The Earth Institute Research Program on Sustainability Policy and Management provides a rigorous analytic base to help inform sustainability decision-making. Our research addresses the fundamental issues facing professionals and policy makers implementing sustainability strategies. We seek to better understand the mechanisms behind sustainability management, in order to develop and promote more effective public policies and organizational practices. We analyze sustainability strategies and initiatives, examine methods of valuing sustainability practices, and study the impact of policies that stimulate sustainability innovations and trends. The goal of the program is to develop models to overcome barriers to institutionalizing sustainability in organizational operations. We aim to hasten the integration of sustainability principles in the management of organizations by providing the data necessary for decision-making.

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Executive Summary

Greater investment in clean energy (i.e., renewables and energy efficiency) by end-use energy consumers requires several critical elements. Efficient financing is one of those key elements. Given both limitations in the ability of the public sector to participate directly in these financings and key challenges in the ability to finance these investments more generally, innovative financing models are often necessary. Some of these financing models can be executed without any form of government support (private sector financing), while other models do require some form of government support (public-private partnerships). The financing methods shown in this report represent a sampling of both private sector financing and public-private partnership models.

Private sector financing models discussed include energy services company (ESCO) financing and solar asset securitization. Public-private partnership models include guarantee structures, on-bill programs, property assessed clean energy (PACE) programs, legislatively-enabled utility charge securitization, and green banks. Each of these models employs one or more of a few general techniques to produce an attractive financing. These techniques include credit enhancement (e.g., third-party guarantees, financing eligibility criteria), special legal or regulatory provisions, and securitization.

A key consideration of any financing model is the cost of capital it produces. While several factors make it difficult to empirically compare the cost of capital between options, it is possible to subjectively evaluate the cost of capital differences between the various financing models.

General observations include:

- The purely private sector options currently differ relatively little in cost of capital, in that both offer a low cost of capital by financing only high quality assets (ESCO financing) or a more senior portion of a diversified pool of assets (solar securitization).
- Without government support, on-bill and PACE programs would both be more expensive than the private sector models because these financings involve less customer selectivity, although government support keeps the cost of capital comparable to private sector models.
- Legislative securitization has a very low cost of capital. The large reduction in cost of capital compared to other options is necessary since the related legislative framework imposes greater constraints than the regulatory framework established through on-bill and PACE programs.
- Guarantee programs and green banks allow for indirect government financing of a portion of the clean energy investment with a corresponding reduction in cost of capital. The effective cost of capital can vary considerably depending on the underlying risks guaranteed or financed.

For the policy maker, it is instructive to consider the level of government support that is feasible for clean energy investments. The models that have the greatest potential to lower the cost of capital (through the greatest risk reduction) generally involve the greatest level of government support.
I. Introduction

Clean energy includes both renewable energy and energy efficiency investments. While renewables can also play a role for energy producers, the focus of this report is on the adoption of clean energy investments by the end-use consumers of energy (businesses, governments, individuals, not-for-profits).

One of the oft-cited barriers to greater adoption of clean energy alternatives by consumers is the limited availability and/or high cost of financing. Other barriers include consumer education, regulatory impediments, and implementation challenges. Whether or not it is the most important barrier, financing is important because the total cost of clean energy investments is comprised primarily of the upfront investment rather than ongoing costs. Solar panels, for example, currently have a large upfront cost, no fuel costs (because sunlight is free) and low maintenance costs, so the total ongoing expense is driven primarily by the cost of financing.

Given that financing is an important consideration for clean energy implementation, it is possible to consider three broad approaches to financing.

- **Public sector financing:** Investments are financed entirely through public borrowings (e.g., Treasury or municipal debt). Investments may be made directly by the government, or may be facilitated by the government, if, for example, the government borrows money and then invests in a private sector enterprise that then deploys the capital.

- **Private sector financing:** Investments are undertaken directly by individuals or businesses, and financed accordingly. The efficacy of this model relies on the creditworthiness of the borrower (and/or the creditworthiness of other key participants in the transaction).

- **Public-private partnerships:** These can take various forms. In each case, investments involve some form of capital contribution and/or risk mitigation (e.g., guarantee) from a government entity, and some form of capital contribution or risk mitigation from a private sector participant(s).

While the public sector model is perhaps the easiest to implement purely from a financing perspective (as the federal government and most state and local governments can access the markets for reasonable quantities of low-cost capital), there are significant limitations to this approach.

- **Trend towards decreasing government involvement:** In the energy sector there has generally been a trend towards de-regulation and private market solutions, rather than increased government involvement.

- **Scale of clean energy investments:** Many investments are sufficiently small that direct government financing may be inefficient.

- **Policy considerations:** There are policies that make clean energy investments less compelling for public sector participants. One example is tax policy, where credits or accelerated depreciation can assist taxpaying entities but do not provide benefits to entities that do not pay taxes. Separate from the economic aspects of policy, investments in clean energy may be viewed negatively by some from a political perspective, and so governments may be reluctant to directly facilitate these investments.

Given these limitations of direct public sector financing, it will be necessary for a significant portion of clean energy investment to be undertaken without it. While investments can be financed through private sector participants, this may result in a high cost of capital relative to a public sector model. There are, however, various ways to combine public sector “support” (which may be evidenced in different ways) with private sector borrowing or investment. This approach is designed to increase the availability, and lower the cost, of capital.

Government support for clean energy investment is rational because these investments can produce positive externalities such as lessened environmental damage, reduced harmful health effects, or increased energy self-sufficiency. Therefore, it is reasonable that some of the costs of these investments should similarly be socialized through government support. Government support has
been a critical element in the U.S. financial markets where there are deemed to be significant benefits to the overall economy including student lending, residential mortgage lending, export financing, and small business financing.

Setting aside the rationale for government support, it is important to understand why, in many cases, it is necessary. Clean energy investments often have one or more characteristics that make them more difficult to finance:

- **Weak credit quality:** Many individual borrowers (businesses or individuals) are of a relatively low credit quality, with a poor or limited credit history. Some financiers have simply chosen to only finance high credit quality borrowers, thus limiting the scale of clean energy investment. Others have chosen to develop more innovative solutions as reviewed in this report.

- **Difficult valuation of collateral:** While many borrowers are of a low credit quality, this has not impeded efficient lending for other asset types. One example is the auto market where collateral is relatively easy to value and for a lender to seize and liquidate if necessary. Clean energy investments, on the other hand, may be difficult to repossess (e.g., home insulation once installed). Even where repossession is possible, investments may be difficult to value (e.g., solar panels), as the technology is rapidly evolving and there is no established secondary market for these assets. Collateral quality is an important consideration in financing structures.

- **Presence of regulatory risk:** Clean energy investments are often encouraged through different governmental actions such as portfolio standards, production tax credits, or other incentives (e.g., feed-in tariffs). Many of these elements are central to clean energy investments, but this creates a double-edged sword: future changes to these regulatory policies could adversely impact investment returns. Government support, whether through financial guarantees, pledges, or otherwise, may lessen these regulatory risks and enhance the financeability of clean energy investments.

- **Need for long-term financing:** Clean energy investments produce returns by increasing energy supply (e.g., solar photovoltaic (PV) panels) or decreasing energy demand (e.g., insulation). Benefits often accrue over a long period of time. If the repayment of borrowings cannot similarly be allocated over a long time period, investments may not be made, as the costs of debt repayment may overshadow benefits in the earlier years. By analogy, far fewer Americans would own homes if mortgages needed to be repaid over a five-year period. Government involvement in mortgage finance assists in creating long-term financing options. Similarly, government support can help to create longer-term financing options for clean energy investments.

Whether clean energy investments are undertaken by private market participants or through public-private partnerships, there are different approaches that are commonly employed to address some of the challenges associated with many clean energy investments:

- **Credit enhancement:** There are different ways to enhance the credit quality of a borrowing:
  - **Guarantees:** It is often possible to obtain a guarantee for all or a portion of a financing from one or more creditworthy entities. This can reduce the likelihood of a default in repayment of the financing, and thereby improve terms for the borrower.
  - **Financing criteria:** Another way to enhance the credit quality of a borrowing is simply to finance only certain assets that are of a higher credit quality. While this does not address fundamental financing challenges, it is a method of securing attractive financing (albeit for a smaller balance of assets).

- **Special legal or regulatory provisions:** There are markets where low credit quality borrowers can borrow large sums over a long period of time with limited collateral. One such market is for student loans. While some of this market is government-supported, there is also a private student loan market where the government does not assume the risk of borrower default. Importantly for the private student loan market, unlike other forms of consumer debt (e.g., credit cards), student loans are generally non-
dischargeable in bankruptcy\(^1\). This may provide an increased level of security to lenders, which reduces their risk, and hence, the cost to the borrower. This is one example of how a legal or regulatory framework can be modified to facilitate improved access to capital. Other examples are discussed in this report.

- **Asset-backed financing (securitization) approach\(^2\):** In this technique, borrowing terms are driven primarily by the credit quality of an asset or pool of assets, rather than the creditworthiness of the borrower. Asset securitization is a common financing technique used in the modern economy. While there may be different benefits of securitization, there are two key ones:

  - **Financing based upon a higher credit quality:** If the asset(s) securitized are of a high quality, it may be more efficient to borrow based upon the credit quality of those assets, rather than the borrower's own credit quality. For example, it may be less costly for an equipment lessor to obtain a loan based upon the value of equipment and future payments from the lessee, rather than the lessor's creditworthiness. Also, securitizations often benefit from being collateralized by a diversified pool of assets. Take, for example, a large pool of loans diversified by borrower and state, but structured similarly and made to borrowers of a certain credit quality. The default rates for such a pool of loans can be very predictable. This can reduce the severity of loss in a securitization compared with a loan to a single borrower (where a default is likely to cause a significant loss).

  - **Non-recourse borrowing:** In a typical securitization, the company undertaking the securitization does not bear the entire risk of default in the underlying assets. For example, consider a bank with a pool of loans totaling $100, which is securitized to produce $90 of loan-backed debt. If defaults resulted in the loans being valued at only $70:

    - the bank would lose its $10 remaining investment in the loans (in a securitization, the company sponsoring the securitization generally retains “first loss”); and,

    - the $70 value of the loan collateral would be applied to the $90 securitization, with investors in the securitization bearing a $20 loss.

While the level of losses in the aforementioned example is likely unrealistic, it demonstrates the impact of non-recourse borrowing. Had the bank borrowed $90 directly by pledging its own creditworthiness, it would be “on the hook” for repayment of $90.

Securitization can produce an exceptionally low cost of capital for clean energy investments. The overall cost of capital is determined by the cost of each component of the capital structure (e.g., debt versus equity) and the relative proportion of each. Securitization can reduce the cost of capital by increasing the proportion of debt available and reducing its cost.

- **Proportion of debt:** Customer defaults are common but somewhat unpredictable. Accordingly, for assets (e.g., loans, customer contracts) with an expected present value of $100, less than $100 of debt would typically be raised through securitization (e.g., $90). The company undertaking securitization must contribute any amount not financed (e.g., $10). Diversification can allow the proportion of debt to be high, while key drivers of the level of debt include the creditworthiness of the assets.

- **Cost of debt:** The cost of debt is driven by market conditions. As with the proportion of debt, it is also impacted by the creditworthiness of the assets securitized. However, the proportion of debt itself is a determinant of the cost of debt. For example, for two identical pools of assets, if one investor is offered debt equal to 90% of the value of the assets, that investor should demand a higher return than an investor offered debt equal to 50% of the value of the assets. The majority of securitizations are structured to a very high credit quality.

In a securitization, the proportion of debt is often higher, and the cost of such debt lower, than the company might be able to obtain based upon its own credit. This is because the pool of assets is diversified and the customer base is generally creditworthy. By obtaining a higher proportion of debt, and less expensive debt, the cost of capital through securitization can be lower than it would be through other financing means, and this can reduce the level of payments made by customers. This improves the economics of clean energy investment.

Before discussing specific financing models, it is important to acknowledge broader factors that impact

\(^{a}\)While a detailed review of securitization principles is beyond the scope of this report, many of the approaches highlighted in this report involve securitization, and so key elements of this financing technique will be discussed herein.
clean energy investment. One is the cost of conventional energy (e.g., electricity from natural gas-fired generation). Another is the cost of the clean energy investment itself (e.g., price of solar panels). While the focus of this report is on financing, changes in these other factors can play an important role in the overall economics of clean energy investment.

It is equally important to recognize that one key driver of capital cost is the risk-free rate (e.g., U.S. Treasury yields). Regardless of the financing innovation, changes to the risk-free rate will impact the overall cost of capital. To put this into context, the graph below shows changes in the 10-year U.S. Treasury yield since 1960.

10-Year U.S. Treasury Yields
(January 1960 to February 2014)

As is evident from the graph, U.S. Treasury yields are near 50-year lows. All else equal, potential rate increases will have a negative effect on the economics of clean energy investment. While higher interest rates may also be coincident with higher costs for conventional energy (thus mitigating the effect of higher rates), the adverse impact on clean energy investments may be greater given the importance of capital costs to their overall economics.

While acknowledging these broader considerations of investment economics and market conditions, the next sections of the report will focus on different financing models used for clean energy investment. These models employ the financing techniques (e.g., credit enhancement, special legal or regulatory framework, securitization) introduced in this section of the report.
Customers investing in clean energy can often finance directly. Assuming that these investments are intended to be of a relatively low risk (which is a reasonable assumption or else such investment would not likely be made), the bulk of the investment should be financed with debt. For individuals, this could be a bank loan or a lease arrangement, as is typical with other types of consumer finance (e.g., auto leases, mortgage loans, student loans). For businesses, this borrowing may come in the form of a bank loan, a lease, or through some form of bond offering (to the extent that the borrower is sufficiently well-established to access that market).

The problem with direct financing in the case of clean energy investment is that the associated financing is often limited in availability or expensive for one or more of the reasons cited above (weak credit quality, difficult collateral valuation, regulatory risk, long-term financing need). To illustrate the importance of these factors, it is possible to look at some markets that possess some of the negatives cited above (e.g., low-quality borrowers, poor collateral), and that lack some of the key mitigants (e.g., special legal or regulatory framework, credit enhancement). One such market is for credit cards to subprime borrowers. Here, interest rates can exceed 20%, and repayment periods are relatively short. For a clean energy investment where capital cost drives economics, such a high cost and short repayment period would make investments untenable.

There are, however, financing models in the private sector that use some of the risk mitigation techniques previously discussed to achieve more favorable financing terms.

Energy Services Company (ESCO) Financing

Background

In the case of energy efficiency, a business, government, or not-for-profit entity may engage the services of an “energy services company” (ESCO). An ESCO will normally evaluate the efficiency opportunity, procure and install necessary equipment, and may provide ongoing maintenance services. While the customer is generally required to pay some portion of the upfront costs, ESCOs will often arrange financing for the customer. In these instances, the customer is normally required to pay a monthly fee based upon, but less than, the energy savings produced. This leaves the customer with greater monthly cash flow than had such energy efficiency investments not been undertaken. Normally, the ESCO “guarantees” these savings, such that the customer monthly payment may be reduced or eliminated if the savings are not realized.

This arrangement may solve the financing issue for the customer (i.e., the customer does not need to arrange its own financing, but rather, enters into the monthly payment arrangement), but creates a financing issue for the ESCO (i.e., the ESCO must finance this arrangement to pay for upfront equipment and installation costs). There are a few critical aspects of this transaction to consider:

- **Profitability of the energy efficiency investment**: If the customer (e.g., a manufacturing business) were to file for bankruptcy, a bankruptcy proceeding would determine whether the customer should continue to make monthly payments (and therefore continue to utilize the energy efficiency investments). Because monthly savings are “guaranteed”, other creditors should generally approve such ongoing arrangements, as it will improve the customer’s cash flow, and therefore, its ability to service other debt.

- **Asset value**: While some portion of the energy efficiency investment may represent “soft costs” (e.g., engineering or design costs) or assets that have limited resale value (e.g., insulation once installed), some of the investment may represent hard assets that do have resale value. These hard assets may be sufficiently valuable that the ESCO can redeploy them to mitigate its loss in the event of a customer default.

- **Creditworthiness of the customer**: Notwithstanding the incentives of customers to continue making monthly payments to the ESCO in the event of credit distress (as noted above), an ESCO will need to be reasonably certain that the customer will remain financially viable and that the customer’s location will not “go dark” (i.e., no solvent tenant available to make monthly payments for the building’s energy efficiency investments).

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b These guarantees are often complicated, as a failure to realize monthly energy savings could result from the energy efficiency investments not performing as promised (i.e., a default in the ESCO’s promise), or due to changed circumstances of the customer (e.g., using more power than expected). For this reason, ESCO contracts are normally undertaken with large customers, where the energy savings are sufficiently large to justify the costs of appropriate measurement and verification.
Creditworthiness of the ESCO: Because the stream of customer payments relies upon the ESCO’s ability to properly determine customer savings upfront and, if required, repair or maintain the energy efficiency investments to generate the savings, the quality of the monthly payment stream is necessarily impacted by the viability of the ESCO.

Complexity of the savings arrangement: In the event that energy is not saved because of the investments, it is likely that the customer will not make payments to the ESCO (as the “guaranteed” savings have not materialized). The ESCO, however, may allege that the customer violated the contract (e.g., not using equipment as intended), and insist that payments continue to be made.

In many instances, the ESCO is able to help the customer arrange for long-term financing secured by the customer obligation. Otherwise, it may be necessary for (a) the ESCO to rely on other forms of borrowing which can be shorter in term or more expensive, or (b) the customer to pay the ESCO upfront for the investment, which may be infeasible for the customer. An illustrative transaction schematic for this type of financing is shown below.

Advantages
There are several reasons why it may be more attractive to finance through structuring a financing of this sort (essentially, financing based primarily on the credit strength of the customer) rather than borrowing based solely upon the creditworthiness of the customer or the ESCO:

- More favorable debt terms: To the extent that the customer being financed is of a higher credit quality than the ESCO itself, it may be possible to see an improvement in financing terms compared to what the ESCO might obtain. Because the monthly payments are likely to continue in the event of credit distress of the customer (as noted above), this type of financing may also offer more favorable terms than a direct customer borrowing.

- Less utilization of borrowing capacity: If either the customer or ESCO chooses to borrow directly, it would be fully liable for repayment of the debt. If, however, the ESCO chooses to structure a financing based primarily on the credit quality of its customer (recognizing the ESCO will remain liable for certain ongoing maintenance obligations and for ensuring customer savings), it is expected to create a lesser financial obligation for the ESCO. Similarly, because the ESCO guarantees customer savings, it creates a lesser financial obligation for the customer than traditional debt that must be repaid regardless of the efficacy of the investment.

Disadvantages
The primary disadvantage is that ESCO financing has proved to be a useful financing technique for only a relatively small portion of the overall energy efficiency market.

- Suitable primarily for larger investments: Investments must be sufficiently large for the borrower to justify the cost of monitoring and the complexity of analyzing the overall arrangement.

- Application primarily for high credit quality customers: ESCO financings have normally focused on the so-called “MUSH” market (municipal, university, school, and hospital customers) as they have the long-term stability to minimize the likelihood of a customer payment default.

- Not available to all ESCOs: Only ESCOs with a strong track record and credibility are typically able to
efficiently access this market given that their ongoing viability is essential to support the ongoing payments from customers.

- **Difficult to securitize**: Securitization generally relies on a statistical approach to predicting defaults based upon a relatively homogenous pool of assets. ESCO contracts tend to be highly customized to meet the needs of each customer, and because of the different risks inherent in performance guarantees, each contract often presents different degrees of financial risk for the ESCO. For these and other reasons, it is often difficult to efficiently pool ESCO contracts into a securitization.

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**Case Study – Foster-Glocester Regional School District**

ConEdison Solutions is an ESCO, affiliated with, but separate and distinct from, the regulated investor-owned utility Consolidated Edison Company of New York, Inc. One of its projects involved installing energy conservation measures in a high school and middle school in the Foster-Glocester Regional School District in Rhode Island. Energy conservation measures included renewable energy, lighting controls, HVAC (heating, ventilation, air conditioning) equipment and controls, electrical enhancements and water efficiency measures.

The capital investment totaled approximately $13 million, and is expected to produce estimated annual energy and maintenance savings of over $900,000. This translates to a simple payback period of approximately 14.4 years (13/0.9). ConEd Solutions will guarantee annual savings over the term of a 13-year energy savings performance contract. Tax-exempt municipal revenue bond financing was arranged through the Rhode Island Health and Educational Building Corporation Public Schools Revenue Bond Financing Program, with principal and interest on the debt being repaid over time through ongoing payments from the school district.

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**Solar Asset Securitization**

*Background*

For the building owner that wishes to reduce energy costs through installing solar PV panels, there are various considerations. These include site suitability (e.g., amount of sunlight given location and orientation), the logistics of installation (e.g., condition of the roof, permitting requirements, and interconnection with the utility company), and other issues (e.g., reliability, aesthetics). Importantly, there are also economic concerns, namely, whether the reduction in electric bills from the utility company exceeds the monthly cost of solar panels (i.e., installation, maintenance and financing costs). This economic calculation is influenced by available incentives. Moreover, while some customers may have the financial resources to pay for solar PV upfront, for most customers, financing costs often drive overall economics.

Although customers may finance solar PV panels through unsecured borrowings, many customers enter into one of two types of arrangements. The first is a lease, where the customer pays a monthly fee with an “electric production guarantee” provided by the system provider/installer. The second is a power purchase agreement (PPA), where the customer pays a fixed rate based on how much electricity the solar panels actually produce. While there are some differences between the agreements, in general, the customer is obligated to make payments so long as the panels continue to operate as promised. If the customer moves, both arrangements generally allow the customer to (a) transfer the payment obligation to the new owner of the building, (b) prepay future payment obligations, or (c) move the solar PV panels to the customer’s new location. The contracts have a number of conditions, but the net result is a relatively secure, long-term stream of payments from customers.
Large solar system providers/installers may have a sufficient balance of these contracts to pool them together into a securitization. Through the securitization, the solar company raises debt backed by the panels and contracts, and receives upfront proceeds. A simplified transaction schematic is shown below.

### Advantages

There are several advantages of solar asset securitization.

- **Lower cost of capital:** Through isolating the credit risk of a high-quality pool of assets, it is often possible to achieve a higher proportion of debt, and for such debt to bear a lower cost, than for traditional borrowing techniques that the solar developer would use if it borrowed directly.

- **Non-recourse borrowing:** As in a typical securitization, the solar company does not bear the entire risk of default in the underlying assets. For example, if the solar company has a pool of leases/PPAs with an expected present value totaling $100, which is securitized to produce $60 of asset-backed debt, the solar developer should never lose more than $40 (i.e., its retained economic interest in the securitization). This reduces the degree of financial risk retained by the solar company and expands its borrowing capacity.

- **Market depth:** By creating a security backed principally by the value of customer payments under residential lease/PPA agreements, this is a form of consumer credit being offered to lenders. The market for creditors willing to lend against a diversified pool of creditworthy consumers is very deep, and this creates a much larger pool of capital for financing solar assets than would otherwise exist.
**Disadvantages**

There are also potential disadvantages associated with solar asset securitization. These include:

- **Complex financing technique:** Securitization involves complex credit and legal analysis. Accordingly, securitization can require a significant amount of upfront time, effort and expense. For this reason, only solar companies with large balances of solar assets (leases or PPAs) are likely to find securitization to be cost-effective.

- **Standardization requirements:** Securitizations typically require some level of standardization among the underlying assets so as to facilitate the credit analysis. Different solar companies are likely to produce leases/PPAs with unique characteristics, making it more difficult to pool assets into a securitization. This limits the overall scalability of this financing approach, although a very standardized lease/PPA product may evolve, allowing securitizations to be created with solar assets from different companies. This would offer scale benefits, in addition to allowing smaller companies to access the securitization market, even if they lack the scale to do so directly.

- **Unclear applicability to weaker credits:** While it is possible to finance a pool of homogenous credits of nearly any quality through a securitization, the cost will reflect the underlying risk. Especially for a relatively new market where performance history has yet to be established, lenders can be unwilling to lend to a pool of weaker credits. Accordingly, at least in the early stages of solar asset securitization, it is unclear the degree to which securitization will be an efficient tool for pools of contracts with less creditworthy customers.

The case study below provides one recent example of solar asset securitization.

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**Case Study – SolarCity $54.4 million Solar Asset Backed Notes, Series 2013-1**

In November 2013, SolarCity completed a $54.4 million securitization of certain of its solar assets\(^1\). The bond financing had a rating of BBB+\(^c\) from credit rating agency Standard & Poor’s\(^1\). As customer payments are received over time, collections are used to pay interest and amortize principal (similar to a mortgage). Accordingly, while the final principal payment to investors is expected approximately 23 years after issuance, the average time of principal repayment (weighted average life) is 7.05 years\(^1\). The interest rate of 4.8% was determined at pricing based upon 2.65% over the interpolated swaps curve, a commonly used benchmark\(^1\). The advance rate in the transaction was approximately 60%\(^1\). This considers both the size of securitization compared to the discounted solar asset balance (payments under leases and PPAs), and an interest reserve account funded by SolarCity.

While the financing terms reflect market conditions at the time of offering, they also reflect the credit quality of the collateral. Of the lease and PPA agreements included in the securitization, 71.1% are with residential

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\(^{c}\) BBB+ is an “investment-grade” rating, which connotes a high-quality debt investment, although it is near the lower end of the investment-grade rating spectrum.
customers and 28.9% are with commercial or governmental customers. Both customer bases are very creditworthy. The average residential customer FICO score is 762 (with a minimum of 680), while for commercial and governmental customers, for those that are assigned a credit rating, the ratings are all “investment-grade” (ranging from AA+ to BBB). This is an important consideration: the availability of long-term capital and its cost was favorably impacted by the quality of customers whose contracts were securitized. Where contracts of less creditworthy customers are securitized, the cost of capital will be adversely impacted, perhaps limiting the overall applicability of this form of financing.

The SolarCity transaction is important. Financial market innovation is an evolutionary process, and this transaction will undoubtedly pave the way for other securitizations of this type. Assuming this transaction performs well, and subject of course to market conditions, one would expect subsequent transactions (all else equal) to have a lower interest rate and/or higher advance rate, improving the cost of capital for the solar company and ultimately for customers. The Chief Financial Officer of SolarCity noted that “Securitization gives us [SolarCity] access to a new source of capital at a lower cost, and it allows us to more closely align our assets and liabilities. We offer fixed price contracts, and by financing them with fixed rate debt, we bring a greater level of predictability to our financing activities.”

A representative for the bank that structured the transaction noted “the transaction represents a tremendous breakthrough for SolarCity and the distributed generation solar industry. By accessing the securitization market, SolarCity has tapped into a large pool of highly efficient capital that can be used to fund its continued growth while significantly reducing its cost at the same time.”

While the SolarCity securitization is an important event in the development of clean energy finance, its near-term application to less creditworthy customers may be limited (unless and until there is sufficient experience with such customers to allow the risk to be properly evaluated). Moreover, with an advance rate of 60%, as compared to an advance rate of over 90% for many conventional asset types (e.g., auto loans to prime borrowers), the potential benefits of securitization are far from being realized yet. Nevertheless, this transaction illustrates a form of clean energy financing that does not rely on any government support for execution, unlike the public-private partnership models discussed in the following section.

d FICO score is a standard metric for evaluating the credit quality of individuals based primarily upon credit history. While the interpretation of credit scores varies, 680 is often the minimum score for prime borrowers, and an average credit score of 762 is very strong.
As discussed in the introduction, there are sound policy reasons for encouraging clean energy investment including lessened environmental damage, reduced harmful health effects, and increased energy self-sufficiency. In consideration for these societal benefits, many governments (and levels of government) have been willing to provide some form of financing support for clean energy investment, in addition to other forms of support (e.g., grants, tax credits, technical assistance). The most straightforward form of financial support is a guarantee, similar to insurance, which is discussed in the following section.

Guarantee Structures

Background
Perhaps the most easy-to-understand type of government financing support is a pledge of the government’s full faith and credit to the repayment of the principal of, and interest on, certain debt. If that debt is used to finance 100% of the investment, then this is effectively a public sector financing with the government assuming any risks inherent in the investment.

There are, however, numerous instances where a guarantee does not support 100% of the investment.

- **Partial guarantees:** A government agency may guarantee only one form of borrowing for a given investment, while providing no guarantee for other borrowings to finance the same investment. The government guarantee can work in different ways:

  - **Senior/subordinate structures:** The government may guarantee financings that are senior or subordinate in right of repayment to other (unguaranteed) financings secured by the same assets. Accordingly, the government may be taking lesser or greater risk with respect to the guarantee, respectively.

  - **Pari passu structures:** The government may guarantee a specified percentage of a financing (or may guarantee one of a number of financings with equal seniority as to right of repayment). In this case, the government assumes a similar risk profile as investors in an unguaranteed financing secured by the same assets.

- **Limited guarantees:** A government guarantee may support payment of principal and interest only if the default is attributable to certain factors. For example, the U.S. OPIC (Overseas Private Investment Corporation) is a federal agency focused on international development. For a fee, OPIC may provide political risk insurance against certain risks associated with foreign investment such as currency inconvertibility.

- **Contingent guarantees:** It is also possible for a government guarantee to be contingent upon certain events taking place with respect to the assets being guaranteed. For example, student loans guaranteed under the U.S. Federal Family Education Loan Program (FFELP) are guaranteed by the U.S. Department of Education for at least 97% of defaulted principal and accrued interest. However, FFELP loans can lose their guarantee in the event of improper loan servicing (i.e., billing, collection, record-keeping and other actions with respect to the loans).

There are ways to combine these types of guarantees with private sector funding to achieve different allocations of risk. The case study will discuss the application of partial guarantee structures for a particular U.S. federal agency. While the agency does not focus primarily on clean energy investments, its long track record and broad range of financing partnerships make it an interesting case study for how government guarantees function. With appropriate policy changes, these types of guarantees could be adopted to facilitate clean energy investment.

Advantages
There are often several advantages to using a guarantee structure:

- **Low cost:** Governments access the capital markets to finance a wide variety of capital expenditures, and defaults are comparatively few for high quality borrowers. A guarantee by such a government entity often results in a low cost of borrowing given its high credit quality and long track record of honoring its financial obligations.

- **Political considerations:** From a government’s perspective, it is often more attractive to offer a guarantee (which, in the expected case, may represent...
a small liability) and facilitate funding from the private sector, than to fund the investment directly (where the government would record a liability for the full amount of its investment). While the economic risk is similar, the government may have a greater ability to incur a guarantee in its budgeting process.

- **Involvement of private sector:** Even if a private sector lender looks principally to a guarantee for repayment, the lender will generally undertake at least some diligence with respect to the underlying assets that provide a source of repayment. Involving the private sector, and familiarizing them with the investments being financed, can set the stage for further capital raising without the benefit of a guarantee (albeit at a higher cost).

- **Easier to subsidize financing:** Government guarantees can be provided strictly on an arms' length basis, that is to say, where the fee the government receives for the guarantee reasonably compensates it for its risk of loss. While financing costs are normally visible to the market, the government can lower the fee to effectively subsidize the financing if desired from a policy perspective.

**Disadvantages**

While the use of guarantees is common, there are disadvantages to these structures including:

- **Crowding out other borrowings:** Governments, like individuals or businesses, have a finite amount of “borrowing capacity”. Even though guaranteed debt does not involve a direct government borrowing, lenders are likely to perceive government-guaranteed debt as an obligation similar to direct borrowing, and so the government’s borrowing capacity would be consumed. The degree to which this borrowing capacity is consumed should be a function of the government's expected exposure under the guarantee, which requires an analysis of the assets guaranteed.

- **Failure to develop true market-clearing prices for risk:** If the government guarantees assets, it does not allow a market-clearing price to be generated for the assets. Without these data points, it is difficult to determine the fair market value of the guarantee.

- **Increased cost versus direct government borrowings:** Where the government borrows directly (e.g., Treasury or municipal general obligation debt), there is no ambiguity as to the borrower. Because direct borrowing is common, there is a high level of liquidity for lenders and, therefore, a relatively low interest cost for borrowers. Guarantee structures tend to be less common and more idiosyncratic, thus interest costs for debt guaranteed by a government are often higher than for a direct obligation of the same government, all else equal.

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**Case Study – U.S. Small Business Administration 504, 7(a) and SBIC Programs**

The U.S. Small Business Administration (SBA) was created in 1953 as a separate federal agency to assist small business concerns and to strengthen the overall U.S economy. It has three significant public-private partnerships for financing small business investment.

- **504 program:** The 504 program is used to finance long-term fixed assets, principally real estate used by small businesses. A 504 project typically includes three parts: a senior loan from a private-sector lender covering 50% of cost, a subordinated loan from an SBA-certified development company (backed by a 100% SBA-guaranteed debenture) covering 40% of cost, and 10% equity from the small business borrower. The private sector takes relatively little risk in the senior loan, allowing that portion of the investment to be financed at a low cost. This subordinated debt can also be financed at a low cost because of the SBA guarantee. The public sector takes risk through guaranteeing subordinated debt of the borrower, although the SBA earns a fee from the small business borrower for providing the guarantee. This fee is intended to cover any losses incurred in connection with the provision of the guarantee.
○ **7(a) program:** In the 7(a) loan program, the SBA guarantees principal and interest payments on a portion of a loan made and administered by private sector lenders. These loans can be used by small businesses for a variety of purposes including working capital and fixed assets. Participating lenders agree to structure loans according to the SBA's requirements, and receive an SBA guarantee on a portion of the loan (typically 75%, although this can vary). The SBA and lender share the risk that a borrower will not be able to repay the loan in full, and the SBA levies a fee for provision of the guarantee.

○ **SBIC program:** SBICs (Small Business Investment Companies) are privately owned and managed investment funds, licensed and regulated by the SBA. They use their own capital, plus funds borrowed with an SBA guarantee, to make investments in qualifying small businesses. The SBA does not invest directly in small businesses, but provides low-cost funding (guaranteed by the SBA) of up to two times the amount of private capital commitments an SBIC has raised. The SBA receives a fee in consideration for the guarantee.

To relate this all back to the forms of guarantee discussed in the previous section, the 504 program is a guarantee of subordinated borrowings, the 7(a) is a guarantee pari passu with unguaranteed borrowings, and the SBIC program is a guarantee of senior borrowings. Transaction schematics for each program are shown next. In each case, the debt guaranteed by the SBA is pooled into securities to increase the efficiency and scale of borrowing.
Pari Passu Guarantee Transaction Schematic (e.g., SBA 7(a))

**Initial Flows**
- Small business
- Lender
- Lenders/Investors
- SBA

- 7(a) loan $100
- SBA-guaranteed portion (pooled) $75 (pooled)
- Guarantee portion of debt (e.g., 75%)
- Guarantee fee

**Ongoing Flows**
- Small business
- Lender
- Lenders/Investors
- SBA

- Debt service
- Pari passu debt service
- Any payments under guarantee

Senior Guarantee Transaction Schematic (e.g., SBA SBIC)

**Initial Flows**
- Small business
- SBIC
- SBA

- Equity Investment $150
- Guarantee fees
- Debt (pooled) $100 (pooled)
- Guarantee of SBIC debt

**Ongoing Flows**
- Small business
- SBIC
- SBA

- Investment returns
- Debt service
- Any payments under guarantee

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**RESEARCH PROGRAM ON**

**Sustainability Policy and Management**

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On-Bill Programs

Background
As noted earlier, it is often difficult and/or expensive for individuals to borrow directly to finance clean energy investments. The cost of borrowing can be reduced, however, if government (through legislation or regulatory action) can reduce the risk borne by lenders. One way is through providing a guarantee, as discussed in the previous section. Another is through modifying a legislative or regulatory provision to alter the repayment mechanism. This is the case with on-bill financing.

On-bill financing refers to paying for clean energy investments through periodic payments on the borrower’s utility bill. So for example, rather than obtain a $10,000 10-year loan from the local bank and have the customer pay $100 each month to the bank, the customer may arrange for a $10,000 loan through a participating financial institution (or government agency), but the $100 would be billed to whomever owns the building as part of their utility bill. These amounts would be collected by the utility, and the utility would then forward collections on to the participating financial institution (or government agency).

On-bill loans may be retained by the participating financial institution or government agency, or may be securitized to monetize the loans. The subsequent case study talks about a financing that securitized assets including on-bill loans. A sample transaction schematic showing an on-bill program and securitization is shown below.

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**On-Bill Program Transaction Schematic**

*Initial Flows*
- Building owner
- On-bill loan
  - $100
- Government agency or financial institution(s)
- On-bill loans (pooled)
  - Cash ($83) plus residual interest
  - Fees
- Utility company
- Securitization
  - Proceeds ($83)
  - Debt
  - Lenders/investors

*Ongoing Flows*
- Monthly bills including on-bill charges
- Building owner
- Utility company
- On-bill charges
  - Residual payments after debt service
- Government agency or financial institution(s)
- Securitization
  - Debt service
  - Lenders/investors
Advantages

There are several key benefits of on-bill programs:

- **Payment obligation stays with the building:** With on-bill financing, the payment obligation is tied to the building, because the owner will always be the party obligated to pay the utility bills (although this obligation may be recouped from tenants). This is relevant if the building owner that makes the clean energy investment (and undertakes the clean energy loan) ever decides to sell the building. In that case, the cost of the on-bill financing stays with the building, just as the clean energy investment stays with the building\(^e\). In a conventional loan, the borrower would need to (a) repay the outstanding loan balance upon the sale of the building, creating a significant financial obligation, or (b) attempt to negotiate the assignment of the payment obligation to the new building owner, which may not be possible.

- **Reduced cost of financing:** On-bill financing may reduce the cost of borrowing because utility companies are normally entitled to terminate electric service for non-payment\(^f\). Accordingly, utility bills are generally paid with far lower rates of default than most forms of unsecured consumer credit. While the utility provides no financial support for the customer payment obligation, the reduced risk of default lowers the risk to lenders, thus allowing them to accept a lower return (all else equal). This can reduce the financing cost for the consumer (e.g., something less than $100 per month in the prior example).

- **Non-recourse to utility company and if securitized, to lenders:** As noted above, the obligation to repay the loan remains with the owner of the building receiving electric service. While the utility company bills and collects monthly payments, it does not guarantee customer payments. Also, if the participating financial institution or agency securitizes its loans, that is a form of non-recourse borrowing. As previously discussed, this has benefits for the participating financial institution or government agency.

- **Maintains role for utility company:** Although utility companies may be reluctant to support clean energy investment given its negative impact on the volume of electricity they distribute, on-bill financing allows them to maintain a relationship with their customers in the provision of clean energy. Additionally, as many customers consider the utility to be their primary point-of-contact for energy, customers may also benefit from the ongoing relationship.

Disadvantages

There are certain disadvantages associated with on-bill financing:

- **Legislative and regulatory changes required:** In order to enable this sort of financing, changes to state legislation and regulatory authorizations are often required. That is because utilities are not normally involved in the provision of consumer credit (other than to the extent power is supplied daily and payment is due at the end of the month). Provisions governing the billing and collection of debt service on loans must normally be addressed through legislative or regulatory action, in addition to negotiations between the utility company and any participating financial institutions or government agency. At a minimum, this adds time to completing this form of financing.

- **Complexity:** At a basic level, on-bill financing requires the coordination of both the participating financial institution or government agency and a utility company. Moreover, utility regulation is complex, and varies from state to state (as each state is regulated by a separate utility commission). This somewhat limits the scalability of this financing approach, although perhaps the market will evolve to the point where more uniform standards are created for this type of financing to reduce the effort to complete financings and better enable securitization.

One example of on-bill financing is shown in the following case study.

\(^e\) While this is not an essential consideration for renewable energy investments like solar PV panels (as panels can be moved), it is an important benefit for energy efficiency investments where it can be very difficult to redeploy the assets, and it is easiest to have the repayment obligation remain with the building owner.

\(^f\) The ability to terminate service is highly regulated (normally by the state public utility commission). For example, customers are typically entitled to a certain grace period when making payments, and must be given ample notice before electric service is terminated. Under certain circumstances, customers must be offered the ability to make payments over time. Also, power cannot be terminated when the weather is so cold (a winter moratorium period) or so hot (a summer moratorium period) that terminating service, and thereby disabling heating and cooling systems, could pose health risks to the customer.
Case Study – $24.3 million NYSERDA Residential Energy Efficiency Financing Revenue Bonds, Series 2013A

In August 2013, the New York State Energy Research and Development Authority (NYSERDA) issued a $24.3 million revenue bond backed by a pool of energy efficiency loans made in accordance with NYSERDA’s Green Jobs – Green New York Program. The general purpose of the program is to provide funding for building energy audits and energy efficiency improvements, and to help create jobs in the process. Through the program, NYSERDA offers two reduced-interest rate loan products to finance qualified residential energy efficiency improvements:

- **Direct bill loans**: These are unsecured consumer loans.
- **On-bill loans**: These loans are repaid through an installment charge on the borrower’s participating electric and gas utility bill.

The program was authorized by enabling state legislation and through approvals by the New York Public Service Commission (the state agency responsible for utility regulation). For both products, a third party “originator” was responsible for underwriting loans. So-called “Tier 1” loans have certain minimum standards including a borrower FICO score of at least 640; debt-to-income ratio not greater than 50%; no bankruptcies, foreclosures, or repossessions within the last seven years; and no combined outstanding collections, judgments or tax liens greater than $2,500. While NYSERDA does offer “Tier 2” loans that have less stringent underwriting standards, those loans were not included in the securitized portfolio. In the loan portfolio, the collateral was 68.6% direct bill loans and 31.4% on-bill loans. The size of the financing ($24.3 million) represented 83% of the principal balance of loans pledged as collateral.

The New York State Environmental Facilities Corporation (NYSEFC) provided an irrevocable and unconditional guarantee of the bonds, secured by certain of its assets. Based primarily upon the strength of the guarantee and creditworthiness of NYSEFC, the bonds were rated AAA (the highest rating category) by the two largest rating agencies, Standard & Poor’s and Moody’s. The high credit quality of the bonds resulted in a low interest cost. The bonds were issued in serial maturities from 1-10 years, with interest rates varying from 0.35% to 3.406%, and an average interest rate less than 3%.

This financing is notable because it illustrates a form of government support: the on-bill loan framework. While the decision was made to guarantee the debt (presumably because the benefits of the guarantee to New York State exceeded the implicit cost of the guarantee), on-bill loans were successfully incorporated into a financing. In the future, it is likely that on-bill loans will be securitized without the benefit of a state guarantee. More generally, this sort of financing illustrates one of the innovative ways of including government support without explicitly requiring a direct guarantee.
Property Assessed Clean Energy (PACE) Programs

Background

As in the case of on-bill financing, PACE programs represent another technique of using government support to reduce the cost of borrowing through changing the repayment mechanism. PACE is an innovative way to finance clean energy investments, where the loan made to finance the clean energy investment is repaid through the building owner's property tax assessment over a long period of time (e.g., 20 years). In that sense it is similar to on-bill loan programs, although the specific repayment mechanism differs (utility bill versus property tax assessment).

In order to enable this form of financing, state legislation is normally required. PACE was introduced in pilot programs in 2008, and now 31 states and the District of Columbia have adopted (or already had) legislation that enables local governments to offer PACE loans to building owners.

One important distinction between PACE and on-bill programs is that for some on-bill programs, in the event that the customer does not pay their utility bill, the utility and the lender (through the on-bill program) share equally in any amounts recovered from the customer. In this sense, the on-bill program is designed to produce a loan repayment obligation with the same low level of credit losses as monthly utility bills. Because property taxes rank senior to mortgage loan repayment, the PACE program is designed to produce an even more secure loan repayment mechanism.

The flipside of this is that mortgage lenders can find themselves subordinated to PACE loans. In 2010, the Federal Housing Finance Agency (FHFA), regulator of two of the largest mortgage lenders (Fannie Mae and Freddie Mac), issued a statement that PACE assessments are not valid and should not be senior to mortgage loans. FHFA argued that unlike property taxes, PACE assessments are voluntary, and are fundamentally loan payments (which, by the terms of most mortgage documents, would be prohibited without mortgage lender consent). While there have been various attempts to address the issue, the status of residential PACE programs remains somewhat in question although solutions have been developed to mitigate this risk.

Separately, PACE for commercial property continues to operate in many regions since the FHFA objection was to PACE obligations ranking senior to residential mortgage loans, not to commercial loans (Fannie Mae and Freddie Mac provide residential loans). Additionally, in the case of commercial PACE, it has become standard practice to obtain consents from mortgage lenders. While consents are not always obtainable, commercial lenders are likely more willing to provide consents for a commercial property than for a residential property for two reasons:

- **Improved collateral value:** Clean energy investments in a commercial building are undertaken primarily because they are cost-effective. Specifically, they are likely to improve building net operating income and/or increase the rents available to landlords. Residential investments may be made for less purely economic reasons. Clean energy investments in commercial buildings are therefore likely to improve the valuation of the building, which can mitigate the subordination of commercial mortgage loans to the PACE loan.

- **Cost effectiveness of the PACE loan arrangement:** Commercial mortgage loans are often larger than residential mortgage loans, with presumably larger returns for the lender. Accordingly, lenders may find it more worthwhile to analyze a PACE loan request for a commercial property than for a residential property.

PACE loans may be made directly by a municipality or by one or more participating financial institutions acting on behalf of the municipality. Either way, the lender still enjoys the higher credit quality and other benefits (discussed below) of these loans compared to traditional loans. PACE loans may also be securitized, as shown in the sample transaction schematic on the following page.

Advantages

There are three key reasons why this mechanism is attractive. They are similar to three of the benefits associated with on-bill programs.

- **Loan repayment obligation stays with the building:** Whoever owns the building will have the obligation to pay property taxes. This is relevant if the building owner that makes the clean energy investment (and undertakes a PACE loan) ever decides to sell the building. Similar to an on-bill financing, the cost of the PACE financing stays with the building, just as the clean energy investment typically stays with the building. If the building was sold and a conventional loan was in place, the borrower would have more difficult options to consider. Specifically, the borrower would need to...

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8 The ranking of the on-bill charges versus other charges may vary between different state programs.
repay the outstanding loan balance, or negotiate the assignment of the payment obligation to the new building owner.

- **Higher credit quality:** Generally, in the event of a default in an obligation secured by a mortgage on real estate, the lender is entitled to foreclose on the real estate, provided, however, that the local government is entitled to any property tax payments prior to the lender receiving any monies. This principle ensures that municipalities, which rely on property taxes to pay for essential services, are able to continue operations. This principle also ensures that PACE lenders enjoy a similar priority right as they are repaid through the property tax mechanism.

- **If securitized, non-recourse to the PACE lender:** As noted above, the obligation to repay the PACE loan remains with the owner of the building paying property taxes to the local municipality. While the municipality bills and collects the property taxes, it does not guarantee customer payments. Accordingly, if the municipality (or participating financial institution(s) working with the municipality) securitizes its PACE loans, that is a form of non-recourse borrowing. As previously discussed, that produces benefits for the PACE lender.

**Disadvantages**

There are certain disadvantages associated with PACE programs:

- **Legislative and regulatory changes:** In order to enable this sort of financing, changes to state legislation and regulatory authorizations are often required. As evidenced by the concern raised by FHFA, the seniority of PACE loans can raise issues. Even if these concerns are entirely addressed, the need for specific legislative and regulatory authorizations can, at a minimum, extend the time required to establish PACE financing programs.

- **Complexity:** Property tax mechanisms vary slightly between jurisdictions. This may limit the scalability of this financing approach, although the market is evolving so that many PACE programs are designed to work across different municipalities (as discussed in the case study). Increased standardization for this type of financing will further reduce the required effort for this type of financing and better enable securitization.

The following case study provides an update on PACE programs in California.
Case Study – California PACE Programs and HERO Funding Class A-1 Notes, Series 2014-1

Notwithstanding the issue raised by FHFA, California remains an active area for PACE. Sonoma and Riverside counties have been leaders in PACE programs, having financed $52.8 million and $134 million of PACE retrofits, respectively. California’s Governor has been supportive of PACE programs as a way to both help the environment and produce jobs, while he has attempted to address FHFA’s concerns. Because of the FHFA concerns, property owners that sell or refinance to FHFA-eligible loans need to repay their PACE assessments. While this has likely reduced PACE loan originations, PACE program officials in Riverside County noted that homeowners are still very attracted to the program given its other provisions (e.g., straightforward documentation, tax-deductibility, long-term low-cost financing, etc.).

In March 2014, the Western Riverside Council of Governments (“WRCOG”) completed a securitization of certain of its PACE assessments. The PACE portfolio consisted of over 5,000 residential PACE assessments with a total value of approximately $107 million. In order to apply for a PACE loan, building owners had to meet certain criteria including (i) current on the property taxes, (ii) no more than one 30-day mortgage late payment during the previous year, (iii) mortgage debt must not exceed 90% of property market value, (iv) proposed improvements must not exceed 15% of property market value, and the combined mortgage and PACE assessment must not exceed 100% of property market value, and (iv) total annual property tax and assessment must not exceed 5% of property market value.

The financing was $103.8 million in size with a scheduled maturity of 20 years and an interest rate of 4.75%. The transaction was rated AA by Kroll Bond Rating Agency and produced a 97% advance rate against the value of the underlying assessments ($103.8/$107).

This is likely to be the first of many PACE securitizations, especially if the FHFA issue is clarified to a greater degree. Commercial PACE assessments are also likely to be securitized in the future as critical mass continues to build.

“As in the case of on-bill financing, PACE programs represent another technique of using government support to reduce the cost of borrowing through changing the repayment mechanism.”
**Legislatively-Enabled Utility Charge Securitization**

**Background**

Before discussing this form of financing, it is necessary to review certain key elements of the U.S. electric utility industry. Approximately 68% of electric customers are served by investor-owned utilities. Investor-owned utilities are private sector companies that operate as regulated monopolies in the distribution of power in specified service territories within a state. These utilities are entitled to a return of and on capital used to fund investments (e.g., transmission lines, etc.) based on their cost of capital (average of debt and equity). Investor-owned utilities earn this return through the rates they charge customers.

The cost of capital associated with utility investments varies by utility and over time, but might typically be in the vicinity of 8-10% for investor-owned utilities. At the same time, the probability that customers pay their electric bills is very high (as discussed previously), and so the risk that capital providers are repaid should be low. There are, however, other risks assumed by investors in utilities.

- **Financial and operating risk**: There is the risk that the utility goes bankrupt, whether through financial mismanagement or due to failure of its revenues (generally a product of regulated rates and customer electricity consumption) to cover its operating costs.

- **Regulatory risk**: State regulators may potentially attempt to disallow the recovery of expenditures made by the utility if, for example, such expenditures are deemed imprudent or recovery is contrary to public policy.

The notion of legislatively-enabled utility charge securitization (referred to here as “legislative securitization” for brevity) is to create state legislation that mitigates these risks. Specifically, the legislation makes the collection of a charge on certain investments irrevocable and not subject to regulatory reversal (addressing regulatory risk) and ensures that collection of the charge is insulated from general liabilities or a bankruptcy of the investor-owned utility company (addressing financial and operating risk). Enabling legislation serves other purposes as well, including provision of a “true up mechanism” that adjusts the charge, up or down, to the extent that electricity consumption, customer charge-offs, or other factors used in determining the charge (typically on a cents/kWh basis) differ from expectations. This legislation is further buttressed through a regulatory order normally issued in connection with these transactions. This reaffirms the regulator’s legislative obligation to treat the right to recover the investments as irrevocable.

One important point in legislative securitization is that the legislation prevents the utility commission from subsequent disallowing any of the investments made by the utility that have been securitized. While this reduces regulatory risk to investors, it also requires the state to cede discretion over any assets securitized. In consideration for this lessened control, or in order to generate momentum necessary to pass the legislation more generally, it is typically customary for the cost of capital savings to be passed entirely through to customers of the investor-owned utility. Bonds of this type are often referred to as “rate reduction bonds”, because the low cost of capital of the securitization can allow reduced rates for utility customers.

The first such securitization was completed in 1995 for Puget Sound Power & Light to recover certain investments in customer energy efficiency. Since then, securitizations of this type have totaled over $40 billion, attributable to a wide range of utility investments, but not to clean energy investments. As discussed in the subsequent case study, the application of the technology has come full circle, as it is once again being applied to addressing clean energy investments.

A transaction schematic for legislative securitization is shown on the following page.

**Advantages**

There are two key advantages to this form of securitization:

- **Low cost of capital**: Through mitigating key risks, securitizations of this type can be completed at a substantially lower cost of capital than the investor-owned utility’s normal cost of capital (e.g., depending on market conditions, 3-5% rather than 8-10%). As discussed previously, cost of capital is a function of both the proportion of debt versus equity and the cost of each component of the capital structure. Securitizations of this type have typically financed 98% or more of the related investments with debt that achieves the highest ratings (triple-A) accorded by the rating agencies. Both the high proportion of debt and its low cost drive this lower cost of capital.

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h There are, however, limitations to the actions of a public utility commission in the regulation of utilities. The utility may also be entitled to pursue certain legal remedies, depending on the circumstances.
Non-recourse to the utility and to the state: As with a typical securitization, the financing is repaid by the cash flows associated with certain assets (in this case, aggregate collections of a charge on monthly customer bills). The securitization does not represent a general obligation of the utility or the state, and so it does not impact the borrowing capacity or creditworthiness of the utility or state the way it would be impacted if either undertook a direct borrowing.

Disadvantages:

- Minimal incentives for investor-owned utilities to participate: Because cost of capital savings are generally passed through to utility customers, this lessens the incentives for a utility to enter into such a securitization. Accordingly, utilities have generally undertaken this form of securitization only when (a) they derive some other benefit such as securitizing critical investments that might otherwise be difficult to finance, or (b) the benefit (rate reduction) to customers can be a negotiating point to achieve other legislative or regulatory concessions important to the utility.

- Legislative and regulatory changes: In order to enable this sort of financing, state legislation and regulatory authorizations are required. At a minimum, this adds time to complete this form of financing, but in the worst case scenario, could prevent the financing from occurring if legislative or regulatory representatives are unsupportive.

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While the securitization is repaid by a charge on customer utility bills, and not guaranteed by either the utility or the state, the utility generally makes certain customary representations and warranties regarding (among other things) its billing and collection of the utility bills, and the state pledges that it will not interfere with the legislative or regulatory rights granted to such securitizations.
Case Study – Hawaii Green Energy Market Securitization (GEMS) Program

In June 2013, the Governor of Hawaii signed legislation to enable the GEMS program. While the program has yet to result in any financing, the basic structure has been proposed based upon other market precedents. In summary, the state has created the requisite framework for a legislative securitization. A charge will be levied on all customers of a utility, and will be allocated from a portion of the existing “Public Benefits Fee”. The proceeds of the securitization may be used to make loans to low-income customers to finance solar installations. These low-income customers may then repay such installations with an on-bill charge, in addition to the charge to repay the securitization (which is borne by all customers). Assuming no defaults in customer payments of the on-bill charge, aggregate collections of the on-bill charge are expected to replenish the portion of Public Benefits Fee diverted to repay the securitization.

The GEMS program may result in a combination of an on-bill loan program with a legislative securitization. Unlike an on-bill loan program, financing can be offered to all customers because the source of repayment is the legislative securitization that is repaid by all customers, not the customers opting into the on-bill program. The final form of the GEMS program may, however, vary.

While it is unclear the degree to which the GEMS program will be successful, or the degree to which this model will be adopted by other states, the GEMS program is another interesting amalgam of financing techniques. It may spark both replication and additional evolution in clean energy finance.

Green Banks

Background

While the aforementioned financing techniques generally represent discrete approaches to financing clean energy investment, some governments have decided that they need increased flexibility to facilitate these investments. In some instances, this has led to the creation of a so-called “Green Bank”. Green banks have been established in the U.S. (Connecticut being the first state to establish one) and United Kingdom, and are being developed in other jurisdictions as well.

These banks can be funded from a variety of sources including charges on customer electric bills, federal or state grants, or private funds in connection with the provision of certain services. These entities are not intended to simply be a vehicle for the public sector to fund clean energy investment. Green banks are generally designed as public-private partnerships where public monies (deployed through a green bank) can mobilize private capital to fund clean energy investments and increase the pool of capital significantly beyond the amount of capital that would otherwise be available if only public monies or only private monies were deployed.

Green banks may utilize the techniques and financing models discussed in this report. They may provide guarantees or other forms of credit support for what would otherwise be purely private sector financings such as solar asset securitization. By separately capitalizing the green bank, it may be quicker or easier to enter into these sorts of financing arrangements, rather than obtaining separate authorization for each such arrangement.
While green banks may take various forms, the transaction schematic below is intended to be illustrative of the upfront and ongoing flows of the bank.

**Advantages**

There are a few advantages to this sort of approach:

- **Flexibility:** Once capitalized, green banks have capital available to allocate towards different types of clean energy investment, and may not subsequently require the same authorizations as discrete financing programs.

- **Centralized approach:** A green bank can become a hub for inquiries about all forms of assistance in the financing of clean energy investment. This offers benefits for both the green bank (by developing expertise that can be deployed across financing programs), and for customers (in the form of “one-stop shopping”).

**Disadvantages**

Green banks can also have certain disadvantages:

- **Mandate and objectives may vary:** The flipside of flexibility is that green banks can have varied roles that can be unclear upon formation of the bank. While these institutions are intended to catalyze the private markets, they can sometimes be perceived as competing with the private sector. Additionally, private sector participants may initially be unclear how and whether to engage a green bank.

- **Political perception:** Green banks may represent a more visible form of government support for clean energy investment than some of the other forms of support discussed here (guarantees, regulatory framework changes). Where political support for clean energy investment is low, the increased visibility of a green bank may be a negative for governments considering this approach (depending on the specific objectives and constraints of the particular green bank).
The following case study discusses the first green bank created in the U.S.

Case Study – Connecticut Clean Energy Finance and Investment Authority (CEFIA)

In Connecticut, its green bank is officially designated the Connecticut Clean Energy Finance and Investment Authority. As of June 30, 2013, CEFIA had total assets of $100.0 million. CEFIA was established in 2011 as a successor to the Connecticut Clean Energy Fund, which was in turn established in 2000. CEFIA is designed to invest its resources in a variety of ways to finance the clean energy goals of Connecticut, lower the cost of clean energy to consumers and reduce reliance on grants, rebates and other subsidies and move toward innovative low-cost financing of clean energy deployment.

CEFIA has established a number of programs including a commercial PACE program, and is in the process of establishing the CT Solar Lease 2 Program, which provides customers with a PPA similar to that employed in solar asset securitization. CEFIA will partner with private sector lenders to provide the requisite capital to fund the PPAs, but CEFIA’s capital may allow the PPAs to be offered to lower credit quality customers than if all capital had to be provided by a solar company or raised through a solar asset securitization.
Having reviewed several financing models, it can be seen that they employ different combinations of the techniques outlined at the outset of the report.

IV. Comparison of Models

As noted in the introduction to this report, financing is an important factor because the cost of capital is a key driver of the overall cost of clean energy investments. Having said that, it is difficult to compare the cost of capital implications between different financing approaches for several reasons:

- **Credit risks**: The financing models discussed here address different underlying risk profiles. These are summarized below:
  - ESCO financings are usually done with only stable (e.g., MUSH) credits.
  - Solar securitization can have limitations on the credit quality of the underlying customers, and further, may finance only a portion (e.g., 60%) of the pool of leases/PPAs on a senior basis.
  - On-bill and PACE programs also have certain eligibility requirements, although these are often less stringent than for a purely private sector financing (e.g., ESCO or solar securitization) given the enhanced security offered by the respective regulatory mechanisms.
  - Legislative securitization normally involves a charge imposed upon all customers within the service territory of a utility(ies). Accordingly, unlike the aforementioned techniques, there is no favorable selection criteria, although the strength of the legislation provides a high level of comfort that the securitization will be repaid.
  - Guarantees and green banks can be employed by governments to finance a broad range of underlying risks, from the relatively secure to the more challenging.

- **Market conditions**: At this stage, the financing models discussed here are fairly novel and few transactions have been executed. For those that have been executed, market conditions vary from time-to-time, making a comparison of interest rates at the time of offering difficult. While this should, at least in theory, be addressed by analyzing the secondary market trading levels of these instruments, there is generally insufficient liquidity and trading volumes to draw precise conclusions on relative cost of capital.

- **Public sector versus private sector investments**: For private companies, the cost of capital represents a blended cost of debt and equity, while for public companies, there is no explicit cost of equity. This makes it difficult to compare the cost of capital between governments and corporations. Even among corporations, the cost of equity can vary significantly depending on several factors including the degree of financial risk assumed by the company.

<table>
<thead>
<tr>
<th>Credit Enhancement</th>
<th>Special legal or regulatory provisions</th>
<th>Securitization approach</th>
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</thead>
<tbody>
<tr>
<td>ESCO Financing</td>
<td>✓</td>
<td>-</td>
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<tr>
<td>Solar Securitization</td>
<td>✓</td>
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<tr>
<td>On-bill Programs</td>
<td>✓</td>
<td>✓</td>
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<td>PACE Programs</td>
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<td>Legislative Securitization</td>
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<tr>
<td>Green Banks</td>
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<tr>
<td>Guarantees</td>
<td>✓</td>
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Tax considerations: Tax policy confounds the cost of capital analysis in at least three key respects:

- Tax incentives may impact the effective cost of capital by, in effect, subsidizing certain clean energy investments.
- Most private sector enterprises pay tax and can therefore enjoy the tax-deductibility of interest and depreciation, while public sector entities (and private sector businesses that are not currently taxpayers) do not pay taxes.
- Depending on the use of proceeds and other factors, public sector entities can also borrow on a tax-exempt basis (i.e., interest paid to bondholders is exempt from taxation), which can lower the cost of borrowing versus taxable issuance.

While these limitations make it difficult to empirically compare the cost of capital between options, it is possible to subjectively evaluate the cost of capital differences between the various financing techniques. For this purpose, it is possible to look at each form of financing as a discrete analysis (i.e., an entity which finances only the clean energy investments relevant for that financing model). Further, it is necessary to ignore market conditions, differences in sponsor (i.e., public sector versus private enterprise), or tax considerations, and focus primarily on the underlying credit risk. Based upon these assumptions, it is possible to produce the following chart.

This chart shows the various financing techniques across the horizontal axis, and displays the cost of capital along the vertical axis. In the case of public-private financing partnerships, the graph portrays the cost of capital with and without the government support. There are a few things to note:

- The purely private sector options (ESCO financing, solar securitization) currently differ relatively little, in that both offer a low cost of capital by financing only the high quality assets (ESCO) or a more senior (i.e., higher quality) portion of a diversified pool of assets. Neither financing requires any government support, and both options should become more attractive over time as the volume of financing increases, all else equal. Solar securitization is likely to have even more upside benefit as the assets are more standardized and therefore, securitization benefits are likely to be greater.
Without government support, on-bill and PACE programs would both be more expensive than the private sector models, although government support (the legislative and regulatory framework) keeps the cost of capital comparable. Because these financings involve less customer selectivity (i.e., easier to obtain an on-bill or PACE loan than a long-term solar PPA) these financings would have a higher cost of capital without the enhanced regulatory framework. Given their seniority, PACE loans may offer a slightly lower cost of capital than on-bill loans where their collection rights are equal with other utility charges.

Legislative securitization has a very low cost of capital given both the high proportion of debt and its low cost due to the strength of the legislative framework. Without the legislative framework, this would be a securitization repaid by all customers with no eligibility criteria (i.e., anyone with utility service pays the charge) and so the government support makes a difference. The large reduction in cost of capital due to government support is necessary since the related legislative framework imposes greater constraints than the regulatory framework established through on-bill and PACE programs.

Guarantee programs and green banks allow for indirect government financing of a portion of the clean energy investment with a corresponding reduction in cost of capital. The cost of capital can vary considerably depending on the underlying risks guaranteed or financed. Accordingly, the graph depicts a range of capital costs for the underlying risk, with the guarantee contributing significantly or insignificantly to the cost of capital of the asset depending on the underlying risk.

For the policy maker, it is instructive to consider the level of government support that is feasible for clean energy investments. The techniques that have the greatest potential to lower the cost of capital (through the greatest risk reduction) generally involve the greatest level of support.
Greater investment in clean energy requires several critical elements. Efficient financing is one key element. Given both limitations in the ability of the public sector to participate directly in these financings, and key challenges in the ability to finance these investments, innovative techniques are necessary. Certain of these financing models can be executed without any form of government support, while other models do require some form of government support. The financing methods shown in this report represent a sampling of those currently available.

Each of these models employs one of a few general techniques to produce an attractive financing. These include credit enhancement (whether by including third-party guarantees or by employing certain financing eligibility criteria), special legal or regulatory provisions, and securitization. Some of the models combine these general approaches, and it is likely that new financing models will be created through novel combinations of these and other techniques.
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