Jump Starting Energy Efficiency in the Commercial Building Sector: A New Model for Retrofitting Commercial Buildings in America's Cities

Patrick Hughes, Energy Future Coalition

ABSTRACT

The list of barriers facing energy efficiency in the commercial building sector is long, but building owners cite the availability of capital as the number one barrier to investing in energy efficiency. The Energy Future Coalition has brought together a diverse coalition of stakeholders – building owners, energy service companies, utility companies, financial sector representatives, labor leaders, non-profits, and other efficiency advocates – to develop a new and innovative approach to overcome this key barrier.

This paper proposes a new and hypothetical model to lower interest rates for building owners by aggregating commercial buildings within a geographic region (e.g., a downtown business district) to create a pool that could be collectively insured for the risk of default by a mix of conventional and unconventional investors, which would reduce the overall project risk to a level where banks could offer low-interest loans to building owners for energy efficiency projects. The goal is to find a means to connect building owners with large amounts of low-interest capital from unconventional investors, such as labor pension funds, corporations, and philanthropies, as well as more conventional investors and investment mechanisms, while simultaneously mitigating the two primary types of risk for energy efficiency projects: performance risk and counterparty risk.

Introduction

Commercial buildings consumed 35.4% of electricity in the United States in 2011, and their share of total primary energy consumption rose from 10.6% in 1980 to 18.3% in 2010 (U.S. Department of Energy, 2010; U.S. Energy Information Administration, 2012). This increase in building energy use is unnecessary. Commercial building retrofits have been proven to reduce energy use between 10% and 50% or more with readily available technologies and building operation practices (Pike Research, 2010). Despite the economic incentives and opportunities for energy savings presented by reducing this large amount of wasted energy, the Pacific Northwest National Laboratory estimates that by 2025, the U.S. commercial building sector will be wasting 3.9 QBtu a year, more than half the annual energy use of California (Dirks, 2008).

To identify and overcome the barriers to scaling investments in energy efficiency, the Energy Future Coalition and the Center for American Progress formed the Rebuilding America coalition in 2009. The coalition, which consists of more than 100 diverse groups representing building owners, energy service companies, utility companies, financial sector representatives, labor leaders, non-profits, and other energy efficiency advocates, set the ambitious goal of retrofitting 40% of America's building stock – 50 million commercial, industrial, residential, and institutional buildings – by 2020 (Hendricks & Detchon, 2009). Upgrading the energy performance of this many buildings would require $500 billion in private and public financing, but would save consumers between $32 billion and $64 billion per year on their utility bills while creating 625,000 full-time jobs through 2020 (Hendricks & Detchon, 2009).

Many of Rebuilding America's stakeholders, including building owners, energy service companies, utility companies, financial sector representatives, labor leaders, non-profits, and other efficiency advocates, have noted the need to connect capital with building owners as a way to unlock commercial building energy efficiency upgrades. This paper proposes a new and hypothetical financing mechanism to leverage large amounts of low-interest capital from unconventional investors, such as labor pension funds, as well as more conventional investors, by simultaneously mitigating two types of risk for energy efficiency projects – performance risk and counterparty risk.

Project Finance: A Key Barrier to Energy Efficiency Investments

Since the stock market crash in the fall of 2008 and the ensuing recession, the availability of credit has been limited (Shafer & Ellis, 2011; U.S. Department of Energy, 2012b). Most commercial office buildings are owned by special-purpose corporate entities, a structure that protects the equity of owners from individual liability beyond the value of the buildings themselves (Christmas, 2010; Sewell, 2006; U.S. Department of Energy, 2012b). Many of these buildings are also fully mortgaged for the value of the building, preventing additional on-balance sheet financing of building improvements (Christmas, 2010; Lines & Supple, 2010). Owners therefore frequently do not have net equity in their buildings that would permit them to further leverage their buildings to obtain capital to use for an energy upgrade. In addition, many commercial office buildings have fallen in value below the remaining indebtedness on their mortgages, including 60% of the mortgages that will mature between 2011 and 2015 (Deloitte, 2011). Such "underwater" buildings cannot borrow against negative equity to finance retrofits, even when the retrofits will help improve the building's value.

To the extent capital is available, building owners are looking to invest their capital resources in ways that will improve occupancy rates, and energy efficiency investments are typically not high on most owners' priority lists despite offering significant financial returns on investment and multiple studies showing that energy efficiency can boost building value and occupancy rates (Christmas, 2010; Eichholz, Kok & Quigley, 2009; Fuerst & McAllister, 2011; Pivo & Fisher, 2009; Wiley, Benefield & Johnson, 2010).

According to Johnson Controls' 2010 North American Energy Efficiency Indicator study, the lack of available capital was the number one barrier to funding energy efficiency projects. Their survey of 1,435 CEOs, vice presidents, property managers, and building owners found that 38% saw lack of capital budget as the number one barrier preventing energy efficiency projects' approval (Johnson Controls, 2010). Because energy efficiency investments have high up-front costs, many building owners do not have the available capital to curb energy waste in their properties. Coupled with the sometimes long-term paybacks inherent to energy efficiency investments, which was cited by 28% as the top barrier to energy efficiency in the Johnson Controls survey, the lack of available capital creates a need for project financing (Christmas, 2010; Johnson Controls, 2010).

The Environmental Defense Fund, in a joint white paper with Duke University's Nicholas Institute for Environmental Policy Solutions, found that investors are looking for ways to finance energy efficiency projects (Kapur, Hiller, Langdon & Abramson, 2011). The availability of investor capital is not the principal problem; rather, it's finding a financing mechanism that can "absorb a large-scale investment" and create a pipeline of projects to bring the financing mechanism to a viable scale, which the Environmental Defense Fund estimates to be close to $100 million (Kapur, Hiller, Langdon & Abramson, 2011). If this level of scale can be reached, then investors can begin to bundle projects into packages that can be sold on secondary markets, adding liquidity to the energy efficiency market and increasing the appeal of investment (Kapur, Hiller, Langdon & Abramson, 2011).

According to McKinsey & Company, in addition to the constraints for building owners, the capital constraints for lenders are non-trivial:

> Upstream financiers may incur increased credit risk when providing capital to privately owned buildings compared to the municipal-university-school-hospital (MUSH) market, because of elevated default risk. In all markets, they face difficulty in establishing collateral for the loan, as projects often involve specialized equipment, unrecoverable design and installation costs, and high retrieval costs, all of which elevate the financier's risk exposure pending default (Granade, 2009).

Thus, it would seem that offering a source of low-interest financing to building owners that can allow them to pursue energy efficiency improvements to their buildings without overly encumbering their balance sheets could be instrumental in unlocking the commercial building energy efficiency market. Existing financing models are limited in a number of ways: off-balance sheet energy service agreements are scrutinized for their compliance with Generally Accepted Accounting Principles (GAAP); property-assessed clean energy (PACE) loans are often subject to mortgage holder approval in the commercial sector; and energy service performance contracts' generally long timelines have limited their use in commercial real estate (Lines & Supple, 2010; Lawrence Berkeley National Laboratory, 2011; Building Owners and Managers Association, 2011). The next section lays out a new, hypothetical mechanism without the drawbacks of the aforementioned models that could unlock private investment in energy efficiency projects by mitigating project performance and counterparty risk.

Developing a Low-Cost Project Financing Model

Capital flows like electricity along the path of least resistance – building owners tend to invest in projects that yield the highest return on investment. Any investment that a building owner makes has an opportunity cost; energy efficiency investments may come at the expense of a new marble floor for the lobby, for example (Henton, 2010). While properly installed and operated energy efficiency upgrades will decrease building operation costs, a marble lobby may increase a building's aesthetic value, and it is up to building owners to decide in which project to invest their limited capital. Reducing the risk involved in financing energy efficiency improvements to commercial buildings lowers the interest rates of loans and increases the return on investment for owners, making it more likely that owners will opt to proceed with energy efficiency upgrades of their buildings (Homer & Sylla, 1996).

If both the performance risk (i.e., the risk that a project will not deliver the projected energy savings) and the counterparty risk (i.e., the risk that a building owner is unable to repay the project loan) can be reduced, banks are more likely to offer loans with lower interest rates, making them more attractive to commercial building owners. The following sections outline a method to reduce both performance and counterparty risk in order to unlock low-cost capital for energy efficiency improvements.

Reducing Project Risk

Every energy efficiency project faces a certain amount of risk, and the likelihood of those risks is priced into interest rates. A risky project will be financed at a higher interest rate than a safer project. In order to reduce project costs for energy efficiency upgrades in commercial buildings, two principal types of risk must be mitigated:

Performance risk. When conducting an energy upgrade of a building, there is a risk that the retrofit will underperform and the projected savings will not be realized, or worse, the project may be cash flow negative (Heo, Choudhary & Augenbroe, 2012). To mitigate this risk, many large energy service companies (ESCOs) offer performance guarantees to ensure that a project will either deliver the expected energy savings or the ESCO will pay the difference between projected and realized savings to the building owner (Renewable Energy and Energy Efficiency Partnership, 2012). These ESCO performance guarantees have been largely limited to projects in the so-called "MUSH" market – i.e., municipal buildings, universities, schools, hospitals, and other large institutional buildings – because MUSH buildings tend to be owner-occupied and are therefore are not subject to split incentives between landlords who pay for efficiency upgrades and tenants who pay energy bills (Satchwell, Goldman, Larsen, Gilligan & Singer, 2010).

Specialty companies like Energi Insurance Services, Inc., Swiss Re, Lloyds of London, and other insurance and reinsurance organizations offer similar performance guarantees to smaller contracting firms, and the potential for their use in commercial building projects is great since 91% of firms that conduct energy efficiency retrofits are small businesses (Mills, 2001; Hendricks & Madrid, 2011). These performance guarantees for small- and medium-sized contractors, like Energi's so-called "energy savings warranty" plan, are only offered to the highest quality contractors, thus ensuring that projects will deliver the expected energy savings (Energi, 2012). Only insuring the highest quality contractors will also reduce the likelihood that a contractor will be financially unable to complete a project, another element of performance risk.

The ability to offer a performance guarantee allows smaller contractors to compete with ESCOs that have the financial capability to offer performance guarantees based on their own balance sheets. This type of guarantee gives building owners confidence that they will receive a positive return on their energy efficiency investments, and that they will be able to repay project financing costs even if the project underperforms. However, for these energy savings warranties to work as intended, i.e., to result in a project that delivers the promised energy savings, it is important to have an independent party conduct the measurement and verification to mitigate the potential for an ESCO to overestimate the energy savings in order to meet the energy savings guaranteed by the warranty.

Counterparty risk. Counterparty risk, sometimes referred to as default risk, is the likelihood that a building owner is unable to make payments on the project loan, resulting in a default. This risk is not mitigated by a contractor's performance guarantee and needs to be addressed through a different mechanism. Credit enhancements such as loan guarantees and loan loss reserves can be used to reduce counterparty risk, but banks often require such credit enhancements to maintain a very high capital reserve, sometimes as high as 50% of the project loan, in order for the bank to discount the interest rate of a loan (U.S. Department of Energy, 2012a).

There are ways to mitigate counterparty risk in commercial building energy efficiency projects, but they require a new way of thinking about how to finance these projects and how to leverage unconventional sources of private investment to lower interest rates. The Energy Future Coalition is proposing a new model to lower interest rates for building owners by aggregating a large number of commercial buildings within a geographic region (for example, a downtown business district) to create a pool that could be collectively insured for the risk of default by a mix of conventional and unconventional insurers willing to put a portion of their balance sheets at risk to insure against counterparty risk, which would reduce the overall project risk to a level where banks could offer low-interest loans to building owners for energy efficiency projects. These loans could then be sold to investors such as labor union pension funds with a mandate to invest in job-creating projects (see Figure 1).

Reducing Risk in Commercial Building Energy Efficiency Projects

Figure 1

Innovative Project Insurance Pool

In the model depicted in Figure 1, a bank is able to offer low-interest loans to building owners because each type of risk, performance risk and counterparty risk, is insured by the contractor performance guarantee and a project insurance pool, respectively. The performance guarantee is currently an ESCO industry standard practice, and works because the contractor is able to guarantee that a building retrofit project will deliver energy savings that are greater than the cost of repaying a loan, thus leaving the building owner with a positive cash flow (Satchwell, Goldman, Larsen, Gilligan & Singer, 2010). What is innovative about this model are the unconventional sources of capital used to fund the insurance pool, as well as the aggregation of a number of projects to reduce the transaction costs for contractors and to decrease the impact of a default to the insurance pool.

Foundations, state and/or local governments, and/or philanthropically minded corporations could engender goodwill and help lower interest rates by offering their balance sheets to an insurance pool that could take on the liability for counterparty risk. This model leverages the balance sheets of entities looking to reduce energy waste and the corresponding greenhouse gas emissions in order to provide insurance against the potential that a building owner will default and will not be able to pay back the balance of a project loan. By taking the counterparty risk onto their balance sheets, these organizations are providing a powerful incentive to banks to lend money to building owners at interest rates that are low enough to encourage energy efficiency retrofits, which based on conversations with Rebuilding America stakeholders is between 5-8%. These organizations can charge a fee equal to the expected rate of default across the aggregated pool of buildings to each of the building owners so that they can recoup the cost of building owner defaults, thus helping to provide building owners with low-interest loans at a net zero cost to the insurance pool funders. Because the default rate, and thus the insurance fee, depends on the quality of buildings in the pool, any financing program should conduct due diligence in examining the financial strength of the buildings included in the pool. By excluding overly risky buildings, the fund can lower the counterparty risk, and lower the fee that the insurance pool will charge.

To give a hypothetical example of how this might work in practice, if this financing mechanism were implemented in a city with an average commercial sector mortgage-backed security default rate of 9%, then the insurance pool would charge a 9% insurance fee if it were to insure a representative cross-section of commercial buildings (Mortgage Bankers Association, 2011). This is a prohibitively high rate if we are to achieve the goal transaction interest rate of 5-8%, as indicated by Rebuilding America stakeholders. To reduce the insurance fee to a more reasonable 2%, for example, the most risky buildings would have to be weeded out of the pool through a due diligence process undertaken by the bank. The due diligence process could consist of requiring a minimum credit score above BBB, for example, or a minimum number of years the building has been owned without a default, both of which are relatively accurate metrics for a building's financial health and are not administratively difficult to collect (Byrd & Cohen, 2011).

Project Aggregation

The success of this mechanism depends on the aggregation of a large number of buildings into a pool that can be collectively insured against counterparty risk. By bundling projects together, contractors can charge less for their work due to decreased project acquisition costs, reducing the overall cost to a building owner of pursuing an energy efficiency upgrade. However, in order for contractors to take advantage of the economies of scale provided by this deal pipeline, there must be a fair and transparent bidding process so that the most qualified contractors win the right to do the work on the projects. This reduces the likelihood of nepotism and ensures that the highest quality contractors are hired to do the work.

Contractors can also take advantage of discounts for purchasing equipment in bulk, as the Clinton Climate Initiative has demonstrated with its Purchasing Alliance program (Clinton Climate Initiative, 2012). Finally, for contractors that typically cannot afford to work on smaller projects, aggregation allows them to bid on projects that would otherwise have prohibitively high business development costs.

In addition, the financial impact to the insurance pool of a single building owner default is diluted over the entire portfolio, reducing the impact of a single default and placing downward pressure on project loan interest rates. Project aggregation allows banks to sell a package of loans to investors on the secondary market as a very low risk investment backed by insurance companies, a type of fund sometimes referred to as a "guaranteed investment contract" or a "stable value" fund (Babble & Herce, 2007). Because this fund would be guaranteed against counterparty risk by an insurance pool, investors seeking stable returns, like pension funds, may be more willing to invest in it (Babble & Herce, 2007). Indeed, the capital for these energy efficiency loans could ultimately come from a pension fund with a mission of investing in projects that create jobs for construction workers, such as a labor union pension fund.

Political Leadership

In order to successfully mobilize the building owners of a particular city, it is important to have the strong support of the mayor or another influential political leader to encourage and, if needed, cajole building owners to participate. Throughout the process, the mayor can act as a convener of building owners and contractors for educational and project development meetings, in addition to enacting supportive public policies to further encourage energy efficiency retrofits. In return for convincing local building owners to participate in this program, political leaders receive the benefits of achieving sustainability goals, revitalizing city neighborhoods and business districts, and creating local jobs.

For example, in Atlanta, Georgia, Mayor Kasim Reed has been instrumental in positing the city as a leader in sustainability through his commitment to retrofit two million square feet of building space in downtown Atlanta to be 20% more energy efficient as part of the White House Better Buildings Challenge (Reed, 2011). Largely in part to Mayor Reed's willingness to encourage building owner participation, Atlanta has already generated more than 31 million square feet in building commitments (Atlanta Better Buildings Challenge, 2012).

Role of the Utility

Depending on the structure of local utilities, they may be willing participate in this model by providing additional rebates or incentives to building owners for investing in energy efficiency, or by offering to act as a conduit for loan payments via on-bill financing of the project loans as depicted in Figure 1. On-bill financing is a method for repaying an energy efficiency project loan through a surcharge on one's energy bill. Because building owners will prioritize the payment of their energy bills in order to keep the lights and other building systems on for their tenants, on-bill financing through a utility offers investors a reliable assurance that the loan payments will be collected (Bell, Nadel & Hayes, 2011). This would result in a less risky investment and thus lower interest rates for building owners.

On-bill financing is only offered by utilities in 20 states, so if a utility is not able or willing to offer on-bill financing, loan payments could alternatively be made directly to the bank that issued the project loan, or through a property-assessed clean energy (PACE) payment mechanism, which is becoming increasingly viable in the commercial sector as demonstrated in locations such as Sonoma County, California and Boulder, Colorado that have used this form of payment in 71 projects so far (Bell, Nadel & Hayes, 2011; Lawrence Berkeley National Lab, 2011). However, as previously mentioned, PACE mechanisms have faced opposition from mortgage holders and typically require mortgage holder consent, which can limit the utility of this mechanism.

Independent Technical Expert

To ensure that realized energy savings are in line with predictions, as well as to build confidence among building owners and investors, an independent technical expert should be employed to review contractor plans for energy efficiency upgrades, as well as to independently monitor and verify the energy savings once a project is complete. This provides an additional layer of accountability for ESCOs and contractors who might otherwise be tempted to overstate savings in order to avoid liability under the terms of the performance guarantee. Finally, an independent technical expert could provide added confidence to building owners, banks, and local political leadership that projects will deliver the promised energy savings, thus providing an assurance, if not a guarantee, that these projects will result in real energy savings.

Win-Win-Win

This approach benefits every entity involved, from the bank to the building owner to the contractor. Banks and investors are able to lend to a new customer base with a very low risk profile due to the dual risk mitigation strategies of the performance guarantee and the insurance pool. Insurance pool participants receive small amounts of fee income, but more importantly they achieve energy reduction and sustainability goals while earning local goodwill for investing in their communities. Building owners benefit most of all from the availability of low-cost loans to improve the energy performance, comfort, operating costs, and overall attractiveness of their buildings to tenants. Utilities benefit from decreased demand and reducing the need to build additional costly generation sources or to purchase expensive peaking power on wholesale markets, although this varies by state depending on regulatory policies. Contractors and ESCOs gain a large and sustained market for their services, which will put many currently unemployed or underemployed contractors and construction workers back to work. Finally, the city and political leaders benefit from a successful program by achieving sustainability goals, reducing greenhouse gas emissions and other air pollution from local power facilities, revitalizing downtown commercial buildings and business districts, attracting new tenants and businesses to their city, and creating jobs at a time when unemployment in the construction sector hovers around 18% (U.S. Bureau of Labor Statistics, 2012).

Distribution of Costs and Benefits within the Project Insurance Pool Model

	Cost	Benefit
Building Owner	Loan repayment with interest.	Reduced building operating cost.
Bank/Investor	Ultimately liable for counterparty/default risk if insurance pool fails to adequately cover the cost of project defaults.	Increased customer base and revenue; Low-risk, stable return investment; Job creation co-benefit for labor union pension funds.
Insurance Pool	Liable for counterparty/default risk.	Revenue from insurance fee; Positive public recognition and goodwill.
City/Political Leadership	Political capital.	Achieved sustainability goals; Increased employment; Revitalized buildings and local economy.
Contractor/ESCO	Liable for under-performing building retrofits.	Increased demand for contractor services; Increased sector employment.
Utility	Decreased revenue from sales, if not decoupled.	Decreased demand means less need for new, more expensive generation sources.

Figure 2

Conclusion

Despite the barriers facing energy efficiency investments in the commercial building sector, there are ways forward. Building owners' concerns about how to pay for energy efficiency investments could be assuaged by access to low-cost loans, which could be facilitated by the hypothetical risk-mitigating finance model described in this paper. Utilizing performance guarantees, independent technical review, and independent project performance monitoring can reduce the risk that a project will underperform, giving both building owners and investors confidence that these projects will result in actualized energy bill savings. In addition, by leveraging the balance sheets of unconventional insurers like foundations and philanthropically minded corporations, the impact on investors of a building owner loan default is drastically reduced. This could result in banks offering significantly lower interest rates to building owners looking to increase the energy efficiency of their buildings.

With the political leadership provided by a city mayor to encourage participation in a program, and a local utility to offer additional incentives to building owners for upgrading the energy performance of their facilities, cities around the United States can begin to retrofit significant portions of their commercial real estate. Once this happens, we can begin to make progress towards the Energy Future Coalition's Rebuilding America goal of retrofitting 40% of America's commercial, residential, and industrial buildings by 2020.

References

Atlanta Better Buildings Challenge. 2011. "Participants." http://www.atlantabbc.com/partners/participants. Accessed May 10, 2012.

Babbel, David & Herce, Miguel. 2007. "A Closer Look at Stable Value Funds Performance." Wharton Financial Institutions Working Paper No. 07-21. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1021361. Accessed May 10, 2012.

Bell, Catherine; Nadel, Steve & Hayes, Sara. 2011. "On-Bill Financing for Energy Efficiency Improvements: A Review of Current Program Challenges, Opportunities, and Best Practices." American Council for an Energy-Efficient Economy. http://aceee.org/research-report/e118. Accessed on May 8, 2012.

Building Owners and Managers Association. 2011. "BOMA Energy Performance Contracting Model." http://www.boma.org/resources/bepc/Pages/default.aspx. Accessed May 10, 2012.

Byrd, Daniel & Cohen, Richard. 2011. "A Roadmap to Energy Efficiency Loan Financing." Progressive Energy Group, LLC. http://www.cleanenergyfinancecenter.org/wp-content/uploads/DOE-Energy-Efficiency-Report-rev-8-29-11.pdf. Accessed May 8, 2012.

Christmas, John. 2010. "Financing Energy Efficiency in the Commercial Building Sector: Barriers and Opportunities." http://www.naseo.org/events/annual/2010/presentations/Christmas.pdf. Accessed May 8, 2012.

Clinton Climate Initiative. 2012. "Accessing Building Technologies: the CCI Purchasing Alliance." http://www.clintonfoundation.org/what-we-do/clinton-climate-initiative/cities/building-retrofit/technologies. Accessed March 8, 2012.

Deloitte. 2011. "Commercial Real Estate Outlook: Top Ten Issues in 2012: A Potential Pause in Recovery Momentum." http://www.deloitte.com/assets/Dcom-UnitedStates/Local%20Assets/Documents/FSI/US_FSI_CommercialREOutlook2012_102011.pdf. Accessed May 8, 2012.

Dirks, J.A., et al. 2008. "Lost Opportunities in the Buildings Sector: Energy-Efficiency Analysis and Results." Pacific Northwest National Laboratory. http://www.pnl.gov/main/publications/external/technical_reports/PNNL-17623.pdf. Accessed May 8, 2012.

Hendricks, Bracken & Detchon, Reid. 2009. "Rebuilding America: A National Policy Framework for Investment in Energy Efficiency Retrofits." http://www.americanprogress.org/issues/2009/08/rebuilding_america.html. Accessed March 9, 2012.

Hendricks, Bracken & Madrid, Jorge. 2011. "A Star Turn for Energy Efficiency Jobs: Energy Efficiency Must Have a Starring Role in Putting America Back to Work." Center for American Progress. http://www.americanprogress.org/issues/2011/09/energy_efficiency_jobs.html. Accessed May 10, 2012.

Eichholtz, Piet; Kok, Nils & Quigley, John. 2009. "Doing Well by Doing Good? Green Office Buildings." http://www.ucei.berkeley.edu/PDF/seminar20090130.pdf. Accessed May 8, 2012.

Energi. 2012. "Energy Savings Warranty." http://www.energi.com/esw.php. Accessed May 8, 2012.

Fuerst, Franz & McAllister, Patrick. 2011. "Green Noise or Green Value? Measuring the Effects of Environmental Certification on Office Values." *Real Estate Economics*. Vol. 39, No. 1. http://sallan.org/pdf-docs/Fuerst_HPB_Value.pdf. Accessed May 8, 2012.

Henton, Doug, et al. 2010. "Untapped Potential of Commercial Buildings Energy Use and Emissions: Capturing Wasted Energy: Efficiency, Retrofits, Barriers." http://www.nextten.org/next10/pdf/NXT10_BuildingEfficiencies_final.pdf. Accessed May 8, 2012.

Heo, Y., Choudhary, R & Augenbroe, G. 2012. "Calibration of Building Energy Models for Retrofit Analysis Under Uncertainty." *Energy and Buildings*. Vol. 47, April 2012. http://dx.doi.org.proxy1.library.jhu.edu/10.1016/j.bbr.2011.03.031. Accessed May 8, 2012.

Homer, Sidney & Sylla, Richard. 1996. *A History of Interest Rates* (pp. 6-7). Piscataway, New Jersey: Rutgers University Press.

Johnson Controls. 2010. "2010 Energy Efficiency Indicator Results for North America." Johnson Controls Institute for Building Efficiency. http://www.institutebe.com/Energy-Efficiency-Indicator/north-america-energy-efficiency-indicator.aspx?lang=en-US. Accessed May 8, 2012.

Kapur, Namrita; Hiller, Jake; Langdon, Robin & Abramson, Alan. 2011. "Show Me the Money: Energy Efficiency Financing Barriers and Opportunities." Environmental Defense Fund. http://www.edf.org/sites/default/files/11860_EnergyEfficiencyFinancingBarriersandOpportunities_July%202011.pdf. Accessed May 8, 2012.

Lawrence Berkeley National Laboratory et al. 2011. "Property Assessed Clean Energy (PACE) Financing: Update on Commercial Programs." http://eetd.lbl.gov/ea/ems/reports/pace-pb-032311.pdf. Accessed March 9, 2012.

Lines, Sam & Supple, Derek. 2010. "Mind the GAAP: A Study on the Effects of Proposed Changes in Accounting Standards for Leases on Investment in Energy Efficiency Retrofits in the United States." Johnson Controls Institute for Building Efficiency. http://www.institutebe.com/InstituteBE/media/Library/Resources/Financing%20Clean%20Energy/Issue-Brief-Mind-the-GAAP.pdf. Accessed May 8, 2012.

Granade, Hannah, et al. 2009. "Unlocking Energy Efficiency in the U.S. Economy." McKinsey & Company. http://www.mckinsey.com/Client_Service/Electric_Power_and_Natural_Gas/Latest_thinking/Unlocking_energy_efficiency_in_the_US_economy. Accessed May 8, 2012.

Mills, Evan. 2001. "Risk Transfer Via Energy Savings Insurance." Lawrence Berkeley National Laboratory. http://escholarship.org/uc/item/6zd279ht. Accessed May 10, 2012.

Mortgage Bankers Association. 2011. "Mortgage Delinquency Rates for Major Investor Groups." http://www.mbaa.org/files/Research/CommercialNDR/3Q11CommercialNDR.pdf. Accessed May 8, 2012.

Pike Research. 2011. "Energy Efficiency Retrofits for Commercial and Public Buildings." http://www.pikeresearch.com/research/energy-efficiency-retrofits-for-commercial-and-public-buildings. Accessed March 6, 2012.

Pivo, Gary & Fisher, Jeffrey. "Income, Value and Returns in Socially Responsible Office Properties." http://www.u.arizona.edu/~gpivo/Pivo_Fisher_Investment%20Returns%20from%20RPI%203_3_09.pdf. Accessed May 8, 2012.

Reed, Kasim. 2011. "Mayor Kasim Reed Calls on Business, Development Community to join Atlanta Better Buildings Challenge." http://www.atlantabbc.com/wp-content/uploads/2011/10/News-Release-Mayor-Reed-Kicks-off-Atlanta-Better-Buildings-Challenge_11-03-11.pdf. Accessed March 8, 2012.

Renewable Energy and Energy Efficiency Partnership. 2012. "ESCO Model." http://www.reeep.org/130/esco-model.htm. Accessed May 8, 2012.

Satchwell, Andrew; Goldman, Charles; Larsen, Peter; Gilligan, Donald & Singer, Terry. 2010. "A Survey of the U.S. ESCO Industry: Market Growth and Development from 2008 to 2011." Ernest Orlando Lawrence Berkeley National Laboratory. http://www.naesco.org/resources/industry/documents/ESCO%20study.pdf. Accessed May 8, 2012.

Sewell, David. 2006. "Effective Use of Special Purpose Entities." The University of Texas School of Law. http://www.sbaustinlaw.com/library-papers/Effective%20Use%20of%20Special%20Purpose%20Entities.Sewell.pdf. Accessed May 8, 2012.

Shafer, Jeffrey & Ellis, Paul. 2011. "Eyeing REITs for Growth: Investing in Distressed Commercial Real Estate Could Pay Off if Advisors Screen the Options Carefully." http://www.cnl.com/commercialRealEstate/docs/REIT%20-%2008.01.11%20-%20Eyeing%20REITs%20for%20Growth.pdf. Accessed May 8, 2012.

U.S. Bureau of Labor Statistics. 2012. "Industries at a Glance: Construction: NAICS 23," http://www.bls.gov/iag/tgs/iag23.htm#workforce. Accessed March 8, 2012.

U.S. Department of Energy. 2010. *Building Energy Data Book*. http://buildingsdatabook.eren.doe.gov/TableView.aspx?table=3.1.4. Accessed March 6, 2012.

U.S. Department of Energy. 2012a. "Clean Energy Finance Guide for Residential & Commercial Building Improvements: Loan Loss Reserve Fund Risk-Sharing Formula." http://www4.eere.energy.gov/wip/solutioncenter/finance_guide/content/loan_loss_reserve_fund_risk_sharing_formula?print=1. Accessed May 10, 2012.

U.S. Department of Energy. 2012b. "Commercial Sector Financing Needs and Opportunities." http://www4.eere.energy.gov/wip/solutioncenter/finance_guide/content/commercial_sector_financing_needs_and_opportunities?print=1. Accessed May 8, 2012.

U.S. Energy Information Administration. 2012. "Electric Power Monthly: Data for February 2012." http://www.eia.gov/electricity/monthly/epm_table_grapher.cfm?t=epmt_5_1. Accessed May 8, 2012.

Wiley, Jonathan; Benefield, Justin & Johnson, Ken. 2010. "Green Design and the Market for Commercial Office Space." *The Journal of Real Estate Finance and Economics*. Vol. 41, No. 2. https://springerlink3.metapress.com/content/61tx7k61u5565183/resource-secured/?target=fulltext.pdf&sid=3funijay41554eqmrjz0fskj&sh=www.springerlink.com. Accessed May 8, 2012.