Quantifying the Financial Value of Insurance for Energy Savings Projects

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ABSTRACT

Insurance is often viewed as an expense applied solely to meet investor, bank lending or regulatory requirements. In the energy savings performance contracting industry, engineers manage performance risk by providing comprehensive investment grade audits, robust designs, project implementation best practices, measurement and verification (M&V) plans, and reasonable energy savings deductible levels. Historically, insuring energy savings has not been widely adopted as a cost effective practice considering the guarantees offered by energy service companies (ESCOs). And from a lender's or investor's risk analytic perspective, the financial value of insurance has not been previously quantified.

This paper combines the financial-risk engineering of lending institutions with the energy-risk engineering of an insurer. It describes three models: a graphical/visual method, a theoretical solution and also a practical stochastic model that computes the credit risk reduction offered by insuring a fraction of the projected savings revenue stream. The work demonstrates the credit enhancement from the projected energy savings stream with and without insurance. An actual building retrofit project is used as an example to demonstrate the analysis model and the value created by energy savings insurance. The paper also demonstrates a methodology that connects the reduction in credit risk to an improvement in credit quality. For example, energy savings insurance can be applied to make a sub-investment grade loan appear, from an equivalent credit risk perspective, as an investment grade transaction.

Introduction

With about 49% of all energy used and 75% of all electricity consumed in the United States in buildings (EIA) the energy profiles of these structures represent a significant opportunity to increase grid reliability and reduce emissions, energy production, and costs. There are four basic pathways to achieve these goals as our economy and population grows:

- Building owners can retrofit the structures with new materials, windows, energy efficient equipment, and distributed generation
- Legacy energy production can be replaced or supplemented with cleaner or renewable sources.
- Building users can change their energy use behaviors.
- Ensure that newly constructed buildings incorporate best practices in energy efficiency design and are integrated with power production.

The diverse building marketplace of residential, commercial and institutional structures is composed of several underlying markets and segments and there is no one-size-fits-all approach. However, there are several options available to building owners to improve energy efficiency. The materials, equipment, and energy engineering knowledge are available today. And also due to the rapid increase in internet supported control, monitoring and operational systems, there is a rich selection of affordable aggregation and reporting tools to support dynamic energy management (US DOE Smart Grid). In other words, the practical engineering solutions to radically reduce building energy demand and consumption exist today.

New building construction provides a significantly improved level of energy efficiency over older structures simply because contemporary equipment and materials are manufactured to higher energy efficiency standards. However, the real potential for energy efficiency is in upgrading pre-existing buildings to contemporary standards. For example, Figure 1 shows, in part, the magnitude of this opportunity in the US and UK (US DOE 2010 and DECC 2012):

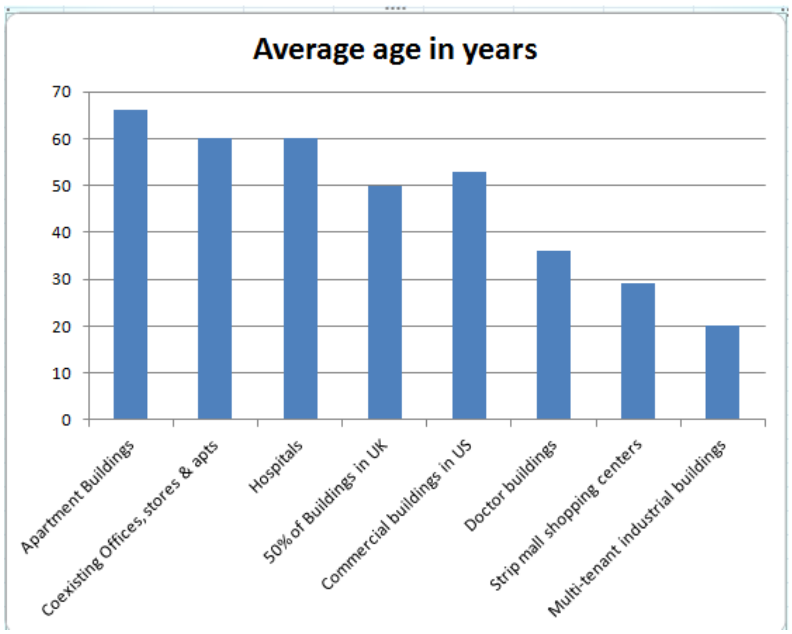

Figure 1. Average age in years of US and UK buildings.

So it is not surprising see that the global building retrofit market valued at $80.3 billion in 2011, is forecasted to grow to $151.8 billion by 2020(Navigant Research). Most of the new investments will be made by ESCOs and other energy engineering companies through the sale of equipment and technical services.

Yet, in spite of the purported long and short term money saving benefits and the proven engineering means to radically improve building energy efficiency, there still remains formidable barriers to the widespread deployment and implementation of actual programs. Regardless of the estimated annual energy savings, building retrofits are capital intensive projects that are executed in a relatively short period, usually less than a year. It is impractical to do these types projects gradually over several years; a compressed schedule is typically required in order that buildings and services remain functional throughout. Consequently, a significant capital expense is incurred by the building owner at the beginning of the project. The sources of this funding, for both the public and private sectors, generally fall into the following categories (ACEEE 2011):

Cash Flows

If the cash flows from the building are large enough, the project can be funded directly from this source. While this option is certainly convenient it implies that the cash flows can be diverted from their previous destination. In some structured finance situations, cash flow allocations are not discretionary, but in others this may be a viable option.

Parent Company Debt

A corporate owned building can borrow funds from internal sources for better than market interest terms. While this approach clearly streamlines the acquisition of capital, the corporation's financial data must reflect this debt which can influence trading values and company valuations.

Acquire Debt

If the building is completely owned, then this option is viable. However, for building owners with mortgages, there are often mortgage covenants that restrict debt accumulation and overriding these agreements can be difficult. Also many mortgages are part of larger security structures which complicates the approval process even further.

Utilize ESCOs & Energy Service Agreements (ESAs)

There are two major versions of a model where the project's capital expense will not be placed on the building owner's balance sheet: (1) The ESCO can create a Special Purpose Vehicle that will own and operate the energy-related equipment in the building. Essentially, the building owner outsources all energy-related operations. The reduction in energy costs pays for the O & M costs plus the ESCO's profit in addition to providing the building owner with lower energy expenses. (2) In the second model, the ESCO funds the project and is paid back over time through the energy savings.

These models have been used in specific market segments and there are many variations in how ESCOs can work. Generally ESCOs are not a source of funding as much as a way of structuring the financial arrangements of projects and whose direct loans and packaged capital are seen as expensive in some segments.

Rebates & Subsidized Capital Resources

Utilities have special programs and equipment rebates that can offset some of the equipment upgrade capital expense but their value does not offset all project costs. State, municipal, and federal programs offer tax incentives for renewable energy investments. But it is our belief that these programs are highly regionalized and are not necessarily long-term benefits, since they are subject to political factors.

Yet, even with the many positive accomplishments (ACEEE 1980-2012) of the building retrofit industry; there still remain several barriers to achieving the anticipated scale and demand for projects. These barriers reflect primarily the complexity of the residential, commercial and industrial building marketplace. On the demand (buyer) side (McKinsey & Company 2009):

- Retrofit projects usually require large upfront costs to achieve the savings annuity
- Savings incentives of energy consumption can be structured differently for tenants and owners, causing confusion.

- Building owners may not fully comprehend (or believe) the retrofit financial benefits.
- Sales cycle for retrofit projects of 9-12 months is too long to keep owner interest.

And on the supply (seller) side, the diversity and large size of the marketplace brings its own challenges. For in order to acquire the scale that is suggested by the overall technical and financial opportunities, the project development and financing need to become more standardized, simplified, and designed to directly address balance sheet requirements.

To deal with these issues, new financial structures have been created and others have been streamlined. Each of the major types listed below have advantages and disadvantages, but together they provide a solid basis to develop a list of financial options that can, hopefully in the near future, begin to penetrate the scale barriers (World Economic Forum 2011):

- Property Accessed Clean Energy (PACE) – regional & regulatory
- Energy Service Agreements (ESA) –special purpose vehicle
- On-Bill Loan – utility
- Government-owned development bank – some non-US markets
- Equipment Lease Finance
- ESCO business model
- Endowment and revolving funds

These finance structures are designed to manage the expense of building retrofits projects relative to the efficiency savings over time. They all involve the transfer for funds (or loans) for project implementation and include accounting of accumulated energy savings. These types of transactions possess two major forms of risk: loan default and asset performance. Default (or credit risk) is assessed and underwritten by the lending institution but the valuation or credit enhancement of insurance related to asset performance is not included in aforementioned financing models. The exception to this statement is the credit enhancement association with government-owned developmental banks.

Credit Enhancement of Asset Performance Insurance

Credit enhancement of a project loan transaction is protection in the form of financial support to cover loan losses under default or other adverse conditions. For energy efficiency projects there are two levels of financial support that generally can be interpreted as credit benefits:

- the new effective revenue stream from the efficiency improvements, and,
- insurance that some or all of the calculated reduction in energy use will be realized.

Many projects require property, casualty, and builder’s risk insurances as part of the structured financial arrangement so these products are already being used as standard requirements for project lending. However, the financial benefits of insuring asset performance are just beginning to be explored.

Asset performance insurance is financial support, subject to the terms and conditions of the policy, to insure that the annual savings for a project will not fall below some prescribed level. From one perspective this provides a valuable benefit to mitigate risk in that the lenders (and the credit rating agency) will be assured of a minimum cash flow at the credit rating of the insurer.

For this analysis we define credit risk as the expected loss or recovery due to default for a loan of principal $\hat{P}$, for a term of ‘n’ years at an interest rate ‘i.’ These calculations are standard in lending activities but for energy efficiency loans there is another variable that also needs to be considered. This is the anticipated savings from lower energy demand and consumption costs. There may be additional savings (or costs) in maintenance and operations but generally these values are not considered when developing loans for efficiency projects.

Insuring a part of the annual savings provides a key benefit in that the total amount insured is backed by the credit rating of the insurer rather than the credit rating of the borrower. Credit rating enhancement insurance for energy efficiency needs to conform to three basic tenets (Puccia 2004):

- If a shortfall in aggregate savings occurs, the insurance company pays the claim within a pre-set period of time regardless of the cause. Any claim-related legal issues are secondary to claim payment.
- Claims settlement follows an approved formula known at the beginning of the policy.
- No additional legal or administrative charges will be assessed to the insured party.

In other words, if there is a claim for a given year, the insurer must quickly pay the claim amount to the policy holder and then pursue recovery or other subrogation measures independent of the insured. The major exception is fraud.

Given that asset performance insurance prescribes to these tenets, the question remains, “how to quantify the credit enhancements of this type of risk transfer”? Energy savings can be viewed as a new revenue stream that offsets the legacy expenses and improves cash flows that are necessary for loan repayment. From this perspective the certainty and size of the energy savings relative to the periodic loan payments should change the default probability for a given loan.

For example, consider the credit worthiness of two loans each for $1,000,000 for 5 years at an interest rate of 6%. The annual payment for this loan is $230,974.80. Each borrower is required to pay this amount each year. However, if borrower #1 is using the money for property improvements (e.g. a new roof) there probably are no annual savings. However, if borrower #2 is using the loan for an energy efficiency project with an annual savings of $100,000 per year, the financial stress to repay the loan is less, suggesting borrower #2 should have a lower default probability and therefore a higher effective credit rating.

Traditionally, lending companies or banks cover default risk and specialty insurers cover asset performance risk (related in this case to energy efficiency). To determine a project rating, analysts consider many project variables associated with default and asset performance, (Mandel, Morgan, and Wei 2012) including sovereign, business & legal, and force majeure risks. At a project level, rating analysis is divided into contract design, technology, construction, operation, competitiveness, legal structure, financial strength, and others. For energy efficiency projects, the major risks usually rest in the adequacy of the engineering design, performance of the technology to achieve the targeted efficiencies, the measurement and verification plan, and whether operational best practices are followed to maintain the saving levels. These risks can be addressed by energy efficiency insurance. Subsequently, as rating agencies begin to study these specialized projects types, more rating benefits of asset performance insurance may emerge.

In this paper we present a qualitative, theoretical, and numerical simulation examples, of methods designed to measure the credit rating enhancement potential for energy efficiency projects. The work does not replace a credit rating analysis done by a rating agency, lender, or investor but it does supply some insights on the amount of credit enhancement that is possible under certain conditions. A secondary application of this paper is to provide a framework that hopefully can be developed to provide a level of uniformity and standardization to financing and rating energy efficiency project loans.

Graphical Depiction of Credit Enhancement with Asset Performance Insurance

To understand how insurance can enhance a loan transaction credit rating, we begin by showing the results of a standard credit risk model. The multi-year default probabilities are taken from S&P's CDO Evaluator Code (CDO Evaluator Engine) and annual interest rates by rating category are estimated from S&P's 2013 literature (Rigby 2013). Since interest rates vary over time and default probabilities are re-published periodically, the objectives of this analysis are to:

- Demonstrate the methodologies that can be applied to value asset performance insurance in structured finance and
- Provide approximate estimates of how risk transfer through insurance can create savings for building energy-efficiency projects.

Figure 2 shows the average default loss or average credit risk associated with borrowing $1,000,000 and $500,000 (each paid back in five annual payments) as a function of the credit rating of the borrower.

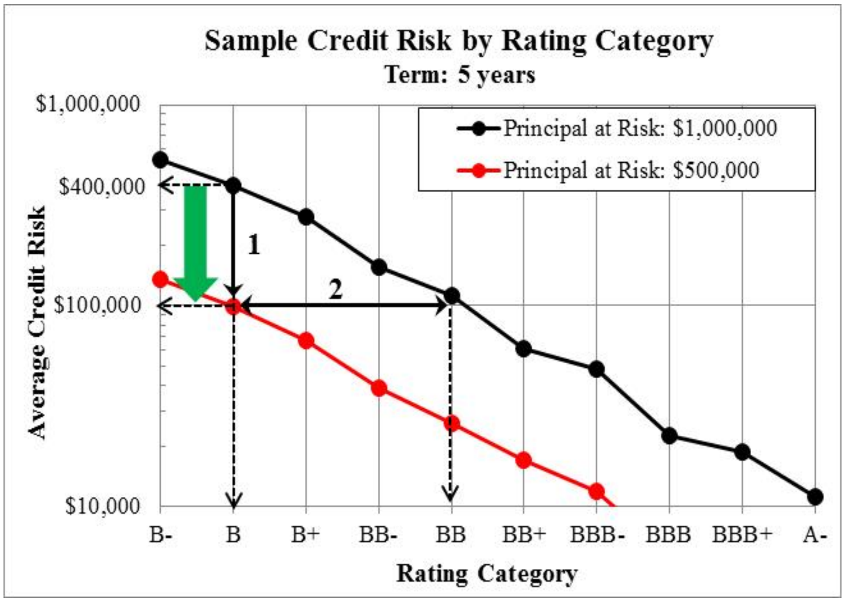

Figure 2. Credit risk enhancement from risk transfer conceptual description.

Both lines show how the default loss decreases as the borrower's credit rating improves. The only difference between the two lines is the principal at risk. The dotted horizontal line shows that the B rated company borrowing $1M has an average credit risk of $400,000. However, if $500,000 is insured, the principal at risk is reduced to $500,000, and the red curve (following the direction indicated by "1" in Fig. 2) applies. However, following "2" horizontally to the right, we see that this value is approximately equal to the credit risk of $1M for a BB rated borrower. Therefore from a credit risk perspective, a $1M loan to a B-rated borrower with $500,000 insured, is equivalent to a $1M transaction over the same time period to a BB rated borrower. In other words, the $500,000 insured value decreases the loan credit risk and therefore increases the loan credit rating; technically in this case from a "B" to a "BB." The difference in credit risk (shown by the green arrow) depicts about a $300,000 credit risk savings associated with insuring $500,000.

This methodology illustrates how asset performance insurance applied to the risk transfer of building energy efficiency savings can be used as a credit enhancement tool by investors, lenders, and rating agencies. There are several assumptions that are inherent in the method as described in Figure 2 that will be explored in the following theoretical and stochastic models.

Theoretical Model Credit Enhancement with Asset Performance Insurance

In this analysis, we describe a model for computing the credit enhancement from insuring a fraction of the loan principal associated with energy efficiency projects. The major approximations or assumptions are in the actual insurance coverages relative to what is needed by rating agencies and lenders to quantify the financial value of energy efficiency insurance in practice.

The situation being modeled is a building energy efficiency project where the implementation time is relatively short compared to the loan period so we ignore implementation delays relative to the loan payment period.

Let

Q_x	(x=1) - the credit rating of the borrower (x=2) - the achieved equivalent rate
L_x	the total amount loan including principal and interest (x = 1, 2)
M_x:	the annual (or periodic) loan payment (x = 1, 2)
$\hat{P}$	loan principal
$P_d(k, Q_x)$	the default probability in year k for a borrower with credit rating Q_x, (x = 1, 2)

For this model we repay the loan with interest in 'n' years with annual payments. The credit risk or default loss recovery for a loan, C_1, for 'n' years at an interest rate i_1 for a borrower with credit rating 1 (say "B") is:

$$C_1 = \sum_{k=1}^{n} P_d\,(k, Q_1)(L_1 - k * M_1) \qquad (1)$$

The annual loan payment M_1 can be written in terms of the loan principal, $\hat{P}$, interest rate, i_1, and loan term, n, as:

$$M_1 = \hat{P} * \frac{i_1}{(1-(1+i_1)^{-n})} = \hat{P} * I_1 \quad (2A)$$

$$\text{and} \qquad L_1 = n * M_1 = n * \hat{P} * I_1 \quad (2B)$$

The basic descriptions of M_1 and L_1 in terms of the interest, principal and loan term are helpful in simplifying the final equations.

Let's assume that the principal and interest required for loan repayment are determined for the borrower at their initial credit rating taking into consideration the insured energy efficiency savings amount, *S*. And the credit risk of *S* is measured at the insurer's credit rating. The resulting total credit risk is the sum of the reduced borrower's credit risk for (L_1-*S*) and the insurer's credit risk for *S*:

$$\sum_{k=1}^{n} P_d(k, Q_1)(n-k)(\hat{P} - S)I_1 + \sum_{k=1}^{n} P_d(k, Q_I)(n-k)SI_I \quad (3)$$

We now need to find the new state (denoted by the subscript 2) where this amount of credit risk is equal to a higher credit rating and lower interest rate for the full loan amount $\hat{P}$.

$$\sum_{k=1}^{n} P_d(k, Q_1)(n-k)(\hat{P} - S)I_1 + \sum_{k=1}^{n} P_d(k, Q_I)(n-k)SI_I = \sum_{k=1}^{n} P_d(k, Q_2)(n-k)\hat{P}I_2 \quad (4)$$

The left-hand side of Equation 4 describes the situation where the lender gives the borrower full benefit of the energy efficiency insurance. The insurance covers the asset performance or energy efficiency savings designed to produce at least *S* dollars of savings over the policy term and the default risk for this portion of the principal is rated at the insurer's credit rating.

This scenario implies that default and energy efficiency savings risk associated with the amount, *S*, is completely transferred to the insurer. In general, default risk coverage is not included in the same policies that cover asset performance. However, the effective new revenue stream from the efficiency savings, the insurer's additional technical project review, and the additional oversight through the policy term intuitively decrease default risk.

Also there is a basic difference between default and energy efficiency insurance that is a significant issue from the lender's perspective. If a borrower defaults the bank can lose the outstanding repayments. However, financial support for energy efficiency insurance is not a strict guarantee. There are terms and conditions that must be satisfied in order for the policy to respond to any revenue shortfall. So lenders cannot be 100% confident that the insurance will provide the needed financial support. Insurance is generally not an unconditional financial guarantee and rating agencies have indicated that energy efficiency policies must respond quickly and unilaterally if any credit enhancement is to be achieved(9). To address this important issue, new energy efficiency policy language is being developed in cooperation with interested investors, contractors, and building owners to ensure that the policy language provides the maximum credit enhancement benefits from this type of insurance.

Using Equation 4, it can be shown that the maximum credit enhancement possible is equal to the insurer's credit rating. If for example, an insurer covers the entire principal in its performance-related coverage then S = $\hat{P}$ which mathematically states this result. Solving Eqn. 4 for ($S/\hat{P}$) we compute a formula than can be used to determine how much credit enhancement is obtained by insuring a given percentage of the principal, $\hat{P}$.

$$\frac{S}{\hat{P}} = \frac{I_1 \sum_{k=1}^{n} P_d(k, Q_1)(n-k) - I_2 \sum_{k=1}^{n} P_d(k, Q_2)(n-k)}{I_1 \sum_{k=1}^{n} P_d(k, Q_1)(n-k) - I_I \sum_{k=1}^{n} P_d(k, Q_I)(n-k)} \qquad (5)$$

Equation 5 has several variables that need to be known before the ratio can be computed: loan term, n, credit rating of the insurer, and the enabled credit enhancement '2.' To demonstrate the results that can be computed from Eqn. (5), we consider the example used in the previous section with the additional piece of data required being the credit rating of the insurer. For this example we will assume the insurer is 'A' rated by S&P.

Table 1. Maximum credit rating enhancement from insuring percentage of loan amount (S / $\hat{P}$)

		Achieved Credit Rating								
		B	B+	BB-	BB	BB+	BBB-	BBB	BBB+	A-
Initial Credit Rating	B-	22%	47%	58%	67%	80%	88%	94%	96%	98%
	B		32%	46%	58%	74%	85%	92%	95%	98%
	B+			21%	39%	62%	77%	88%	93%	97%
	BB-				23%	52%	71%	85%	92%	96%
	BB					39%	63%	80%	89%	95%
	BB+						40%	68%	82%	93%
	BBB-							47%	71%	88%
	BBB								45%	77%
	BBB+									58%

Table 1 is interpreted as follows: if the borrower was rated at a B-, then insuring 22% of the loan principal is required in order for the loan to have the same credit risk as a B rated loan for the total principal $\hat{P}$. In other words, insuring 22% of the principal has the potential to improve the credit rating of the loan transaction from a B- to a B. The biggest credit improvement comes for the non-investment grade rating categories (< BBB-) where the default probabilities and interest rates are considerable higher relative to the highly rated insurance company. As the borrower credit rating improves, the difference in credit risk between the borrower and the insurer decreases thereby diminishing the value of the insurance.

Stochastic Model for Energy Efficiency Insurance Valuation

In Figure 2 the credit benefit of insurance was demonstrated by reducing the principal at risk by a fixed amount – namely the insured amount of the project total efficiency savings. Yet, in building energy efficiency projects the actual amount of annual of savings is a stochastic variable subject to variation from a large number of internal and external factors. Energy efficiency loans are generally paid off by project cash flows where savings is seen effectively as new revenue stream compared to pre-retrofit operations. Therefore from an insurance and lending perspective there are two components that reduce the principal at risk: (1) the stochastic new revenue stream created by the efficiency upgrades and (2) the deterministic efficiency insurance which supports a minimum level of savings.

Intuitively, a company with an energy efficiency savings revenue stream is more likely not to default than an equivalent company that does not have this benefit. Yet rating agencies and lenders do not generally consider savings cash flows as a new revenue stream for providing credit enhancement benefits. Insurance, depending on the coverage details, can be considered a credit enhancement instrument.

There are several factors that can influence loan default rate. For example, a corporation which owns many buildings can be forced into loan default due to external factors related to their business that have nothing to do with local project cash flows. Yet for the single building owner where energy efficiency projects are viable, the efficiency savings stream can have direct revenue value in the long term project cash flows. To provide some insight on how these cash flows can influence the credit risk of loans, a stochastic model was developed that incorporates the stochastic distribution of potential efficiency savings with the additional option of augmenting this distribution with insurance.

To demonstrate the application of the model, consider an energy efficiency retro-fit project for an office building located in Connecticut. The project is composed of 12 energy conservation measures (ECMs) related to HVAC, building envelope, and control system upgrades. The total project costs are \$2.5M with an expected annual energy savings of \$185,000.

Performing a risk analysis from the audit reports, baseline, and engineering data, a range of possible ECM outcomes are computed and correlations between ECMs are assessed. From this data a project level savings distribution is computed as shown in Figure 3.

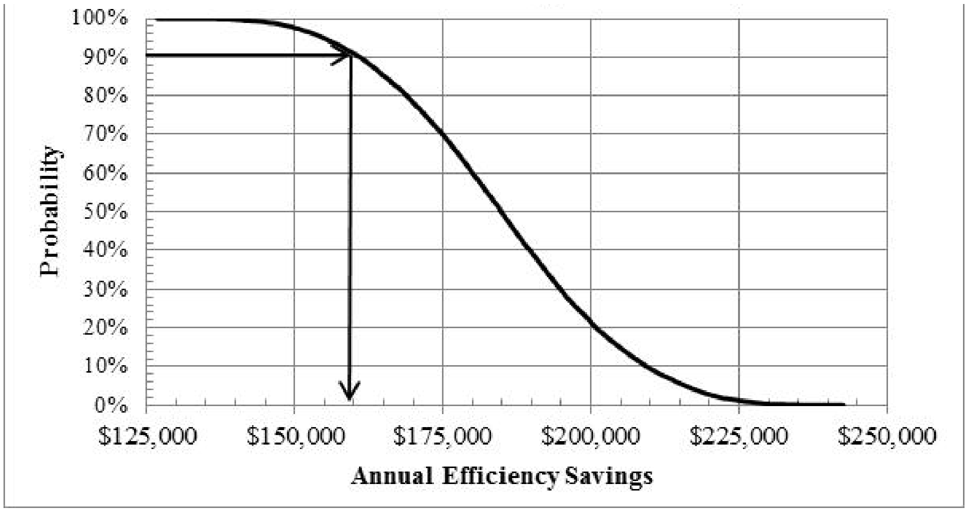

Figure 3. Distribution of annual efficiency savings for Connecticut Office Building Retrofit Project.

According to Figure 3, there is a 90% chance of the annual efficiency savings will exceed about $160,000 and a 20% chance that the savings amount will exceed $200,000. This curve represents valuable quantitative information that can be used to reduce the real income required to repay the loan. Let's consider a 10 year loan for the full project costs of $2.5M. To measure the credit enhancement value of the efficiency revenue stream and the additional value of insurance, we set the insured annual savings at the 10% deductible level from the expected savings estimate of $185,000 which corresponds to $166,500. The insurance company is assumed to be AA rated. Table 2 shows the credit enhancement potential that is obtained from:

- insuring $1,665,000 (10x$166,500) at the insurer's credit rating with the remaining part of the principal financed at the borrower's credit level, and
- the stochastic new revenue stream from the annual efficiency savings distribution shown in Figure 3

Table 2. Credit enhancement potential

		Achieved Credit Rating								
Initial Credit Rating	**Insurance?**	**B**	**B+**	**BB-**	**BB**	**BB+**	**BBB-**	**BBB**	**BBB+**	**A-**
B-	**No**	**98%**	**98%**	**35%**	**20%**	**---**	**---**	**---**	**---**	**---**
	Yes	**98%**	**98%**	**98%**	**35%**	**---**	**---**	**---**	**---**	**---**
B+	**No**	**---**	**---**	**98%**	**98%**	**40%**	**2%**	**---**	**---**	**---**
	Yes	**---**	**---**	**99%**	**98%**	**98%**	**10%**	**---**	**---**	**---**
BB+	**No**	**---**	**---**	**---**	**---**	**---**	**98%**	**12%**	**5%**	**---**
	Yes	**---**	**---**	**---**	**---**	**---**	**98%**	**98%**	**28%**	**6%**

In Table 2, three initial credit rating examples are shown with and without the energy efficiency insurance. The percentages refer to the probability of exceeding a level of credit enhancement. Notice the new revenue stream from the energy efficiency savings alone is sufficient to reduce the credit risk to gain two credit rating improvement in two cases and a single level of improvement for the highest initial credit rating, BB+. The value of the insurance is shown in all three examples by comparing the probability of exceeding the credit rating level as shown in the three circles. For example the B- borrower has only a 35% chance of exceeding the BB- level but with insurance this confidence is improved to 98%.

The value created by insuring a minimum level of savings provides a marginal increase in credit enhancement that is difficult to quantify in general. It is the lender's decision as to how much influence will be given to the effective revenue stream and to the insurance since all models contain assumptions and limitations. The revenue, while very real, is difficult for a lender to value because:

- From a securitization perspective there are no accounting rules as to how to value a stochastic energy efficiency savings distribution,
- Lenders generally do not have the engineering knowledge to assess the financial risk of the proposed energy efficiency revenue stream, and
- Energy price market risk over the loan term can influence the financial results.

Insurance is a financial risk transfer instrument that is well understood from a coverage perspective, but as this paper discusses, there can be additional project value created by reducing the effective credit risk which can be realized as a credit enhancement. The value created from this process is project dependent but the general categories are:

- Lower interest rate for the borrower: A credit enhancement can be translated into a basis point reduction in loan interest. This calculation and judgment is a function of the lender's view of the project. Mills (2003) describes the interest cost savings of energy-savings insurance versus a traditional savings guarantee. Our analysis shows the cost of the insurance is small in comparison to the financial benefit associated with the credit enhancement. Figure 4 shows a case study example, based on data from an energy efficiency project in Connecticut that highlights the lower interest rate for borrower, 4.0% versus 5.5%, due to insurance.

Loan Amount:	$1,992,683	**With Energy Efficiency Insurance: Years 1-5**	
Rate:	5.50%	Annual Insured Energy Efficiency Amt:	$164,489
Term (mo)	240	*(Insured Amt = Annual Debt Service)*	
		5 Year Insured Total:	$822,445
Without Energy Efficiency Insurance			
Monthly Payment	$13,707	Monthly Payment for first 5 years@ 4.0%:	$15,147
	x240	Monthly Payment for remaining 15 years@ 5.5%:	$9,562
Total Term Payout	$3,289,779	Time averaged monthly payment:	$10,958
		Total Term Payout:	*$2,629,922*
		Insurance Value = (Payout w/o ins - Payout w/ins)	***$659,857***

Figure 4. Lower interest payment for borrower because of insurance.

- Lower reserves for the lender: The quantification of the reduction in credit risk as shown in the stochastic model can be applied to reduce loan loss reserves which can enable the lender to make more loans.
- Intangible borrower assistance: It is possible that the insurance can improve a loan to make the loan appear as an investment grade transaction. This fact can help the borrower improve its marketplace perception, for example in the acquisition of capital funding, bond development, and stock performance.

Summary

The Introduction discussed the large potential for the building retrofit industry and that the financial community and building owners have yet to develop a systematic and standardized approach to streamline financing. While the technical and business justifications for these types of projects do exist, there are still roadblocks to large scale implementation. The authors speculate that as energy prices, emissions, and grid reliability become more important issues, retrofit projects will become more prolific. And the need to include insurance as a viable risk management instrument can be an important component of the financing equation – not just for better loan terms but also to possibly make more project capital available. The availability of insurance will increase the number of energy efficiency projects in two ways. First, level the playing field for contractors that are unable to provide a guarantee of energy savings due to constrained balance sheets. This will increase the selection pool for owners and increase competitiveness in the market. Second, as discussed in this paper, reducing credit terms will free up capital and in turn make projects more affordable and increase the likelihood of implementation.

Three methods of how insurance and energy efficiency savings can improve the credit worthiness of building retrofit projects have been discussed. The visual method provides a qualitative description regarding how insurance can reduce the effective principal at risk and how the net credit risk of this transaction is equivalent to the full principal loan credit risk at a higher credit rating. The principal of equivalent credit risk is the basis for credit enhancement. The theoretical approach shows that the limiting credit enhancement possible is the credit rating of the insurer. The method also assumes that project risk and default risk are covered by the insurance company. This is generally not currently the case in that insurers provide project performance protection and not default coverage. Project performance risk is generally the highest risk in retrofit projects in that lenders have good experience and expertise in assessing default risk but little to no experience in assessing performance risk which is exactly the cover that is being added by the insurance discussed here.

The stochastic model uses the basic visual model approach but instead of considering a fixed decrease in the principal at risk, the decrease is a probability distribution corresponding to the annual building efficiency savings distribution computed from a risk analysis of the energy efficiency project. In the stochastic model this distribution is modified to include a minimum level of savings. This patented methodology (Jones and Barats 2012) provides a practical method to assess project specific credit rating enhancement benefits as a function of the credit rating of the borrower and the other loan terms.

References

ACEEE - Energy Efficiency Finance 101: Understanding the Marketplace, Aug 2011, Joel Freehling, http://aceee.org/white-paper/energy-efficiency-finance-101.

ACEEE - *Major Accomplishments: 1980-2012*, http://www.aceee.org/about/accomplishments

CDO (Collaterized Debt Obligations) Evaluator Engine, http://www.standardandpoors.com/products-services/CDO-Evaluator-Engine/en/us.

DECC "The energy efficiency opportunity in the UK" Nov 2012 https://www.gov.uk/government/publications/energy-efficiency-opportunities-in-the-uk.

EIA (Energy Information Administration) Commercial Building Energy Consumption Survey (CBECS) http://www.eia.gov/consumption/commercial/.

Jones, Richard B., G. Barats, "Insurance Product, Rating System and Method," U.S. Patent #8,544,588, Issued June 5, 2012.

Mandel, Benjamin H., D. Morgan, and C. Wei. July 2012. "The Role of Bank Credit Enhancements in Securitization," Federal Reserve Bank of New York, Economic Policy Review.

McKinsey & Company "Unlocking energy efficiency in the US economy" July 2009 http://www.mckinsey.com/client_service/electric_power_and_natural_gas/latest_thinking/unlocking_energy_efficiency_in_the_us_economy.

Mills, Evan. 2003. "Risk Transfer via Energy Savings Insurance." *Energy Policy,*31:273-281. LBNL-48927. http://evanmills.lbl.gov/pubs/pdf/energy_savings_insurance.pdf

Navigant Research "The Market for Energy Efficiency Retrofits in Commercial Buildings will Nearly Double by 2020, Reaching $152 Billion Worldwide" http://www.navigantresearch.com/newsroom/the-market-for-energy-efficiency-retrofits-in-commercial-buildings-will-nearly-double-by-2020-reaching-152-billion-worldwide.

Puccia, Mark, Financial Enhancement Ratings, Global Credit Portal, Standard & Poor's, December 10, 2004.

Rigby, Peter, "Is 2013 the Year Interest Rates start Rising on U.S. and European Bonds?," Ratings Direct®, Standard and Poor's Rating Services, January 18, 2013.

US DOE (United States Department of Energy) 2010 Builders Energy Data Book http://buildingsdatabook.eren.doe.gov/default.aspx.

US DOE (United States Department of Energy) Smart Grid program. www.smartgrid.gov.

World Economic Forum, *A Profitable and Resource Efficient Future: Catalysing Retrofit Finance and Investing in Commercial Real Estate.* Geneva, Switzerland. October 2011, http://www.weforum.org/reports/profitable-and-resource-efficient-future-catalysing-retrofit-finance-and-investing-commercial.