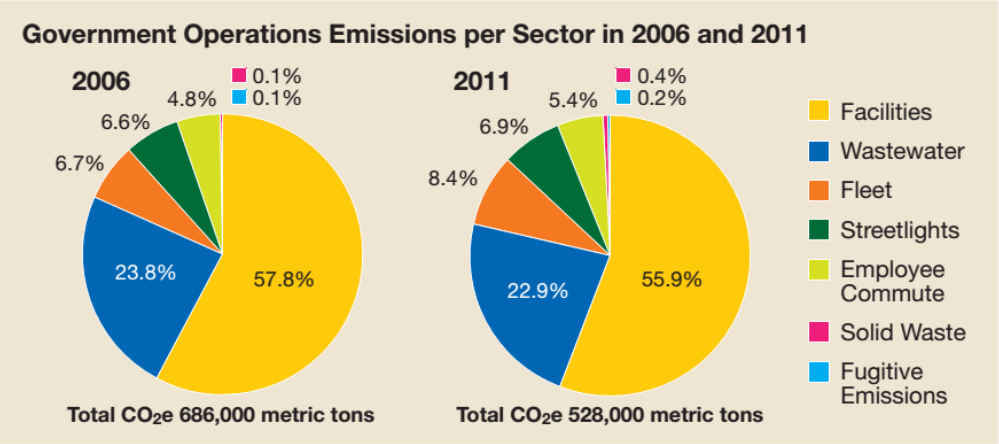


Nearly 75% of the District's total emissions is attributed to the electricity use and heating of buildings, both non-residential commercial and residential.[78] Non-residential commercial buildings accounted for 59.0% of emissions in 2006 and 56.3% of emissions in 2011. Federal Government (GSA) facilities

accounted for 4.3% of emissions in 2006 and 4.0% of emissions in 2011. Residential buildings accounted for 14.9% of emissions in 2006 and 15.4% of emissions in 2011.

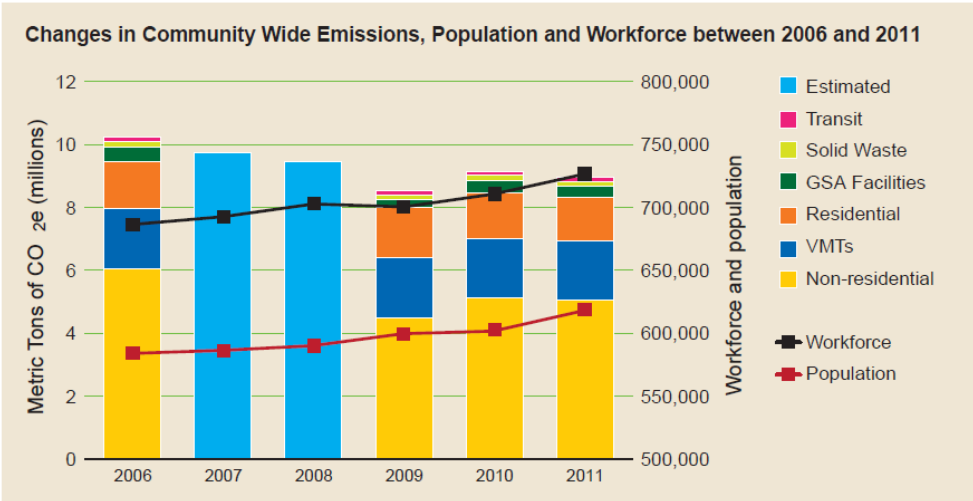
District Government facilities accounted for 3.9% of community wide emissions in 2006 and 3.3% of emissions in 2011. The figure below shows District Government emissions per sector in 2006 and 2011.

Figure 31. District Government emissions per sector in 2006 & 2011[78]



The transportation sector accounts for nearly the entirety of the District's remaining emissions. In comparison to other states and cities, the District is not home to energy-intensive or carbon-intensive industries that either consume relatively large amounts of energy or inherently emit CO2 during production processes (i.e. the production of certain chemicals, steel, and cement).

Figure 32: Changes in Emissions, Population and Workforce 2006-2011[79]



It should be noted that the District's overall CO2 emissions fell between 2006 and 2011 despite a population increase. According to the District's 2011 GHG Inventory, the city's emissions fell from 10.21 million tons of CO2e in 2006 to 8.93 million tons in 2011, even as the city's population grew from 583,978 to 617,996 and as the city's labor force grew and housing construction increased. The decrease in CO2 emissions is attributed to several factors, but energy efficiency upgrades to District government buildings,

including a major renovation to the city's wastewater treatment plan, achieved a reduction of approximately 150,000 metric tons of CO2.

The Inventory also credits CO2 reductions to a shift toward cleaner electricity generation, primarily from coal to natural gas, among the suppliers of the District's electricity for 16.8% of the overall decrease. A continued regional trend toward cleaner electricity generation may occur owing to the recent growth in regional natural gas production and adopted/pending federal policies.

Expected population growth between now and 2032 could undermine the District's efforts to reduce its overall energy consumption. The Sustainability Plan notes that the District's population might grow by 250,000 people over the next 20 years, which creates a challenge of reducing energy use in the face of a potentially significant growth in electricity demand. A carbon price applied to the District's building sector has the potential to deliver significant reductions in current energy consumption, while also establishing a market price signal that encourages entities to consider current and future energy use when making planning and investment decisions.

Looking Ahead

Two specific policy changes for the District's electricity market may be adopted in the very near future. The Building Energy Performance Task Force's 2014 report encouraged policymakers to consider the adoption of an energy efficiency resource standard (EERS) that would require utilities to achieve annual efficiency gains. The report cited an ACEEE study that found that "every state that reported statewide electricity savings over 1 percent in 2011 had an EERS in place."

In June 2015, the PSC opened a proceeding to identify technologies and policies to modernize the energy delivery system in the District of Columbia to make it more reliable, cost-effective, and interactive.[80] This effort has been commonly referred to in other jurisdictions as designing utility 2.0 and creating a new business model that would reward utilities for not just energy sales. The PSC will receive citizen and stakeholder feedback on these issues.

Institutions

Department of Energy & Environment

The Department of Energy & Environment (DOEE) is the regulatory agency with authority to oversee energy and environmental issues affecting the District. Their mission includes: "issuing permits, monitoring environmental conditions, providing funding and technical assistance, assessing environmental risks, developing policies, inspecting facilities, enforcing environmental regulations, working with other entities to solve everyday environmental issues, and informing and educating the public on local environmental trends and their benefits."[81] The DOEE guides energy planning and policy creation for the District, directly administers several clean energy programs, and manages contracts for clean energy rebate and financing programs operated by third-party administrators.

DC Sustainable Energy Utility

The DC Sustainable Energy Utility (DC SEU) was established in 2008 under the Clean and Affordable Energy Act (CAEA). [82] The CAEA established the Sustainable Energy Trust Fund (SETF) to fund the creation of a Sustainable Energy Utility, to be operated by a private company on a contractual basis under the supervision of the DOEE. The Vermont Energy Investment Corporation (VEIC) and eight other local partners formed the Sustainable Energy Partnership and won the contract to operate the DC SEU

beginning in March 2011.[83] The DC SEU provides various incentives and information for District residents and business to use less energy and save money and has an annual budget of about $18 million.

Laws and Policies

The District has implemented a number of laws and policies that guide clean energy market growth. This includes mandates for the usage of certain kinds of energy, as well as construction guidelines that ensure more efficiency buildings.

Renewable Energy

Renewable Portfolio Standard

Electricity suppliers with retail sales in the District must meet a gradually increasing mandate to provide renewable electricity. The District initially adopted a RPS in 2005 and made three significant revisions to the RPS in 2008, 2011, and 2014. As of 2015, electricity suppliers have to obtain at least 9.5% of retail electricity sales from Tier I renewable resources, (such as wind, solar, and biomass), and 2.5% of electricity from Tier II energy resources (either hydroelectric or waste-to-heat). After 2015, the requirement for Tier I compliance increases by 2% annually until 2020 when 20% of all electricity sales must be covered by Tier I generation. In addition, by 2023, 20% of energy must be generated by renewable sources with 2.5% derived by solar installations located within the District or a feeder system connected to the District.[84]

In 2011, for the purposes of meeting the solar requirement of the RPS, the District adopted legislation that required all solar PV or thermal systems certified by the PSC to be located within the District. The number of certified solar projects fell dramatically, but in recent years the PSC has received an increased number of applications for certification. As of the end of 2014, 33.2 MW of solar capacity was certified, with only 13.3 MW was located within the District. The PSC estimates that while the amount of solar capacity is increasing, it will still likely fall short of what is necessary to meet the RPS. For example, there is an estimated need of 54.7 MW of solar capacity in 2014 and 64.3 MW in 2015. The PSC notes that this potential shortfall might be mitigated by the elimination of the cap on qualifying solar capacity for installations owned by District agencies and the adoption of the Community Renewable Energy Act, which allows for community net metering projects of up to 5 MW.

The PSC's most recent RPS status report summarizes the compliance steps taken by the 28 electricity suppliers reporting retail sales to customers in the District as of 2013. The report indicates that most suppliers acquired Renewable Energy Credits (RECs) and Solar Renewable Energy Credits (SRECs) to comply with the RPS, while seven suppliers opted to pay the alternative compliance fee of $500 per MWh.[xxii] The sum of compliance fees jumped from nearly $5,000 in 2012 to nearly $700,000 in 2013, an increase which the PSC attributes to the difficulty of acquiring SRECs that must now come from in-District generation. The compliance fees are placed into the Renewable Energy Development Fund (REDF) that supports renewable energy market development in the District.

SRECs are generated by District-located solar hot water heaters and solar photovoltaic systems smaller than 5 MW. SRECs are valid for 3 years after the date of generation and provide a potentially significant source of revenue for owners of solar systems.[85] By statute, the fee that an electricity supplier must pay as a penalty in lieu of owning an SREC is $500/MWh or $0.50/kWh. As a corollary to this fee level, as of

[xxii] RECs are the unit of compliance for the general RPS, and SRECs are the unit of compliance for the solar requirement of the RPS. Alternative compliance payments are made by suppliers that fail to acquire the requisite number of RECs, and those fee payments are deposited in the Renewable Energy Development Fund.

March 2015, the open market price of SRECs in the District was $480/MWh or $0.48/kWh. This is to be expected, as SREC purchasers (suppliers that must comply with RPS) would be unwilling to buy an SREC at a price equal to or greater than the fee that must be paid to the PSC in place of owning the SREC. It is worth noting that this SREC price is nearly double the next highest SREC price of any other state in the nation. In most states, SRECs trade at a price below $100/MWh.[86] This should indicate that there is a strong market signal to develop solar in the District. Also, with SREC prices at this high level, distributed solar is highly cost effective and can be sold at a price far below the price of grid-based electricity.

Net-Metering

Net metering is a regulatory structure that allows distributed generation systems to sell any unused power back into the grid, with the utility paying a set rate per kwh. Net metering has been in effect in the District since March 2000 for residential and commercial customer-generators with systems powered by renewable energy sources, combined heat and power (CHP), fuel cells, and microturbines. Systems up to 1 MW in size are eligible, and for community renewable energy facilities, systems up to 5 MW are eligible. Systems that are 100 kW or less get credits for their net excess generation which are carried over to the customer's next electricity bill indefinitely at a retail rate. Systems that are between 100 kW and 1 MW get their net excess generation credits carried over to the customer's next electricity bill indefinitely at a generation rate.[87] In 2014, the Council of the District adopted legislation authorizing community net metering, and the PSC is accepting comments on how to establish rates for community net metering.

Efficiency

Green Building Act

The Green Building Act of 2006 (GBA) is an integral part of the District's green building strategy. It requires that all non-residential District public buildings with at least 10,000 square feet of floor area be certified at LEED Silver or higher (schools must be LEED Certified or higher).[88] Furthermore, these non-residential buildings must be designed to achieve an ENERGY STAR score of 75 or greater. District owned or financed residential projects with at least 10,000 square feet of floor area must exceed Enterprise Green Communities certification standard. Since January 2012, all new non-residential private development projects 50,000 square feet or larger are required to be LEED Certified or higher under the GBA.

By the District's own calculations, buildings covered by the GBA and benchmarking rules account for fewer than 2,000 (1.6% of properties) of the District's 128,000 buildings. However, these buildings account for more than 48% of total floor area and 85% of total commercial floor area. The table below shows the sectorial breakdown of floor area subject to the GBA and benchmarking requirements.

Table 12: Covered Properties under the Green Building Act[89]

Sector	Covered Property Size (sq. ft.)	Covered Floor Area (million sq. ft.)	Covered floor area as % of Sector floor area
Commercial	50k+	183	85%
Multifamily	50k+	91	60%
Institutional	50k+	36	69%
Municipal	10k+	35	96%
Industrial	50k+	6	50%
Single Family*	50k+	-	0%
Federal**	N/A	-	0%
Total		351	48%
There are no single-family properties this large. *****The District has no authority over Federally owned properties.***			

Clean and Affordable Energy Act of 2008

In addition to requiring certain buildings meet certification requirements, the Clean and Affordable Energy Act of 2008 (CAEA) requires that all District public buildings with at least 10,000 square feet of floor area be energy benchmarked annually starting in 2009.[90] The CAEA also established private sector benchmarking requirements starting with buildings with at least 200,000 square feet of floor area in 2011 (ultimately delayed to 2012). Private building requirements incrementally apply so that all buildings (including multi-family residences, with at least 50,000 square feet of floor must be benchmarked by the end of 2014. The District government estimates that the benchmarking requirements effect approximately 200 District public buildings (which are over 10,000 square feet) and 1,800 private buildings (which are over 50,000 square feet).[90] All public and private benchmarking results are publicly disclosed.

Energy Efficiency Financing Act of 2010

The District's Energy Efficiency Financing Act was passed in 2010 and amended in 2012. This law was designed to facilitate the financing of clean energy projects in the District, and set up the District's Property Assessed Clean Energy (PACE) program.[xxiii] The law established the Energy Efficiency Loan Program; gave the mayor the authority to raise up to $250 million in revenue bonds to fund the program; and created the National Capital Energy Fund to house the funds and revenue from future interest payments. The law stipulates that loans made from the Energy Efficiency Loan program can be repaid by Special Assessments which are levied and paid in the same manner as property taxes.[91] To date, this $250 million bonding authority and loan fund has never been tapped or used. Instead, the PACE program is currently operating on purely private funding.

Sustainable DC Act of 2012

The District's Sustainable DC Act 2012 amended the Energy Efficiency Financing Act. The Sustainable DC Act authorizes the issuance of bonds from private financing institutions, to allow the DC PACE program

[xxiii] The PACE program is described in greater detail in Chapter 2 of this report.

more operational flexibility. This law also amended the CAEA so the energy benchmarking program now requires disclosure of ENERGY STAR Portfolio Manager scores for all private buildings over 50,000 sq ft.[92]

Energy Conservation Code

In 2014, the District adopted new construction codes that, among other things, strengthen the energy and green building requirements that new construction projects must meet. The Energy Conservation Code of 2013 (ECC) applies to all commercial and residential buildings.[93] It is based on 2012 edition of the International Energy Conservation Code (IECC)[94] with amendments specific to the District[95]. The 2013 code produces a building that is about 30% more energy efficient than the building required by the 2008 code.

Green Construction Code

The Green Construction Code of 2013 (GCC) extends the practices mandated by the GBA. It is based on the 2012 edition of the International Green Construction Code (IGCC)[96] with District specific amendments[97] and covers site development, land use, material conservation and efficiency, energy conservation, water conservation, and indoor air quality. The Green Construction Code (GCC) applies to all commercial projects with at least 10,000 square feet of floor area and all multifamily residential projects with at least 10,000 square feet of floor area and at least 4 stories tall. There are several alternative compliance paths to the GCC: (1) ASHRAE 189.1-2011; (2) LEED Certified or higher; (3) Enterprise Green Communities Certified or higher; and (4) National Green Building Standard (ICC-700) Bronze or higher, and ENERGY STAR New Homes or Multifamily High-Rise Certification.[98]

Other Policies

Building height restrictions and historic districts and building policies also influence the building market and energy use in the District.

The Height of Buildings Act of 1899[99] sets maximum building heights, increasing demand for maximizing Floor Area Ratio (FAR)[100] and potentially limiting the size of renewable energy systems that can be installed on building rooftops, especially in the dense downtown core. Both of these consequences make it challenging to install rooftop renewable energy systems that are capable of meeting the energy needs of the building on which they are installed.

Under the Historic Landmark and Historic District Protection Act (1978)[101] and the National Historic Preservation Act,[102] there are approximately 50 historic districts and over 800 individually designated buildings. These regulations can limit the depth of energy retrofits because retrofits may not impact the visual appearance of the building such that it is incompatible with its historic designation. Furthermore, historic district regulations generally prohibit alterations that are visible from the public right of way—limiting renewable energy system installation. As pointed out by the District's Net Zero building report, the issues to energy efficiency and renewable energy deployment will increase as more buildings cross the 50-year age threshold after which buildings can be considered historic.[100]

District Goals

Sustainable DC is a sustainability planning effort led by the DOEE and the Office of Planning first initiated in late summer 2011. Through Sustainable DC, various stakeholder groups and volunteers met regularly to draft a vision and develop recommendations for goals and actions within the topics of built environment, climate, energy, food, nature, transportation, waste, water, and the green economy. The

work of Sustainable DC culminated in the Sustainable DC Plan.[103] The following goals from the Sustainable DC Plan deal with climate and energy targets.

50% Reduction in CO2 Emissions by 2032

The Sustainable DC Plan includes a goal to reduce citywide greenhouse gas emissions by 50% (and 80% by 2050) while adapting to the hazards of climate change. The Sustainable DC Plan identified the following as potential means of achieving that goal: emissions reduction targets for each emission source or sector of the economy; interactive online tools such as calculators, online portals or forums that provide better emission data, and allow people to make more informed decisions; and financial tools, such as a carbon tax or a carbon benefit program.

50% Reduction in Energy Use and 50% Power from Renewables by 2032

The Sustainable DC Plan includes a goal to reduce energy consumption by 50% and increase the use of renewable energy to 50%. The Sustainable DC Plan identified the following as potential means of achieving these goals: mandatory energy audits and disclosure for all buildings periodically and at the point of sale; the replacement of public street lighting and related infrastructure with efficient, energy-efficient models; shifting reliance from coal-generated power sources to more renewable sources.

Each of these goals would be incredibly ambitious on their own. As mentioned above, the District has little industry and no power generation, so strategies for accomplishing these goals must heavily rely on the choices of building owners within the district to reduce and decarbonize their energy consumption.

Programs

In the District, the DOEE and the DC SEU oversee various clean energy rebate and incentive programs. DC PACE (discussed below) is the only loan program in the District.

Rebates

Offered by DOEE

DIY Home Energy Audit Program

This program encourages District homeowners to conduct a Do-It-Yourself Audit to identify and correct most energy efficiency problem areas.[104] The DIY Home Energy Audit website provides guidance on performing a DIY audit and recommends the use of a certified contractor to make major home energy efficiency improvements.[105]

Discounts on Utility Bills

This program provides low-income District residents with discounts of on utility bills to help reduce their utility costs while educating them on energy efficiency practices that further reduce their energy spending. Program participants must demonstrate financial need to qualify and must complete a short program that teaches them how to save energy in their home. This program is funded through a Low Income Home Energy Assistance Program (LIHEAP) block grant, which amounts to about $10.3 million for fiscal year 2015.[106]

Weatherization Assistance Program (WAP)

This program helps low-income residents reduce their energy bills by providing technical and financial assistance to make their homes more energy efficient. WAP performs energy audits for qualifying families and installs audit-recommended energy efficiency measures to help families maintain energy-efficient, safe and healthy homes. In the District, WAP is administered through selected Community Based

Organizations that hire local contractors to install the efficiency measures recommended by the audit. WAP is funded by the U.S. DOE, which allocated about $538,000 to the District for fiscal year 2015.[107]

Solar Advantage Plus Program

This program provides rebates to help low-income District residents install solar panels on their homes. Authorized solar installers design and install solar PV systems free of charge for homeowners and receive a rebate of $2.50/Watt, with a maximum rebate of $10,000 per system. The program operates on a first-come, first-served basis.

Offered by DC SEU

Appliance Rebates

The DC SEU offers appliance rebates on select ENERGY STAR appliances. Rebates range from a few dollars to hundreds of dollars depending on the appliance.[108]

Income Based Incentives

The DC SEU offers no-cost Compact Fluorescent Lights (CFLs) to patrons of local food banks meeting certain income requirements, distributed directly through the food banks. The DC SEU also offers incentives to homeowners and housing groups that meet certain income requirements to install solar photovoltaic systems or solar arrays on single or multifamily homes.

Home Performance with ENERGY STAR

The DC SEU's Home Performance with ENERGY STAR Program is a national program sponsored by the U.S. DOE that incentivizes homeowners to identify and install energy efficiency improvements in their homes. The DC SEU is the local DC implementer of this program, and offers financial incentives of up to $1,800 for qualifying home energy upgrades, such as air sealing and insulating your home.[109]

Low-Income Comprehensive Multifamily Program (LIMF)

The DC SEU offers financial incentives and technical assistance to affordable housing developers and property owners who incorporate energy-efficient systems and measures in the new development, redevelopment, or substantial rehabilitation of affordable housing in the District. To qualify for incentives, developers must demonstrate that at least 66% of their residential units per building are designated for or inhabited by households with incomes at or below 60% Area Median Income.[110]

Low-Income Multifamily Implementation Contractor Direct Installation Program (ICDI)

The DC SEU offers a variety of energy- and water-saving devices and upgrades at no cost to owners and property managers of qualified affordable housing units. The DC SEU provides resident education on the equipment being installed and hires contractors to install the equipment at no cost to building owners or residents. The same income restrictions as the LIMF program apply.[111]

Business Energy Rebates Program

This program provides District businesses, institutions, and owners of multi-family residences with rebates for installing energy-efficient equipment. Qualifying measures include lighting, HVAC, boiler and gas fired water heater upgrades, steam trap upgrades, compressed air, refrigeration, VFDs and food service/vending. Rebates are available up to a maximum of $80,000, per location, per fiscal year.[112]

Commercial and Institutional Custom Program

This program targets owners of large buildings in the District who are replacing old equipment, renovating an existing building, or beginning a new construction project with an incentive amount up to $80,000 per

location, per fiscal year. The DC SEU offers average rebates of $60 per MWh ($0.06 per kWh) and $12 per MMBTU ($1.20 per therm) of project savings. Measures or operational improvements leading to cost-effective energy savings are eligible for consideration to receive incentivized services from the program. Program services may include financial incentives, technical and design assistance, and coordinating services to assist consumers, design professionals, vendors, and contractors in overcoming the barriers to installing energy-efficient equipment.[113]

Financing

Property Assessed Clean Energy

The District has a Property Assessed Clean Energy (DC PACE) Program for commercial and multifamily properties. The PACE program provides loans to building owners for clean energy upgrades which are paid back via an assessment on the building's property taxes. The assessment constitutes a lien on the property—loan applicants must certify that the assessment does not violate any existing lender agreements. The lien and the responsibility to pay back the loan through the property tax bill are attached to the property, and stay with the property if it is sold. The District's PACE program provides financing for projects between $250,000 and $10,000,000 located in the city. The combined debt on the property (including the PACE loan) cannot exceed 90% of the property value. The Mayor can issue up to $250 million in bonds to fund this program. These funds, as well as any funds from the Energy Efficiency Conservation Block Grants, will be held in the National Capital Energy Fund.

On-bill Financing

Currently, on-bill financing is not permitted within the District. In other jurisdictions, this tool has been authorize to allow customers to repay loans for investments in renewables or energy efficiency via their electricity bill. The on-bill financing concept is discussed in more detail in the Green Bank chapter.

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[1] "New York State Green Bank Business Development Plan," Booz & Co., September 3, 2013.
[2] "National Solar Jobs Census 2014 | The Solar Foundation." Accessed May 10, 2016. http://www.thesolarfoundation.org/national-solar-jobs-census-2014/.
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