

What Investors Want

How to Scale Up Demand for U.S. Clean Energy and Green Bonds

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A Report by



Acknowledgments

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Executive Summary

Investors in the United States increasingly want to invest in solutions to climate change. The good news is that investors have growing opportunities to make those investments, with clean energy bonds.

So far, the public discussion about green bonds has focused on issuances from multilateral development banks and multinational corporations. Far less attention has been paid to the U.S. green bond market, particularly to the subset of green bonds used to finance renewable energy production, transmission and infrastructure, as well as energy efficiency.

But that has now changed. The U.S. market for fixed-income securities known as green bonds has now become a robust and growing market.

What this market has lacked is a strong understanding of investor demand for these clean energy and green bonds in U.S. markets. Without a clear sense of this demand, this market will not expand at the scale needed to finance badly needed climate and energy solutions.

That is the purpose of this important study, the first of its kind in the United States. This study explains the nature of investor demand for clean energy bond finance in the U.S. It examines what institutional investors need – their demand characteristics – to purchase these new financial instruments and make them part of a sound investment portfolio.

In order to capture this financial experimentation and innovation and to take it to the next level, Clean Energy Group (CEG) and Croatan Institute undertook this year-long investigation of the demand characteristics of U.S. institutional investors. Over the course of the last twelve months, we have interviewed more than three dozen bond buyers, including asset managers and investment consultants, foundation endowments, faith-based investors, investment banks, corporations and insurers, and public pensions.

In September 2014, at a side event to the United Nations Climate Summit in New York City, we convened an in-person session with two dozen investors, issuers, rating agencies, and funders to discuss preliminary findings of the inquiry. This paper is the product of that investigation and in-depth discussion.

The study first places clean energy bonds within the larger frame of the green bond market. It briefly highlights market characteristics of green muni bonds and corporate green bonds. It provides a disaggregated interpretation of investor demand for these kinds of instruments across a variety of institutional investors, from asset managers and bond portfolio managers to foundations and endowments, faith-based investors, insurers and pensions. The paper also examines the key investment criteria these investors use when evaluating green and clean energy bonds: liquidity, credit quality, size, terms, use of proceeds, and labeling.

Our findings should form the basis for a deeper analysis of this market. In simple terms, we found robust and growing demand for green and clean energy bonds. When these bonds have been issued, they have been heavily oversubscribed by different categories of investors.

Green bonds present a new opportunity for universities and pension funds to align their investments with their missions, without compromising their fiduciary responsibilities.

However, this demand is not homogenous across all categories of investors, and each institution will apply its own specific investment guidelines and policies to its underwriting criteria. Liquidity, credit quality and size all matter a great deal to investors.

Our inquiry concludes with a broad range of specific recommendations that in time could increase the flow of funds into clean energy bond finance. We suggest further actions in the areas of research and analysis, convening and collaboration, and we provide a blueprint for how to increase deal flow in order to realize the full potential that the green bond market presents in the U.S.

At present, this field remains largely unexplored. While many acknowledge the role that institutional investors need to play in financing clean energy and climate solutions, we do not know what kinds of investments make sense for their portfolios. Until we know what investors want, the suppliers of green bonds will not have a clear signal for what kinds of bonds they should issue to meet that demand.

Having a better understanding of the role of clean energy bond finance is especially important for the growing groups of foundations, endowments, and other institutional investors that are grappling with fossil-fuel divestment and seeking new investments in climate solutions. They need a positive investment strategy to complement any divestment activity. Green bonds should be a key element of that strategy.

In other words, investors who want to take the money away from fossil-fuel industries through divestment should also consider ways to take away the market by investing in clean energy bonds.

Unless we know more about this clean energy finance market and how to grow it, we cannot expect to solve the large climate problems that face the country.

Green bonds present a new opportunity for universities and pension funds to align their investments with their missions, without compromising their fiduciary responsibilities.

Key Recommendations

What follows are the key recommendations of this report. They are a blueprint for action to enhance investment into clean energy bonds in the United States. (A complete set of recommendations is found later in the report.)

Further Research and Analysis

1. Conduct further research on the full range of green and clean energy bond buyers in order to develop a more complete picture of the specific, disaggregated demand characteristics of active investors. Considerably more research could be done with public funds, corporate treasurers, college endowments, and larger mutual funds and asset managers.
2. Assess more clearly and quantitatively the size of potential investor demand and the opportunity set associated with clean energy bond investment by reviewing fixed-income portfolio allocations of this fuller range of investors active in this market.
3. Conduct deeper analysis of green bond attributes in order to develop greater consensus about the nature of the instrument and the degree to which they can be understood as a distinctive category to which to allocate assets. Can such a thematically constructed tool be understood properly as an “asset class”? Or are green bonds better understood simply as one of many segments of debt instruments within fixed income?
4. Analyze more carefully why many underwriting investment banks have not yet perceived distinctive opportunities around labeled green bond transactions – and what role they can play in addressing supply/demand disequilibrium. Part of this analysis could involve reviewing underwriting criteria and understanding the processes that lead banks to determine whether to buy the deal, place it, or offer it onto the public markets.
5. Explore the potential ways that clean energy bond financing can support the nascent green revolving loan fund model being used by colleges and universities, hospitals, and municipalities.

Convening and Collaboration

1. Develop new collaborative frameworks for bond buyers to convey their demand expectations to issuers and educate wider groups of institutional investors, bond buyers, underwriters, and investment consultants about the opportunities associated with clean energy bond financing.
2. Convene separate peer groups of bond-buying investors (mutual funds, insurers, pensions, foundations, endowments, consultants, SRI, faith-based groups, underwriting investment banks, smaller organizations) in order to have more focused conversations about specific kinds of green bonds that meet their investment criteria.
3. Convene credit rating agencies in order to encourage expanded coverage of clean energy and green bonds, across the credit spectrum, with particular depth needed in the domestic municipal bond market.

4. Convene underwriters to understand the middle-market opportunities within the municipal bond markets.
5. Foster collaborative outreach about clean energy bonds to the growing groups of investors that are grappling with fossil-fuel divestment and fossil-free investment, with all due attention to their specific demand profiles (public pensions and other public funds, foundations, endowments, family offices, faith-based investors, labor pensions, high-net-worth individuals, and their advisers and investment consultants).

Develop, Diversify, and Deepen Deal Flow

1. Understand, optimize, and replicate key models of emerging best practices that have met investor expectations, including the Morris Model, the Massachusetts Model, the NYSERDA Model, the SolarCity Model and the DC Water Model.
2. Foster activity to deepen and diversify the pipeline of clean energy bonds. Diversification might include a better distribution of green bonds across the credit-quality continuum, the yield curve, and geographies; longer date tenors beyond 10 years; larger issuances; more secondary market opportunities; more taxable bond offerings; more bundling of clean energy projects into a single offering; targeting more social impacts and community benefits in such bonds, and related, more creative uses of clean energy bonds noted in the report.
3. Deepen the clean energy attributes of green bonds. Explicitly label all clean energy bonds as “green bonds” in order to harmonize and integrate bond financing for renewables and energy efficiency into what is clearly consolidating into a distinctive category of the bond market; ensuring on-going reporting of proceed use and better align proceeds data and reporting with emerging “impact investment metrics” for a total portfolio approach.

Background and Introduction

Clean Energy Group commissioned the Croatan Institute to conduct this study to explore the demand dynamics of investment in clean energy bonds in the United States.

Over the course of 2014, researchers at Clean Energy Group and Croatan Institute conducted interviews and desk research in order to understand the motivations and investment decision-making criteria of bond buyers actively purchasing or underwriting green bonds, particularly those used to finance renewable energy or energy efficiency projects. Members of our research team have had conversations with bond buyers, portfolio managers, investment officers, underwriters, credit analysts, and investment consultants at more than three dozen firms and asset-owning institutions close to the green bond space.

This paper reports the findings from our inquiry and reflects the feedback received at the convening of investors and funders on “Clean Energy Bonds and Investor Demand,” which was held on September 22, 2014, at the Surdna Foundation in New York City. The invitation-only convening was organized as a private side event to the 2014 United Nations Climate Summit that was held the following day. It included approximately two dozen investors and stakeholders, including members of the research team and a selection of the interviewees, as well as other bond buyers, asset managers, institutional investors, service providers, credit rating agencies, underwriting investment banks, philanthropic foundations, and non-governmental organizations.

Based on our findings, this report also lays out a blueprint for action that we believe will enhance green bonds as more effective tools for financing a clean energy transition. Specifically, our recommendations identify further research and analysis to be undertaken, propose a series of convenings and collaborative efforts among key investors and stakeholders, and highlight numerous ways to increase the flow of clean energy bond finance deals.

This report lays out a blueprint for action that we believe will enhance green bonds as more effective tools for financing a clean energy transition.

I. Clean Energy Bonds within the Growing Green Bond Market

Over the last several years, green bonds have increasingly attracted attention in global capital markets. Bloomberg New Energy Finance has described these debt securities as “an emerging source for clean energy capital,” and a rapidly growing one at that; new green bond issues are on pace to reach \$40 billion in 2014 alone, more this year than the combined \$37.8 billion in green bond issues that Bloomberg tracked from 1995 to 2013.¹ Earlier this year, a set of voluntary process guidelines known as The Green Bond Principles were developed as a way to promote integrity within this rapidly growing market. Within the last several months, the first Green Bond indices have also made their appearance.

But green bonds are not used exclusively for financing renewable energy or energy efficiency. They also finance a vast array of environmentally friendly companies, products, projects, and services, making it a challenging space to quantify consistently. Analysts often point to international development banks as the first issuers of green bonds, dating back to 2007-08 when the European Investment Bank issued its first “climate awareness bond” and the World Bank’s International Bank for Reconstruction and Development (IBRD) issued a AAA-rated “green bond,” at the demand of a group of Scandinavian institutional investors.²

However, Bloomberg New Energy Finance has tracked green bond activity over a much longer time span, including renewable energy project bonds and other municipal bonds used to fund clean energy projects dating back to the late 1990s, not all of which has been explicitly labeled by issuers as “clean” or “green.”

Much of the recent volume and momentum of green bonds has certainly been driven by international development banks, led by the International Finance Corporation, the European Investment Bank, and the Asian and African Development Banks. Still, domestic muni bonds and project bonds remain a vibrant, if small-scale part of the larger green-bond space. Indeed, well before the multilateral development banks issued their first green bonds, U.S. cities and states had issued muni bonds explicitly for clean energy purposes. San Francisco issued a \$100 million revenue bond in 2001 to implement solar and wind energy generation in the city, and three years later Honolulu, Hawaii approved a much smaller \$7.85 million solar and energy efficiency bond.³ In 2005, Idaho adopted legislation for the Idaho Energy Resources Authority to issue bonds to finance renewable energy projects developed in the state by electric utilities and non-utility generators.

The domestic clean energy bond market provides the focus of this report, because so much current discussion of the green market has focused on the global, supranational market. While the supranational green bond market is much larger, the vast majority of the green bonds issued by multilateral development banks have been high-quality, investment grade securities. However, in the current low-interest-rate environment—a result of quantitative easing and increased investor appetite for more stable, fixed-income securities in the wake of the financial crisis—fixed-income investors have increasingly been “reaching for yield,” by purchasing paper across the full credit spectrum. This is in no way unique to the green bond space. As one investor told *Pension and Investments* earlier this year, “We are seeing investors (in high yield) looking to move to shorter duration, or taking more credit risk in companies by moving down in quality.”⁴

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1. Terminological Confusion: Green, Clean, Climate

Despite efforts to create more formal guidelines for green bonds, investors and stakeholders remain confused about what counts as a green bond. Competing categories merely add to the confusion. For example, some analysts categorize all green bonds as part of an even larger universe of “climate bonds.” The London-based Climate Bonds Initiative, a leading resource on this emerging market, has quantified these “climate-themed bonds” as a \$500 billion global marketplace, far more than a full order of magnitude larger than outstanding global green bonds, which have been estimated at around \$35 billion.⁵

One of the methodological criticisms of the \$500 billion “climate bonds” construct is that it is predominated by transport projects, under the simple presumption that railroad infrastructure is less carbon polluting than other transportation alternatives. As S&P green bond analysts have rightly observed, “compared to renewable energy projects, whose climate benefits are relatively more easily quantifiable, the climate benefits of transport projects, along with those of many other issuers in other sectors, need to be established on transparent methodologies.”⁶ Although a railroad infrastructure bond may be more “climate friendly” than bonds financing more carbon intensive forms of transportation, such a “climate-themed bond” differs in both degree and kind from green bonds used explicitly to finance renewable energy infrastructure.

Given this confusion of terminology, we have presented the relative size and notional overlap of these various kinds of bonds in Figure 1, in order to place them in a wider perspective. Although the green bond market is experiencing rapid growth, it nevertheless remains a very small component of the broader bond markets. After all, \$1.4 trillion in U.S. corporate debt was issued in 2013 alone, and outstanding U.S. muni and corporate bonds are worth roughly \$13.5 trillion. Analysts estimate the size of the broader global bond markets is around \$80-95 trillion.

In an effort to provide greater clarity to this rapidly growing green bond marketplace, the International Capital Market Association, working with leading underwriters, has put forward a series of Green Bond Principles. These voluntary “process guidelines” define green bonds primarily by their use of proceeds, which need to have some quantifiable environmental benefit.⁷ The principles cite renewable energy and energy efficiency as among the environmental services that green bonds finance, but they also include a much wider array of environmental finance areas, including efficient buildings, sustainable waste management, sustainable land use, biodiversity conservation, clean transportation, and clean water infrastructure. Third-party verification firms, notably the French research firm Vigeo, the Norwegian Center for International Climate and Environmental Research – Oslo (CICERO), and Deloitte, are beginning to certify that debt securities meet these emerging green bond guidelines.

Also, leading benchmark providers, such as MSCI and Barclays, recently announced the creation of a Green Bond Index, and S&P Dow Jones Indices followed suit shortly thereafter with its own.¹⁰ The characteristics of the underlying bonds comprising these indices will become proxies for the broader green bond space. In five years of historical back-testing, the S&P Green Bond Index had outperformed broader, unscreened, U.S. benchmarks and global aggregates, with slightly more volatility, as Figure 2 highlights. However, the relatively small and rapidly changing sample size of green bonds makes it hard to draw much of any conclusion about green bond performance attributes.

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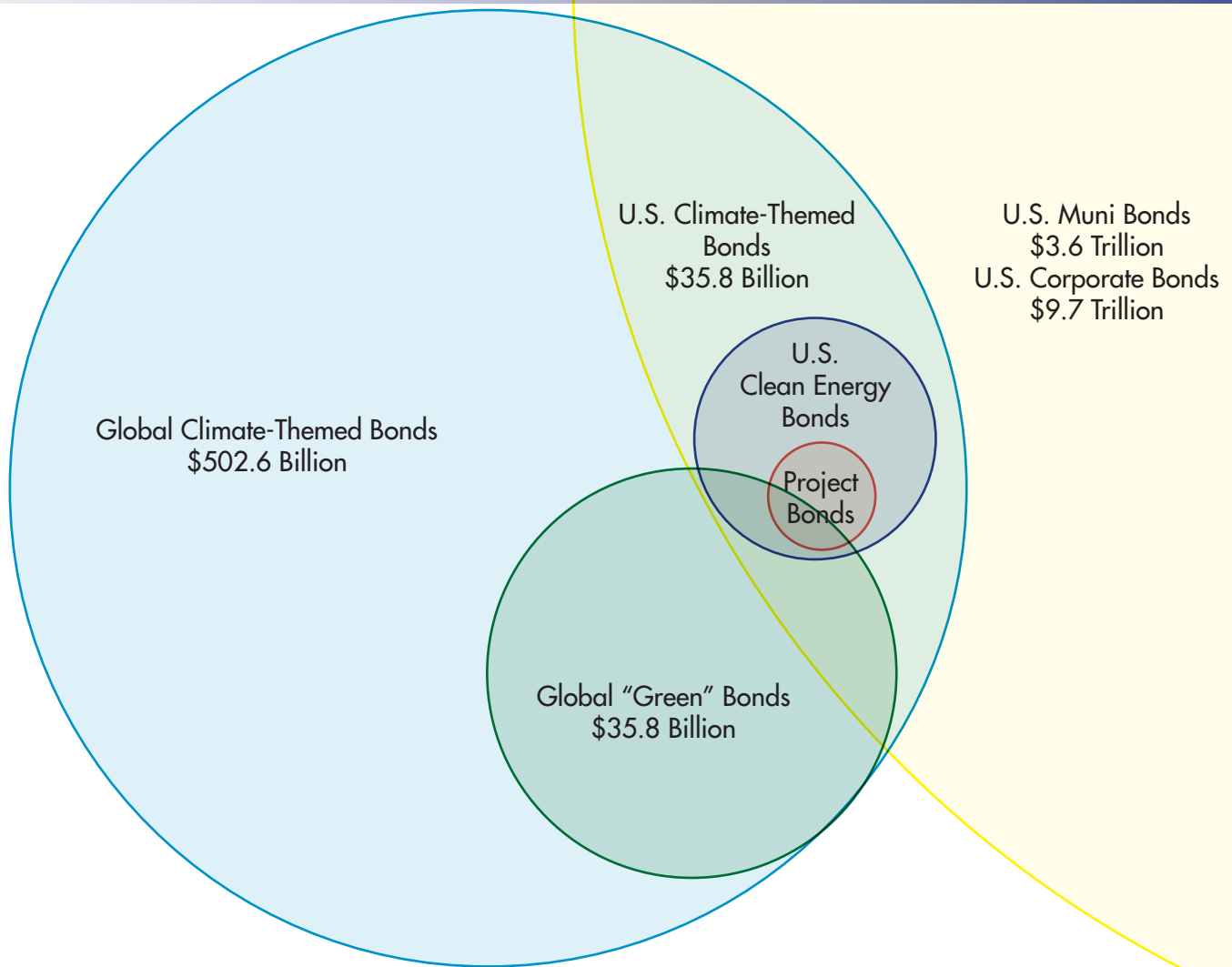


Figure 1: US Clean Energy Bonds within the Broader Bond Universe

SOURCE: Bloomberg New Energy Finance, Climate Bonds Initiative, and SIFMA.

NOTE: Data reflect total bonds outstanding as of Q1 2014. Proportions are notional.

Green Bond Indices

There are strong signs of increasing supply and investor demand for green and clean energy bonds. Three major financial entities – Barclays/MSCI, Bank of America Merrill Lynch and S&P – have launched green bond indices.⁸ This is clear evidence of a swiftly maturing market. The characteristics of the underlying bonds comprising these indices will become proxies for the broader green bond space. Bond indices are used by bond funds to benchmark individual issuances and measure their relative performance.

Initially, these indices would have been dominated by AAA-rated supranational issuers. But in 2014, qualifying green corporate issuers have contributed equally to the growth of the index and now make up a third of the index capitalization, adding diversification and incremental spread now that the average rating having declined to AA2 with the addition of the corporates.⁹

Green bonds have been used to finance renewable energy and other positive environmental outcomes for many years in the U.S.

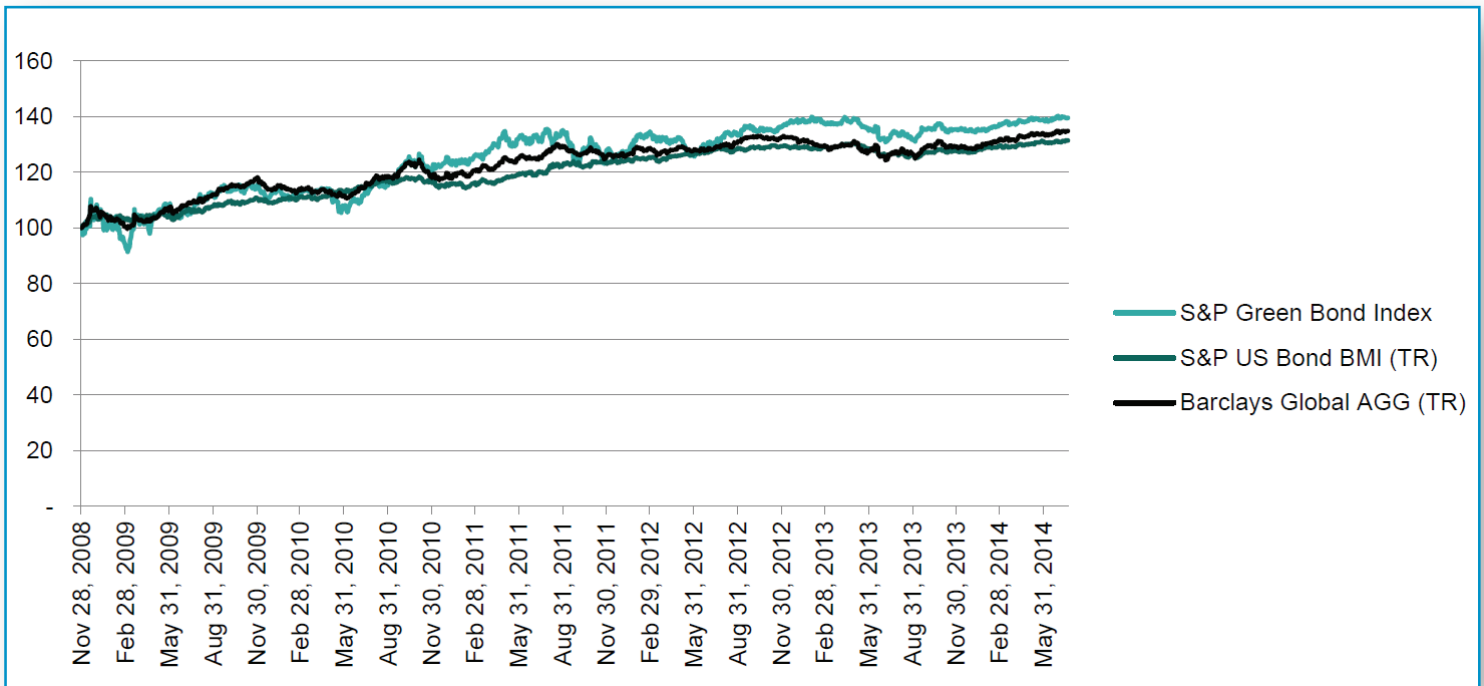
2. Green Municipal Bonds

As previously described, green bonds have been used to finance renewable energy and other positive environmental outcomes for many years in the U.S. Indeed, in 2006, federal legislation supported these trends by authorizing \$800 million for a new kind of tax credit bond called a Clean Renewable Energy Bond (CREB). CREBs were designed to provide no-interest debt financing to rural electricity cooperatives and other nonprofit agencies unable to take advantage of federal "Production Tax Credits," which had long encouraged wind power and other renewable energy generation among for-profit utilities. For example, using these federally supported tax credit bonds, California issued \$20 million in CREBs to finance solar photovoltaic panels at CalTrans transit stations and other sites across the state in 2006.¹¹ Another \$400 million in additional bonding authority was later allocated to CREBs in 2008 after a huge demand for authorizations.

An \$800 million "new CREB" program, with far less generous financial terms to borrowers, was subsequently expanded to a wider group of issuers, including state, local, and tribal governments and public utilities and electric co-ops. Congress ultimately authorized a total of \$2.4 billion to the new CREB program under the American Recovery and Reinvestment Act of 2009.¹²

In recent years, environmentally oriented muni bonds in the U.S. have hovered around \$230 million per year in new issuance, financed primarily as federal tax credit bonds, including CREBs and similar Qualified Energy Conservation Bonds (QEGBs).

**Figure 2: S&P Green Bond Index
Historical Performance against Benchmarks**



SOURCE: S&P Dow Jones Indices

QECCBs are taxable bonds that can be issued as tax credit bonds, or direct subsidy bonds, and provide municipal issuers the ability to borrow money at low rates for energy efficiency projects. Unfortunately, according to Bloomberg NEF, only around \$1 billion in QECCBs, 31 percent of the total \$3.2 billion allocated, have actually been issued since the inception of the program in 2008. Bloomberg has described 2013 as the QECCB market's "best year ever," with \$230 million raised, but over the previous five years, the annual volume averaged less than \$155 million.¹³ However, some issuers—notably the Los Angeles Department of Water and Power and the University of Louisville, KY—have taken full advantage of the federal program.

Los Angeles' \$131 million deal is of particular interest, as the largest QECCB to date (see Table 1). Additionally, more than \$20 million in CREBs were used to bring the full offering to more than \$155 million. At that scale, LADWP readily attracted the attention of credit analysts. (Fitch gave the offering an AA- rating.)¹⁴ The relatively long-dated, 17-year, taxable revenue bonds helped to finance more than 30 MW of utility-scale renewable energy, generating capacity that the city was able to install, own, and operate.¹⁵ One of the projects, the 10 MW Adelanto Solar Power Project, which was financed with \$48 million in QECCB funding, came online during summer 2012 within seven months of construction. At the time, it was the nation's largest solar installation built and owned by a municipal utility. At commissioning, Adelanto was projected to avoid 12,800 metric tons of CO₂ emissions and to power 3,300 homes each year.¹⁶

In recent months, the New York State Environmental Facilities Corp. (EFC) and the District of Columbia Water and Sewer Authority have each issued labeled green bonds focusing on water infrastructure, more than doubling those recent years' volume. Although they are green, these water infrastructure bonds are clearly distinct from bonds that are financing clean energy and mitigating greenhouse gas emissions. The EFC was the first municipal agency to sell green bonds in the U.S. since the Green Bond Principles had been publicized earlier in the year. They sold \$213 million, and the green character of the offering appears to have attracted new "crossover" investors to EFC who were interested in the bond's strong credit rating and green features.¹⁷

The DC Water and Sewer Authority sold \$350 million in DC Water bonds as taxable "century bonds," with a staggering 100-year term. Last summer, as part of a wider offering of tax-exempt, general obligation bonds, Massachusetts had issued a series of self-labeled green bonds worth \$100 million, but this summer's DC Water bond was the first U.S. muni bond to be independently verified as meeting the Green Bond Principles. (It was also the first century bond ever listed by a water utility.)¹⁸ Proceeds from the DC Water bond sale, which proved to be \$50 million higher than initially planned, will be used to finance the authority's long-term DC Clean Rivers Project.¹⁹ DC Water's CFO Mark Kim reported after the sale that the green certification played a role in attracting nearly \$100 million in additional demand, and investors included pension funds, insurers, and other long-term investors often found purchasing corporate bond securities.²⁰

After the 30 percent oversubscription for its \$100 million green bond offering last year, Massachusetts returned to the market in September 2014 with a new offering of general obligation green bonds. Initially slated at \$250 million, the par amount was increased to \$350 million in response to heavy investor interest. These self-labeled green bonds included energy efficiency and conservation projects in state buildings, but also a diverse array of other "environmentally beneficial" projects supporting clean water, open space, natural habitat restoration, river revitalization, and environmental remediation.²¹ This suggests that

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Table 1: Top 20 Qualified Energy Conservation Bonds Known Issued by State
(as of 11/29/2013)

Issued To	State	Issue Date	Amount Issued	Use of Proceeds
Los Angeles Dep't of Water & Power	California	8/17/10	\$131,000,000	Solar & wind
City of Chicago	Illinois	11/4/10	\$29,665,000	Energy efficiency; wastewater reclamation facility reconstruction
Cook County	Illinois	7/23/13	\$24,945,000	Facility upgrade - correctional facilities, health hospital nursing home improvements.
NYSERDA	New York	8/13/13	\$24,300,000	Energy audits and residential EE improvements for eligible applicants pursuant to NYSERDA's Green Jobs- Green NY program
Gilbert City	Minnesota	6/26/12	\$22,367,040	Energy efficiency
University of Louisville	Kentucky	12/20/10	\$20,942,000	School improvements
Santa Clara County Photovoltaic Project	California	2/10/11	\$20,368,000	Renewable generation
Oxnard Union High School District Project	California	9/29/10	\$19,067,730	Solar improvements in schools
Kansas Development Finance Authority	Kansas	12/21/10	\$17,815,000	Kansas State University projects
Knox County	Indiana	4/12/12	\$16,200,000	Unknown
Commonwealth of PA	Pennsylvania	9/30/10	\$15,810,000	Capital improvements to prison facilities
Yuba Community College	California	6/21/11	\$15,040,000	Renewable generation
The University of Akron	Ohio	9/30/13	\$15,000,000	Energy efficiency retrofit
Los Angeles County	California	8/31/11	\$14,000,000	Solar projects
San Diego	California	4/15/11	\$13,141,596	Lighting conversion program
University of Kentucky	Kentucky	11/19/10	\$12,955,000	School improvements
Deerfield	Illinois	9/26/11	\$12,500,000	School improvements
Los Angeles	California	10/25/11	\$11,920,000	City facilities retrofit
St. Louis County	Missouri	4/29/11	\$10,305,000	Green community loan program
Lodi Unified School District Project	California	11/18/10	\$9,915,000	Solar improvements in schools

SOURCE: Energy Programs Consortium.²⁵

the volume of these three, new, muni bond issues in 2014 alone—from Washington, D.C., New York, and Massachusetts – will be on track to exceed \$910 million in green bonds, nearly quadrupling the \$230 million in 2013 issuance. And that would be before any QEGBs in the pipeline have been accounted for this year. In other words, the U.S. green muni bond market will almost certainly be an unprecedented billion-dollar market this year.

Other noteworthy developments related to green and clean energy within the muni bond market over the last several years include the creative deployment of credit enhancements such as loan guarantees, tax credits, and public-private partnerships.²² Muni bonds can take numerous forms, as taxable or tax-exempt debt, funded either from earmarked revenues or as part of the general obligation of the issuer.

A good case study is the New York State Energy Research and Development Authority's (NYSERDA) successful securitization of its residential energy efficiency loan portfolio.²³ In order to create an investment grade bond for institutional investors to purchase, credit enhancement was necessary. NYSERDA entered into discussions with New York State's EFC, a bond authority that provides financing to municipalities, businesses, and NY State agencies for environmental projects, to obtain EFC's guaranty of their \$24 million bond issuance using the Clean Water State Revolving Fund. Once the taxable QEGB bond was structured with significant over-collateralization from the loan portfolio and a \$9 million loan loss/debt service reserve was established, the bond series was issued with a AAA-rating.²⁴

Several states, including Connecticut and New York, have also developed Green Banks that are able to provide loan guarantees, subordinated debt, and other credit enhancements to finance environmental projects. Green Banks not only leverage private capital with public dollars to provide gap financing, but they can provide an integrated financing program to support new markets. They also can warehouse financed transactions for securitization and sale to investors.

Massachusetts Second Green Bond Offering

In September, 2014, the state of Massachusetts announced its second Green Bond offering of \$350 million in infrastructure investment. It generated tremendous interest from both retail and institutional investors, with orders exceeding \$1 billion for \$350 million worth of bonds. This is the second time that Massachusetts has sold bonds with proceeds that are dedicated to fund environmentally beneficial projects across the state.

The 10-year bonds are rated double-A-plus. Massachusetts is using the green bonds to help pay for a marine terminal in New Bedford, MA, which is designed to support the construction of offshore wind projects. The state will also use proceeds for clean water, energy efficiency, river revitalization and open-space protection efforts.


AAA-rated bonds issued by NYSERDA for residential energy efficiency loans

On August 13, 2014, NYSERDA announced that it had raised \$24.3 million in Residential Energy Efficiency Financing Revenue Bonds (Series 2013A) to finance and refinance loans that were issued through the Green Jobs-Green New York (GJGNY) program for energy efficiency improvements. The Bonds are guaranteed by the New York State Environmental Facilities Corporation, which manages the largest Clean Water State Revolving Fund (SRF) program in the U.S., providing financial assistance to local governments and other public entities in the State to finance or refinance clean water and drinking water projects.

This is the first time that an SRF bond authority has guaranteed bonds that finance energy efficiency projects. It is a nationally replicable model as all states have water bonding authorities that leverage EPA Clean Water State Revolving Funds. It would allow state bonding agencies that currently issue bonds with strong credit ratings under the SRF program to now issue bonds or provide credit enhancement for energy efficiency and clean energy. It would overcome the ratings challenges that clean energy projects have often faced in obtaining financing through the public capital markets.


The bonds are secured by a pledge of loan payments from the residential energy efficiency loans that were issued through the GJGNY program, which total approximately \$29.2 million in principal from 3,116 residential loans, as well as any available monies in the revolving loan fund established under the GJGNY program. The bonds have been AAA/Aaa-rated by S&P/Moody's, based upon a Guarantee of the payment of principal and interest on the Bonds provided by the New York State Environmental Facilities Corporation (EFC) through its State Revolving Fund (SRF) program.

The Bonds were sold as taxable Qualified Energy Conservation Bonds (QECCBs). The Bonds were one of the first programmatic undertakings of the Green Bank within NYSERDA. Announced by Governor Cuomo in January 2013, the Green Bank was created to alleviate financial market barriers that currently impede the flow of private capital to clean energy projects.



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3. Corporate Green Bonds

Although green muni bond issues are growing in the U.S., the segment still remains far smaller than the \$6 billion in new corporate green bonds that have appeared on the global bond markets over the last two years. Following numerous large, benchmark-sized bond offerings from European companies that began to appear in late 2012 (Air Liquide, EDF, Unilever, GDF-Suez), US corporates started to issue their own green bonds late last year. Bank of America led the way with a \$500 million corporate green bond, which was quickly bought by a diverse group of investors, including AP4 (A Swedish Public Pension), BlackRock, Breckinridge Capital Advisors, the California State Teachers' Retirement System (CalSTRS), Calvert Investments, PAX World Management, LLC, Everence's Praxis Intermediate Income Fund, SSgA, Standish Mellon Asset Management LLC, TIAA-CREF, and Trillium Asset Management, LLC.²⁶

Pure-play renewable energy companies have also increased their bond sales, even if they may not market their bonds as green. Over the last year SolarCity has raised more than \$225 million in three rounds of sales of asset-backed securities, backed by lease income from its rooftop solar panel installations.²⁷ The company also recently issued \$200 million in retail bonds, sold directly through a dedicated website.²⁸ Late last year, Hannon Armstrong Sustainable Infrastructure offered \$100 million in green bonds, structured as a securitization of assets on the company's balance sheet, including 100 wind, solar, and energy efficiency infrastructure installations at 20 properties. Hannon Armstrong's bonds were unrated and privately placed.²⁹ Earlier this year, two publicly traded Real Estate Investment Trusts (REITs), Regency Centers Corp. and Vornado Realty Trust, also issued \$700 million in green bonds to help finance LEED-certified properties, the first nonbank corporates in the U.S. to market their bonds as "green."³⁰ As in other segments, not all corporate green bonds are providing financing for clean energy.

II. Investor Demand for Domestic Clean Energy Bonds

Although domestic clean energy bonds remain a relatively small segment of this rapidly expanding global green bond market, they are nevertheless the principal focus of this inquiry into the nature of investor demand. Given the repeated instances of oversubscribed offerings, demand for green bonds is clearly strong.

Following the issuance of green bonds by REITs, an analyst with the U.S. Green Business Council wrote, for example, "With quality investment alternatives in short supply, Green Bonds are attractive to any fixed income investor. Add over \$13 trillion in Socially Responsible Investment (SRI) capital seeking real estate fixed income portfolio investments and one can forecast the continuation of investor demand outstripping the supply of marketable securities."³¹ Similar multi-trillion-dollar estimates have been made based on the combined assets under management of members of the Investor Network on Climate Risk or signatories to the United Nations-backed Principles for Responsible Investment.

While SRI institutions and asset managers are among the mainstay investors in green bonds, these investors have no plans to re-allocate their full fixed-income allocations to green bonds, let alone re-allocate the entire universe of SRI assets under management. Based on very preliminary analysis of SRI balanced and bond funds run by firms such as Calvert, Everence, Green Century, Pax World, and Trillium Asset Management, green bonds remain limited to a few holdings within much more diversified SRI fixed-income strategies that also include wide exposures to U.S. Treasuries, mortgage-backed securities, agency debt, community investments, and corporate bonds that meet environmental, social and governance criteria. Within the full bond portfolios, the green bond holdings typically range from only 1 percent to 15 percent.

Over the last year SolarCity has raised more than \$225 million in three rounds of sales of asset-backed securities.

Understanding demand for clean energy bonds therefore requires disaggregating the various types of bond buyers, understanding their diverse profiles, and analyzing their often divergent decision-making criteria.

Based on that holdings range and assuming hypothetically that 25 percent of global SRI assets are allocated to fixed-income portfolios, one could estimate the upper band of potential effective SRI demand for green bonds as ranging from approximately \$30 billion to \$500 billion at most. Much more careful quantitative work needs to be undertaken in order to assess this potential demand accurately, but with the strong large-cap equity bias within the SRI universe and the prevalence of non-environmental criteria in qualifying SRI assets, we presume that \$500 billion is an ambitiously high upper band for green bond targets from global SRI practitioners.

However, investors using SRI strategies are only one driver of green bond demand. Conventional asset managers, corporate treasurers from companies such as Ford and Microsoft actively managing their sustainability profiles, and pension funds are all buying green bonds, and underwriters have indicated that insurers and hedge funds are active buyers as well. Understanding demand for clean energy bonds therefore requires disaggregating the various types of bond buyers, understanding their diverse profiles, and analyzing their often divergent decision-making criteria.

In other words, investor demand for green bonds may be strong, but it is by no means homogeneous. In exploring demand for clean energy and green bonds, we focused our research, analysis, and outreach on six broad categories of investors that we found to be particularly active green bond buyers:

1. Asset managers and investment consultants
2. Foundations and endowments
3. Faith-based investors
4. Investment banks
5. Corporations and insurers
6. Public pensions

This list of green bond buyers is by no means comprehensive, and the categories are also not mutually exclusive. (Some asset managers are also faith-based investors, for example.) Because SRI investors are especially active participants in the space, we have segregated our analysis of asset managers and investment consultants between dedicated SRI firms and more conventional investment firms that may have only a portion of their fixed-income assets committed to sustainable investment strategies.

1. Asset Managers and Investment Consultants

A. Conventional Asset Managers and Investment Consultants

Several “mainstream” asset managers and investment consultants have begun actively participating in the green bond market, or they have created dedicated environmental, social and governance (ESG) investing strategies or teams that are tracking the market. Breckinridge Capital Advisors, for example, is a \$19 billion fixed income asset manager in Boston that integrates ESG investment criteria across its entire business but also runs two “sustainability strategies” with around \$275 million in assets under management for clients that want to invest more proactively in sustainability themes. Among green bonds that have been issued, Breckinridge’s high-quality focus has led them to buy AAA-rated paper from the multilateral development banks, the NYSERDA taxable QECB green bond, and the Bank of America corporate green bond. Since Breckinridge manages money for a variety of clients, including tax-exempt institutions such as foundations and individual investors with specific tax exposures, the asset manager has an interest in a variety of green bonds, both taxable and tax-exempt.

State Street Global Advisors (SSgA), a major Boston-based asset manager with more than \$2 trillion in global assets under management and more than \$180 billion in assets subject to ESG investing criteria, has created one of the only dedicated “High Quality Green Bond” strategies.³² SSgA has been very active in buying supranational issues from the development banks and supporting development of the field. Like Breckinridge, SSgA has a very strong interest in high-quality credits. TIAA-CREF maintains 10 percent of its Social Bond Fund invested in “proactive social investments”. Unlike other asset managers that run green bond funds, TIAA-CREF’s green bond exposure goes through the Social Choice Bond Fund.³³ This bond fund is an actively managed fixed-income fund that invests in securities that meet certain ESG criteria. In addition to filtering out companies that do not meet their social guidelines, the fund proactively targets investments in socially beneficial companies and projects in market segments that include affordable housing, community or economic development, renewable energy and natural resources.

PIMCO expressed significant interest in green bonds, tempered by an observation that green bonds are currently slightly higher risk than similar paper, yet commanding lower yields.³⁴

Each of these conventional asset managers has a bias toward high-quality green bonds with clear performance benchmarks. Without a credit rating and often credit enhancements, they often will not buy.

Other conventional asset managers that are actively buying green bonds include Angel Oak Capital Advisors, BlackRock, Eaton Vance, First Investors, JPMorgan Chase, Northern Trust, SEI Investments, Standish Mellon Asset Management, and Vanguard.³⁵

Several investment consulting firms, such as RBC Wealth Management, Mercer, and Rogerscasey, which advise foundations and endowments, high-net-worth individuals, and pension fund clients, have a strong appetite for climate-related investments. As a consultant rather than an asset manager, RBC does not buy bonds directly, but it vets managers in the space and directs their clients’ fixed-income allocations into specific green bond strategies.

B. SRI Asset Managers

Many dedicated SRI firms, such as Calvert Investments, the First Affirmative Financial Network (FAFN), and Community Capital Management are deeply involved in the domestic clean energy bond market. The faith-based integrated financial services firm Everence (formerly known as Mennonite Mutual Aid) runs an intermediate income bond mutual fund that markets to SRI retail and institutional clients. Although each firm approaches bond investing differently, they all tend to be smaller players with a very strong interest in the environmental attributes of green bonds.

The SRI firms are far more concerned with the actual use of proceeds than their green labeling, and many expressed a willingness to consider a bond used to finance environmental projects regardless of how it might be marketed. Because they typically have fairly strong ESG criteria, the SRI firms may be less inclined to buy a green bond from a “brown” issuer that would otherwise fail to meet their screening criteria. For example, Rathbone Brothers PLC, a British fund manager with ethical guidelines, went on public record as saying the fund did not buy EDF’s green bonds “because they also produce nuclear energy.”³⁶ Indeed, several SRI firms worried that the green labeling amounted to greenwashing, and one expressed serious concerns about the non-transparent use of proceeds by World Bank green bonds.

At the same time, many SRI managers have expressed an expectation commonly found among conventional asset managers that green bonds should perform as other bonds. A bond fund

manager from PAX World Management, for example, reported that he had passed on the Regency REIT's green bond earlier this year because he felt the issuer was seeking a premium price for it. By contrast, other SRI firms, including Everence, trumpeted their purchase of the same issue because it corresponded to their social and environmental criteria.³⁷

Because SRI investors tend to be smaller players in the bond market, they do not require extremely large issues. Consequently, they can go in on smaller deals than larger institutional investors; indeed, some small portfolio managers are not even able to get access to the larger oversubscribed issues. At least some SRI managers are very active in the secondary market. Although they may be buying all types of green bonds (corporate, supranational, and municipal), the SRI investors tend to be most active in the muni bond markets. They manage money for many different types of clients, from high-net-worth individuals and families who are faced with tax considerations to tax-exempt foundations and educational endowments. Consequently, SRI investors (with diverse clientele and broad investment mandates) have an appetite for both taxable and tax-exempt bonds. In general, they tend to buy higher-rated paper from obligors that meet normal due diligence. Although they have the flexibility to invest in lower rated bonds, they tend only to buy shorter-duration bonds, since they do not feel adequately compensated for the risk over the longer term.

The structure of the vehicles under management constrains investment holding periods, maturity, and liquidity preferences. Whereas some managers hold to maturity for their clients by running separate accounts, mutual fund managers such as Calvert and Everence need to have daily pricing and liquidity.

2. Foundations and Endowments

Stakeholders are increasingly pressuring foundations and higher education endowments to consider the climate impacts of their investment portfolios. Many of these institutional investors have responded by considering fossil fuel divestment. Divest-Invest Philanthropy is a recently-launched coalition of foundations who have pledged to divest from fossil fuels. Divest-Invest Philanthropy represents a growing group of foundations committing not only to divest from fossil fuel stocks and bonds, but also to reinvest in clean energy and other climate solutions. As part of the research process for this paper, we spoke with several foundations involved in Divest-Invest Philanthropy, as well as asset managers and investment consultants who serve them as clients.

Until now, much of the investment side of the Divest-Invest movement has focused on cleantech private equity and venture capital. However, growing numbers of foundations and endowments are recognizing the opportunities for clean energy investment across asset classes in their portfolios.

Because few foundations actively manage bond portfolios in house, investment consultants and external managers are vital in generating interest for green bonds among these institutional investors. Many consultants used by Divest-Invest Philanthropy have approved green bond fund strategies for their clients. For example, one \$100 million foundation that embraced divestment last year has explicitly shifted its entire fixed-income portfolio to sustainability strategies, allocating 75 percent to Brekinridge's sustainability strategy, with limited high-quality green bond exposure, and 25 percent to Calvert's new Green Bond Fund, which has more diversified credit exposure. A strong sense of fiduciary duty pervades the culture at this foundation, leading them to embrace green bonds combined with a strong tilt toward quality.

Divest-Invest Philanthropy represents a growing group of foundations committing not only to divest from fossil fuel stocks and bonds, but also to reinvest in clean energy and other climate solutions.

Although this particular foundation is embracing green bonds as a mission-aligned investment, it is not interested in sacrificing returns. However, some of the family foundations involved in Divest-Invest Philanthropy have shown a tolerance for accepting some concessionary returns in exchange for demonstrable mission-related environmental impact, if the investments meet the due-diligence standards of their investment consultants.

3. Faith-Based Investors

Faith-based investors too have been active in the clean energy bond space. We spoke with three faith-based investors: Friends Fiduciary, Everence, and the Church Pension Group for the Episcopal Church. Each investor has a somewhat different profile. CPG solely manages pension funds, whereas Friends and Everence manage money for private clients and other institutions. While some faith-based investors made it clear that their faith leads them to a socially responsible investment practice, others have been reluctant to adhere to certain SRI strategies, including divestment from fossil fuels.

The faith-based investors we spoke with reported that environmental issues are important to them, and that they view green bonds as a piece of environmentally-themed investing. However, like Community Capital Management, these faith-based investors share a focus on social issues, primarily poverty. Several suggested that they might incorporate more green bonds into their portfolios if the use of proceeds included a social dimension—for example, targeting efficiency upgrades within the affordable housing segment.

Like the SRI asset managers, faith-based investors manage money for a range of clients, both with and without an appetite for tax-exempt paper. Their guidelines allow for lower grade and some unrated paper, and they buy across the credit spectrum. They expressed interest in a wide range of size of issues. However, liquidity is important for these investors—especially for Everence, which manages mutual funds that require daily liquidity.

4. Investment Banks

Investment banks play a critical role on the demand side as underwriters of clean energy bonds. Banks that are active in the green bond space are in a good position to have some of the most comprehensive—and influential—views of the market, because they see both buyers and sellers that would otherwise remain hidden from view. Banks are among the first players to review potential deals from issuers hungry for financing and then to structure their terms, whether they be corporate asset-backed securities, municipal bonds, or project bonds. Unlike most of the other kinds of institutional investors actively buying bonds, investment banks are not constrained by the same burdens of fiduciary duty as buy-side market participants.

Banks are also bond buyers, with a de facto right of first refusal to determine whether to keep a debt opportunity for their own portfolio needs, often on highly favorable terms, or to sell it as bonds onto public markets or as private placements. One banker working the middle market, for example, told us that they underwrote many smaller tax-exempt bonds to purchase entirely for their own account. If they like the finances of a deal, they will do the whole deal. Alternatively, banks can distribute bonds they underwrite directly to their own clients, as Bank of America Merrill Lynch (BAML) recently did with \$12 million in World Bank green bonds sold to individual investor clients of Merrill Lynch Wealth Management.³⁸

At the same time, banks have their own interest in tapping debt markets, so they can also issue bonds while underwriting their own offering. For example, BAML participated in the underwriting of its parent company's \$500 million green bond last year.

Several suggested that they might incorporate more green bonds into their portfolios if the use of proceeds included a social dimension—for example, targeting efficiency upgrades within the affordable housing segment.

Markets begin to come into clearer focus when they are seen from all sides.

The underwriting investment banks most highly engaged in green bonds, such as Bank of America Merrill Lynch, Citigroup, and JPMorgan Chase, played a leading role in formulating the Green Bond Principles. Some bankers with whom we spoke expressed concern that the criteria for what makes an issuance “green” had seemed somewhat opaque to them. One major underwriter, for example, assumed that any bond issued by an international development bank was intrinsically a socially responsible investment because of the bank’s development mission.

However, some social investors remain concerned about transparency of development bank reporting. For these and other reasons, Green Bond Principles were created to provide a framework for evaluating the environmental impact of a green bond investment, and moving the market towards standard disclosures for transactions.

While big banks work on large deals involving prominent corporate, public, and supra-national issuers, smaller muni bond opportunities related to clean energy seem to have escaped the attention of most large investment banking firms. Financing energy efficiency and renewables for small agencies and local authorities has been left to middle market bankers, who manifest little interest in the ultimate green use of the proceeds by the obligor. The bankers in these segments with whom we spoke seemed largely uninformed about green bonds, even though they were knowledgeable issuers of tax-exempt debt and regular lenders to renewable energy projects.

None of the bankers we engaged with in our inquiry thought that the green attributes of a bond would deliver any pricing premium over equivalently structured debt from the same issuer. Oversubscriptions for green bonds could, in this view, be understood as a sign that the bond market itself simply remains very much a “seller’s market,” saturated with investors ready to buy.

5. Corporations and Insurers

Insurers have expressed heterogeneous interest in the clean energy bond market. Our team interviewed several insurers, Metlife, W. R. Berkley, and Zurich, and we had additional brief conversations with numerous others that did not materialize into full-fledged interviews. We also spoke with other Metlife bond managers and analysts, as well as insurance asset managers at Guardian Life, AIG, and Prudential. Two of these firms acknowledged the attractiveness of green bond issues with long tenors to their liability-driven investment strategies.

Zurich Insurance, the subsidiary of a European parent, has publicly proclaimed its focus on green bond issuance. Zurich announced that it wanted to double its allocation to green bonds from a targeted \$1 billion to \$2 billion, as part of its broader SRI strategy. “Green bonds are a great example of an investment that allows us to have a positive impact on society and the environment, while meeting our financial criteria,” Chief Investment Officer Cecilia Reyes said in the statement.³⁹ However, Reyes has also expressed concern about the growth of the market, and its potential for green-wash, leading to tempered enthusiasm in the space. Discussing the need for increased transparency and accountability before making bigger plays, Reyes said, “If this market becomes broader and deeper, then we can invest beyond the strategy that we have in place at the moment.”⁴⁰ Zurich has invested \$400 million to date, and if it reaches \$2 billion, that would constitute one percent of its \$200 billion in assets. Whether this could become a green bond “allocation” target for other insurers remains an open question.

Green Bond Principles were created to provide a framework for evaluating the environmental impact of a green bond investment, and moving the market towards standard disclosures for transactions.

At least a small number of corporate 401(k) defined-contribution plans provided in retirement plan fund rosters have some green mutual funds options with integrated green bonds, notably Intel. Several corporations including 3M, Ford, and Microsoft, have bought green bonds as part of their treasurers' operating portfolios, and that their sustainability or corporate social responsibility strategies encouraged them to participate.

However, many corporate treasury operations are more focused on managing the firm's capital and funding operations than investment proper. Young corporations may be focused on reinvestment in operations and the trend away from defined benefit plans for employees has limited the asset accumulation to meet pension obligations.

In large firms such as GE and GM where defined pension benefits persist, these plans are often managed outside the Treasury function. Instead, operational considerations dominate standard industrial company treasuries, including the ongoing management of asset/liability risk, and attention to the evolving decision to retain or dissolve the defined benefit plan in favor of a defined contribution alternative. Corporate investment decisions related primarily to health and retirement benefits often fall within the purview of third parties such as actuaries, record-keeping firms engaged to oversee plan benefits and outside investment managers. We did identify corporations active in corporate socially responsible (CSR) investment and have commented elsewhere on the resultant social bond demand as a component of green bond activity.

For this reason, our outreach to corporations focused on managers of the assets that back property protection plans, health and pension benefits, banks and insurers. Insurers were of particular importance to our inquiry due to their capacity to invest across all fixed income markets, municipal, government and corporate, at all tenors and across the credit spectrum. In addition, they maintain specialty portfolios to participate in local and community markets where they often provide guarantee products, as part of their corporate social responsibility activities.

Fixed income allocations for insurers are much higher on average than many institutional investors, often ranging from 50 percent to 60 percent on average. They are active in the space even without a green mandate. Frankly many insurers buy quietly and were hesitant to share insights into their investment decision-making criteria.

We spoke to the director of one insurer's social investment program, who manages a \$200 million portfolio. Although the program is socially focused (primarily on low-income housing), it has no specific green strategy per se. The director told us that fixed-income portfolio managers were likely active in the green bond space, but doubted that the green attributes would sway them if the underlying financials were not robust.

Because of the liability-driven investment of insurers, their time horizon can be longer than many other investors. However, because they have so many disparate liabilities of different tenors, insurers must invest across multiple time horizons across their portfolios. As with many institutional investors, insurers' preference for taxable debt with higher yields leads them to eschew the muni bond market where much of the clean energy bond activity is found.

Zurich announced that it wanted to double its allocation to green bonds from a targeted \$1 billion to \$2 billion.

6. Public Pensions

Fixed-income allocations for public pensions average around 23 percent, far lower than fixed-income allocations for most insurers, yet higher than those for most endowments.⁴¹ We did not interview any public fund investors, but publicly available information indicates that some U.S. public pensions are becoming more active in the green bond market.

For example, CalSTRS, one of the buyers of Bank of America's corporate green bonds, was one of the first public pension funds to sign the Green Bond Principles.⁴² The California Public Employees Retirement Systems (CalPERS) has \$44.8 billion in fixed income, 15.5 percent of the total assets under management, as of first quarter of 2014.⁴³ CalPERS credit analysts are beginning to understand the risk of stranded assets and other regulatory risks associated with debt investments in fossil fuel companies. They are also evaluating whether to integrate climate change and sustainability-related assets across the total fund, including fixed income.⁴⁴ As previously mentioned, international public pensions such as AP4 are also buying in the market—indeed even in the U.S. market.

III. Demand Characteristics of a Market in Disequilibrium

Examined across the broad range of green bond buyers we have examined, six key issues repeatedly arose in the course of our research and interviews on the nature of demand for clean energy bonds:

1. Liquidity
2. Credit Quality
3. Size
4. Terms
5. Use of Proceeds
6. Labeling

1. Liquidity

Many institutional investors require a high degree of liquidity in clean energy bonds. Daily liquidity was necessary for many investors, especially those running mutual funds that require daily pricing and allow daily redemptions. Some said it was the most important consideration for them. Some institutional bond buyers seek green taxable bonds that have the same characteristics of US Treasuries – high quality (“AA” rated or better), low yield and liquidity.

In order to fulfill expectations for higher liquidity, most institutional bond buyers pursue larger deals. Some have in-house limits on the proportion of a bond issue they can own, so this raises the bar further for the minimum size they are willing to purchase. The SRI and faith-based bond buyers have manifested a far greater tolerance for smaller issues, even when they are large institutional buyers.

However, unlike the very large institutional investors, some smaller investors are not able to participate in deals because they do not manage large enough client or proprietary portfolios to make large bond purchases. For example, one smaller retail-oriented portfolio manager cannot always get into the larger issues, but nevertheless has ready access to smaller deals because he is a highly experienced muni bond manager, who knows the obligors very well. He also finds the liquidity he needs in the secondary market, where much of his trading activity occurs.

Many larger investors face capacity constraints in terms of their ability to follow all of the small bond offerings, particularly the small muni bonds. Thus, it would be advantageous for them to see the market evolve to bundle several small clean energy bonds into a single offering. This innovation could help to offset the cost of additional disclosure for transparency and interventions to separate green project issuance from the general obligations of small municipalities.

2. Credit Quality

The investors we talked to have a wide range of credit requirements. Some expressed a desire to see clean energy bonds across the continuum from unrated to those rated BB to high quality AAA bonds. Some investors require high credit bonds, whereas others prefer lower quality, higher yielding paper.

Several interviewees suggested diversifying offerings across the quality spectrum as a means to build out the market for clean energy issuance. Indeed, in our interviews, we heard demand for unrated or fairly low quality products from investors with higher risk tolerances and greater return appetites. This diversification across credit quality would help to avoid crowding of supply at the top, which could ultimately lead to under-subscription or a loss of interest in the space.

In addition to diversifying the quality of the bond offerings, bonds should be diversified across type as well. At this point, the market consists largely of taxable corporate and supranational bonds, and tax-exempt municipal bonds. Because many investors cannot take advantage of the tax benefits of exempt bonds, several of our interviewees suggested increasing the offerings of taxable municipal bonds. On the other hand, tax-exempt bond buyers need the munis to be issued.

3. Size

In a bond market calibrated in billions, small issues of a size less than \$100 million occupy market niches. The municipal market is quite highly segmented: General obligation (GO) versus Revenue bonds, tax-exempt versus taxable issues within the revenue bond segment; geographical and state preferences and short/medium term versus long-term tenors.

Size follows use of proceeds to some extent. GO bonds take their size and other characteristics from the financing cycle of obligors and the relative value considerations that drive muni bond buyers to select among competitive issues. These general obligations need not be constrained by project size or considerations beyond the bond issuers' ability to repay as perceived by the marketplace and verified by financial analysis.

Revenue bonds that are used to fund clean energy projects are constrained by the financing needs of the developer. They are usually public-private partnerships and non-recourse to the private corporation or state involved in the deal. Therefore, investors can rely only on the project cash flows for repayment. Such issues can range in size from as small as \$10 million.

We heard from bank investors who purchased such tax-exempt revenue bonds in sizes of \$75-250 million for their own portfolios. Clearly, the portfolio value of these tax-exempt issues allowed them to find buyers. They did not need ascribed liquidity to be marketable.

In fact, investors' strategic purposes make simple analogies between size and liquidity difficult in the green bond space. Large institutional players noted that the increasing size of green

Revenue bonds that are used to fund clean energy projects are constrained by the financing needs of the developer.

bond issuance from supra-nationals and corporations are a positive sign of increased market development. Larger issues are coming to market because green bond issues from well-established names such as the World Bank continue to be oversubscribed for investment.

These same large issues may be purchased by investors comfortable with the obligor and held in portfolio. Therefore, the implications of size alone for green bonds and the subset of domestic clean energy issuance are not readily generalized from our discussion with investors.

Nevertheless, for banks with specific underwriting criteria and bond buyers with specific liquidity needs, the limited availability of “index-eligible” bonds was repeatedly cited as an issue of concern. A reliable pipeline of replicable, well-structured bonds from issuers could help mitigate the negative aspect of smaller sized bonds for some participants. Similarly, a consortium of issuers using standardized underwriting and structuring could ease the transactional burdens perceived by banks and buyers.

A reliable pipeline of replicable, well-structured bonds from issuers could help mitigate the negative aspect of smaller sized bonds.

4. Terms

As a general rule, green bonds do not appear to benefit from price premiums over similarly situated bonds, and investors repeatedly said that they were unwilling to sacrifice investment yield when considering green and clean energy bonds. At the same time, one rating agency did observe some premium. And some institutional bond buyers seek green taxable bonds that have the same characteristics of U.S. Treasuries—high quality (“AA” rated or better), low yield and liquidity.

This similarity to other bonds is an important characteristic of green bonds, as most investors report an unwillingness to sacrifice returns for “greenness.” There are exceptions—some SRI asset managers reported flexibility when it came to terms if there were a compelling environmental or social impact narrative associated with an issue. However, most of that flexibility is found in credit quality, size, and tenor, rather than yields.

In some sectors, because green bonds are oversubscribed, there may be some discount to the yield for the issuer, which one rating agency observed to some degree with REIT green bonds. At this time, this phenomenon may be confined to REIT bonds. The possibility of oversubscription due to high demand should entice issuers to develop more green bonds, with the hope of lowering the cost of capital. However, few of the underwriters we interviewed perceived such an opportunity for their issuing clients.

As previously discussed, different types of investors have different tax exposures, and thus demand bonds with heterogeneous tax liabilities. Although many municipal bonds are tax-exempt, many of the investors interested in green municipal bonds cannot take advantage of that, as they are already tax exempt. This includes some of the faith-based investors, the public pensions, foundations, and others. We found a lack of taxable municipal clean energy bonds available to these tax-exempt investors, and that this is a major opportunity moving forward.

5. Use of Proceeds

Transparency of the use of proceeds appears to be a barrier to increasing investment in green bonds. Challenges around the use of proceeds include transparency and the “greenness” of the underlying projects being financed.

Transparency of use of proceeds is important to many investors, as confirmed with disclosure, third-party audits and continued reporting. Other investors are less concerned with what the use of proceeds is; if they like the credit and yield they will buy it.

As previously mentioned, some investors have passed up investment opportunities due to lack of transparency. For example, several investors steered clear of the Build America Bonds because of lack of clarity of use of proceeds. Some SRI asset managers went so far as to say that the World Bank bonds lacked adequate transparency regarding use of proceeds. Many others, however, were very comfortable with the World Bank’s reporting—and viewed it as a fairly high-bar standard.

On the other side of the use of proceeds issue, several of our interviewees were largely satisfied with the market’s transparency. Some mainstream investors view the international development bonds issued by the World Bank, the African Development Bank, and the IFC as intrinsically “social” or “green” because they usually target development in underserved parts of the world, emerging economies or environments in need of relief or recovery from natural catastrophes and war.

Consistent with the view of mainstream investors, some SRI/ESG dedicated investors expressed interest in continuing to see a wide range of issues, including a spectrum of use of proceeds transparency and “greenness.” One faith-based investor expressed this desire, explaining that the green bond market is still in its infancy, and any efforts to standardize could limit the potential growth of the space.

One investor raised a related use of proceeds concern regarding green bonds that are repaid from the organization’s general revenue and not from the financed green activity. This makes investors question the extent to which they are financing green projects. The problem would be resolved by increased transparency from issuers. Alternatively, use of proceeds concerns could be addressed through product development and underwriting to restructure green bonds to assure that the capital for repayment of this issuance comes from the revenue generated from the green use of proceeds, not from general revenue.

Another concern that was expressed was the unintended consequences that arise when credit enhancement is used instead of obligor transparency to support green labeling. For example, a few municipal market investors observed that when a general obligation issuer (GO) provides credit enhancement or facilitates the upgrade of a bond’s rating by providing its GO guarantee, the support can help or hurt a given bond’s marketability.

Judged on the specific characteristics of the issue use of proceeds, structure and status with the obligor, a given green issue may find its target investors among a wide range of potential buyers from high grade investors to junk bond participants. Therefore, obligor transparency regarding use, underwriting interventions to protect proceeds, and return of dedicated capital could enhance the attractiveness of green labeled issues.

Transparency regarding use, underwriting interventions to protect proceeds, and return of dedicated capital could enhance the attractiveness of green labeled issues.

Some investors are so focused on the use of proceeds that they are almost indifferent to a bond being labeled as a “green bond.” Significantly, these investors have the capacity for intensive due diligence as well as a deep familiarity with the issuers. These resources allow them to recognize when bonds are working towards environmental protection regardless of what they’re called. However, most investors do not have this capacity, so having bonds expressly labeled “green” can be very helpful.

By contrast, as mentioned in the above SRI section, investors who may have limited due diligence resources but must adhere to stringent ESG criteria or screens, such as some dedicated SRI investors, will rarely accept a “green bond” issued by a “brown” company.

Because green bonds, for the most part, maintain the same market profile as other bonds from a given obligor that are not used for environmental purposes, investors with no explicit desire for “green” may nevertheless invest in green bonds. Such investors are generally unconcerned with the green label or the environmental record of the obligor, but are attracted to the bond for its financial merits.

In fact, a large segment of the U.S. bond investing community appears to fall into this category. This inquiry was not a systematic survey of all market participants designed to determine whether these investors dominate the market for clean energy issuance. However, the majority of corporate bond buyers contacted during the outreach for our work claimed that the evaluation of clean and green bond issues in their firms is driven by “the financials” and standard risk/reward criteria.

Despite the differing views within the sample of investors interviewed, overall, our discussions indicated that any successful standardization of green bonds should include requirements for reporting on the use of proceeds.

6. Labeling

Investors may overlook a bond that finances clean energy if it is not labeled as a green bond, particularly in the less liquid muni bond market and in the corporate ABS segment. The Green Bonds Principles now provide voluntary guidelines for labeling a green bond.

Some investors with appetites for green bonds across the quality spectrum and yield curve expressed concern that standardization of the green bond market at this early stage would constrain innovation and diversity of offerings, and that it could add unnecessary costs. However, most investors with whom we spoke thought that the development of principles could be a good way to give legitimacy to the space.

Not all labeled “green bonds” are alike, so investors need to have enough information to understand whether and to what extent they are green. A clean energy bond used to finance new renewable energy generating capacity that quantifiably mitigates greenhouse gas emissions is not equivalent to “green bonds” whose proceeds are used to maintain existing transportation or water infrastructure, to build new “sustainable” shopping malls, or to finance a diffuse array of “climate adaptation” projects with poorly defined environmental impact.

Similarly, the sustainability attributes of the issuer needs to be taken fully into consideration. A “green bond” issued by a large financial institution, energy company, or conglomerate that is actively magnifying climate risk in other lines of business is not equivalent to green asset-backed securities of renewable energy companies.

Recommendations

The following specific recommendations flow directly from our findings. Taken together, they constitute a blueprint for action to enhance investment into clean energy bonds. These recommendations fall under three interrelated categories: (a) further research and analysis, (b) convening and collaboration, and (c) developing, diversifying, and deepening deal flow.

Further Research and Analysis

1. Conduct further research on the full range of green and clean energy bond buyers in order to develop a more complete picture of the specific, disaggregated demand characteristics of active investors. Far more data on bond buyers are available than this study has investigated, and a much larger sample of investors could be approached for insights in future research and consultations. Considerably more research remains to be done with public funds, corporate treasurers, college endowments, and larger mutual funds and asset managers.
2. Assess more clearly and quantitatively the size of potential investor demand and the opportunity set associated with clean energy bond investment by reviewing fixed-income portfolio allocations of the range of investors active in this market.
3. Conduct deeper analysis of green bond attributes in order to develop greater consensus about the nature of green bonds as a financial instrument. Can such a thematically constructed tool be understood properly as an asset class? Or are green bonds simply one of many segments of debt instruments within fixed income?
4. Compile case studies of green bond deals in order to draw lessons into best practices, successes, and failures.
5. Analyze more carefully why many underwriting investment banks have not yet perceived distinctive opportunities around labeled green bond transactions—and what role these banks can play in addressing supply/demand disequilibrium. Part of this analysis should involve reviewing underwriting criteria and understanding the processes that lead banks to determine whether to buy the deal, place it, or offer it onto the public markets.
6. Develop a deeper analysis of why the tax incentives embedded within CREBs and QECBs were not fully utilized by muni bond issuers, and why large green bond buyers had no real appetite for these kinds of products.
7. Analyze more fully the emerging experiences and opportunities for clean energy finance associated with Green Banks in states such as Connecticut and New York.
8. Explore the potential ways that clean energy bond financing can support the nascent green revolving loan fund model being used by colleges and universities, hospitals, and municipalities.

Convening and Collaboration

1. Develop new collaborative frameworks for bond buyers to convey their demand expectations to issuers, along the lines of this convening. Educate wider groups of institutional investors, bond buyers, underwriters, and investment consultants about the opportunities associated with clean energy bond financing.
2. Convene separate peer groups of bond-buying investors (mutual funds, insurers, pensions, foundations, endowments, consultants, SRI, faith-based groups, underwriting investment banks, smaller organizations) in order to have more focused conversations about specific kinds of green bonds that meet their investment criteria.

Deep dialogues with overly heterogeneous groups of investors may quickly encounter stumbling blocks related to time horizon, fiduciary norms, ESG perceptions, and access to money managers and investment vehicles, as well as the other diverging demand characteristics discussed. Ideally, these convenings would happen on investors' home turf, among existing peer groups of endowments, foundations, public pensions, labor trustees, SRI firms, and impact investors.

3. Convene credit rating agencies in order to encourage expanded coverage of clean energy and green bonds, across the credit spectrum, with particular depth needed with the domestic municipal bond market.
4. Convene underwriters, working with them to build understanding the middle-market opportunities within the municipal bond markets and to develop turn-key underwriting practices for smaller bond issues that replicate structures of emerging best practices among new kinds of issuers.
5. Foster collaborative outreach about clean energy bonds to the growing groups of investors that are grappling with fossil-fuel divestment and fossil-free investment, with all due attention to their specific demand profiles (public pensions and other public funds, foundations, endowments, family offices, faith-based investors, labor pensions, high-net-worth individuals, and their advisers and investment consultants).
6. Encourage all parties interested in clean energy bond finance to join the Green Bond Principles as Members, if they are issuers, underwriters, or investor, or Observers if they are service providers, NGOs, or other stakeholders. The Principles will likely become an important convening network and resource in this space.
7. Convene investors and relevant stakeholders such as Clean Energy Group, CDFA, the Energy Programs Consortium, NASEO, Sustainable Endowments Institute, and US Department of Energy, into multi-stakeholder working groups to address more technical obstacles and opportunities, such as the underutilization of QECEBs, the potential replication of using Clean Water State Revolving Funds as loan guarantees, green revolving loan funds, and green banks. Convenings should involve state and local development finance officials, local agency treasurers and nonprofit finance officers, clean energy finance specialists, bond counselors, green bond buyers, credit analysts and raters, underwriters, and other experts.

Develop, Diversify, and Deepen Deal Flow

1. Understand, optimize, and replicate key models of emerging best practices that have met investor expectations.

Among the early candidates for examination are the following:

- a. *Morris Model* (High-quality taxable general obligation bond): Taxable municipal bonds floated by a AAA-rated obligor Morris County, NJ, backed by the revenues of solar power purchase agreements. Define them as “green bonds.”
- b. *Delaware Sustainable Energy Utility Model* (Tax-exempt general obligation bond, bundling projects, obligors, and loan guarantees among multiple participants in a P3 structure): Establish a public nonprofit Sustainable Energy Utility to issue tax-exempt municipal bonds for renewable energy and energy efficient retrofits that bundles financing for a wide variety of organizations, including schools, public facilities, colleges, hospitals, working with ESCOs and with credit enhancement provided by a general obligation guaranty of each participating obligor as well as guaranty of participating ESCOs, alongside a guaranty of appropriated state funds.
- c. *Massachusetts Model* (Tax-exempt general obligation bonds for bundled environmental finance projects): Bundle clean energy and energy efficiency projects into a more diversified “green bond” series, backed by the full faith and credit of the state. The use of proceeds should be transparently tracked and reported on annually, including environmental and climate-related impacts associated with specific projects receiving financing. Data on energy savings, cost savings, greenhouse gas emissions abated, job creation, and other investor-relevant social and environmental impacts should be tracked.
- d. *QECCBs, Appropriately Scaled* (Qualified federal tax credit bonds): Take full advantage of subsidies provided by the additional \$2 billion in federal Qualified Energy Conservation Bond financing being left on the table by dozens of states that have not used their full allocations, before the funding for them could be deauthorized. Aggressive outreach needs to be done with states that have not tapped these allocations. Issuers need to focus on bundling and aggregating projects at larger scales, as was done by the LADWP, aiming for minimum offering volumes of \$25 million. States with smaller allocations need to explore opportunities to pool and bundle at more appropriate levels of aggregation. Apply findings from research and convenings related to the underutilization of these federal tax credits bonds. Ensure that all QECCBs are self-labeled as “green bonds.”
- e. *NYSERDA Model* (Taxable revenue bonds with loan guaranty from Clean Water State Revolving Funds): Use untapped \$1 trillion, loan guaranty authority of AAA-rated Clean Water State Revolving Funds to provide credit enhancements to municipal bonds financing clean energy and energy efficiency. NY State combined the guaranty with a low-cost federal qualified QECCB structure, but the CWSRF guaranty could readily be used as a tax-exempt bond as well.

- f. *DC Water Model* (Taxable “century” infrastructure bonds): Extend the time horizon of bond maturity beyond 30 years in order to lower payments, match financing to the intergenerational burdens of large-scale infrastructure projects, and lock in relatively low cost of capital, while appealing to longer-term and liability-driven investors “reaching for yield,” including pensions, endowments, and insurers.
 - g. *Renewable Energy Asset-Backed Securities* (Taxable corporate bonds): SolarCity and Hanson Anderson provide models here of how to refinance existing solar and wind installations, using SRECs and PPAs currently in place, rated at lower-quality, investment grade levels of interest to SRI asset managers and others “reaching for yield” across the curve and the credit-quality spectrum.
 - h. *Multilateral Model* (AAA-rated, tax-exempt, dollar-denominated supranational bonds): Given the success of World Bank, IFC, EIB, and other regional development bank green bonds, the structure could be replicated and improved upon in two directions that are germane to this inquiry. First, proceeds could be much more narrowly targeted for renewable energy power generation and energy efficient retrofits and upgrades in the developing world (excluding large-scale hydropower or other deployments involving large-scale ecosystem transformation). The aim would be to hasten the global clean energy transition by weaning developing and emerging markets more rapidly off fossil fuels in ways that have positive rebound effects upon developed energy markets in the form of lower-cost renewable technologies and lower demand for non-renewable resources, such as coal, natural gas, and tar-sands oil. Secondly, a greater focus on neighboring geographies in Latin America and the Caribbean could be encouraged since few, if any, of the supranational green bonds have gone to environmental projects in the western hemisphere. These could be geographically targeted series of IFC or World Bank bonds, new offerings of the IADB, or sovereign/quasi-sovereign green bonds of countries in the Americas.
2. Foster activity to deepen and diversify the pipeline of clean energy bonds. Diversification might take the following useful forms:
 - a. A better distribution of green bonds across the credit-quality continuum, the yield curve, and geographies – particularly away from the predominance of AAA-rated development bank debt;
 - b. Longer-dated tenors, beyond 10 years, to match investor liabilities, risk parameters, and appetites for enhanced yield
 - c. Larger, rated issuance with at least \$100-\$250 million initial offering volumes
 - d. More secondary market opportunities
 - e. More taxable bond offerings, particularly for tax-exempt investors
 - f. More creative clean energy municipal revenue bonds, tied to secure sources of revenues that may not necessarily be related to the use of proceeds
 - g. More taxable corporate and municipal bond offerings
 - h. Bundle, pool or securitize smaller projects, loans, and agencies to attain greater scale in initial offerings

- i. For each obligor, bundle clean energy projects with all other green projects together into a single issuance
 - j. More green bonds that include explicit social impacts as well, in order to capture investment from fixed-income social investors, such as those focused on community development, that require social performance metrics or a targeting of low- and moderate-income communities (high-quality job creation, affordable housing construction)
3. Deepen the clean energy attributes of green bonds:
- a. Explicitly label all clean energy bonds as “green bonds” in order to harmonize and integrate bond financing for renewables and energy efficiency into what is clearly consolidating into a distinctive category of the bond market.
 - b. Consider the voluntary Green Bond Principles as a working set of minimum guidelines, but exercise caution with overly homogenizing, rigidifying or standardizing this emerging, experimental market.
 - c. Hold issuers accountable for the green attributes of their deals and encourage measurable outcomes to address risks associated with climate change.
 - d. Ensure on-going reporting by issuers on use of proceeds to investors.
 - e. Align use of proceeds data and reporting with emerging “impact investment” metrics so that fixed-income clean energy investing in public markets can be integrated into “total portfolio” approaches to impact investing.

Conclusion

While bonds issued by multilateral development banks and multinational corporations in Europe and Asia have captured most of the institutional investor capital over the last several years, the domestic green bonds market is beginning to grow substantially. Multiple jurisdictions have issued many different forms of green bonds over the last decade and a half. These have included domestic municipal bonds, project bonds, and corporate bonds.

We found that there is a critical need for investor education in regard to green bonds, as well as standardization of deal structures and documentation. And we found that asset-backed green municipal bonds (i.e., the securitization of loan portfolios such as those recently done by New York State) are attractive to investors because of their required monthly reporting, which does not occur with other project-related bonds.

The rapidly growing, domestic, clean energy bond market provides an important opportunity for investors, and it can fill a critical need for increased funding for renewable energy and energy efficiency. However, several obstacles impede the level of growth needed, including a lack of issuance, a lack of accessibility due to size and structure concerns, and serious questions around transparency, use of proceeds, and impact. This report has laid out the issues, disaggregated by demand profiles, and then suggested pathways forward from all aspects of the market, government, and civil society.

Glossary

Tenor	The length of time until maturity of a bond.
Credit Quality	The perceived likelihood that the bondholder will be paid the full amount owed on time.
Time Horizon	The length of time an investor holds an investment.
Muni Bond	A bond issued by a state, municipal government, agency of government, or a non-profit organization. In this report, only refers to domestic municipal bonds.
Corporate Bond	A bond issued by a corporation.
Taxable Muni Bond	A municipal bond that is not tax-exempt, as many muni bonds are.
Supranational Bond	A bond issued by an international, multilateral, intergovernmental organization or agency.
Use of Proceeds	How the proceeds from selling a bond are used by the issuer.
Green Bond Principles	A set of voluntary process guidelines for issuing green bonds, developed by major underwriters, with the International Capital Market Association (ICMA) serving as the Secretariat.
CREB	Clean Renewable Energy Bond. Federal Tax-Exempt bonds for renewable energy, in which the tax credits are treated as taxable income by the investor.
QECB	Qualified Energy Conservation Bond. Taxable bonds subsidized by federal tax credits or cash rebates.

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Appendix

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Alan Biller Associates

Ameriprise Financial

Arista Investment Advisors, LLC

Bank of America Merrill Lynch

Breckinridge Capital Advisors

British Columbia Pension Corporation

Calvert Investments

Clearbridge Advisors

Community Capital Management

Church Pension Group of the Episcopal
Diocese

Ernst & Young

Everence Financial

First Affirmative Financial Network

Fairview Securities, Inc.

Fitch Ratings

Friends Fiduciary Corp.

Gifford Fong Associates

Glenmede

Intel

JPMorgan Chase

Keybank Capital Markets

Krietzberg Financial Group

Lincoln Financial

Metlife Investments

Moody's Social Performance Group

NMS Capital Group, Inc.

Nuveen

Park Foundation

Pinebridge

Prudential

RBC Wealth Management

Segal Rogerscasey

The Sierra Club Foundation

State Street Global Advisors

Terraverde Capital Partners, LP

Valhalla Fund, LP

W. R. Berkeley

Wells Fargo Securities

Zurich Insurance Group

Participants in the Convening on “Clean Energy Bonds and Investor Demand”

Side Event to the United Nations Climate Summit

Surdna Foundation

New York City

September 22, 2014

As You Sow

Breckinridge Capital Advisors

Cambridge Associates LLC

Church Pension Group

Clean Energy Group

Community Capital Management

Council of Development Finance Agencies

Croatan Institute

Doris Duke Charitable Foundation

Everence Financial

First Affirmative Financial Network

Glenmede

F. B. Heron Foundation

JPMorgan Chase

Moody's Investors Service

MSCI ESG Research

Surdna Foundation

Trillium Asset Management LLC

About the Authors

Joshua Humphreys, Ph.D., is President and Senior Fellow of Croatan Institute and a leading authority on sustainable investing. An historian by training, Dr. Humphreys has taught at Harvard, Princeton, and NYU. He has also served as a Fulbright Scholar in Paris, a visiting research associate at the Johns Hopkins School of Advanced International Studies, an associate fellow at the Rutgers Center for Historical Analysis, a scholar-in-residence at the Rockefeller Archive Center, an affiliate of the Princeton Institute for International and Regional Studies, an associate of the Minda de Gunzburg Center for European Studies at Harvard, and an Aspen Environment Forum Scholar. Dr. Humphreys has advised numerous organizations on complex issues in social and environmental finance. His insights on trends in sustainability, fossil-fuel divestment, endowment management, and social and environmental finance, and impact investing have been widely published and regularly cited in the press. He frequently speaks to the public on these themes and has served as an expert witness in both litigation and legislative arenas. He also serves as an associate fellow at Tellus Institute and an advisory board member of the Dwight Hall SRI Fund at Yale University, the Responsible Endowments Coalition, and the Coalition for Responsible Investment at Harvard.

David Roswell is an Analyst at Croatan Institute. He graduated from Oberlin College with a double major in Environmental Studies and Economics. While at Oberlin, he organized around sustainability and economic justice. He was a co-founder of the Responsible Investing Organization, a student group dedicated to working with the college to align its investments with its values. In addition to his work on this project, Roswell works with Croatan Institute on projects tracking trends in responsible investing, understanding investor demand for place-based investing in Appalachia, and developing models for institutional investor action on climate change.

Robert Sanders is Senior Finance Director at Clean Energy Group. He has over twenty-five years of experience in community development and energy-related commercial finance, with expertise in designing, implementing and evaluating financing programs, financial products and related services in the areas of clean energy and sustainable community development. Mr. Sanders was formerly the Managing Director of Energy Finance for The Reinvestment Fund, a leading innovator in the financing of neighborhood and economic revitalization with \$700 million dollars under management from 800 investors. In this capacity, he served as Fund Manager for the Sustainable Development Fund, a \$32 million fund created by the Pennsylvania PUC to promote renewable energy and energy efficiency, as well as TRF Fund Manager for the Pennsylvania Green Energy Loan Fund and the Philadelphia metropolitan area EnergyWorks Loan Fund – representing \$80 million of new public and private resources for building-related clean energy projects. As lead for all energy investing, Mr. Sanders made loans, leases, equity investments and performance-based grant incentives and positioned TRF as a leader in energy finance among community development financial institutions (CDFIs). He served two terms on the Board of the Pennsylvania Energy Development Authority and was a director and officer of the Clean Energy States Alliance, a national organization comprised of members from more than twenty publicly-funded clean energy funds and state agencies. Mr. Sanders holds an MCP from the University of California at Berkeley and a BA from Stanford University.



Clean Energy Group is a leading national, nonprofit advocacy organization working in the U.S. and internationally on innovative clean energy technology, finance, and policy programs.

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Croatan Institute is an independent, nonprofit institute for advanced social and environmental research and engagement. The Institute's activities address some of the most complex sustainability challenges of our time, often in close partnership with practitioners in the field and movements for social and environmental change.

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