http://www.smartermi.com/content/mortgageinsurance/us/en/learn/what_is_mortgage_insurance.html

What Is Mortgage Insurance

Buy a Home With Less Than a 20% Down Payment

- Traditionally, lenders have required a down payment of 20% of a home's purchase price to qualify for a mortgage.
- Mortgage insurance can help you buy a home with less than a 20% down payment -- and as little as 3% down.
- It provides financial protection to lenders and investors if a homebuyer defaults on a mortgage loan.
- Mortgage insurance is not mortgage life insurance, which pays off your mortgage if you become disabled or die. Nor is it homeowners insurance, which protects you from loss due to fire, theft or other disaster.

If you have a home loan with mortgage insurance, your mortgage payments will include the cost of the mortgage insurance premium. The premium can be paid monthly, annually or up front. The mortgage insurance provides financial protection for investors and lenders in case of mortgage default.

the Green MLS | TOOL KIT

search the site GO

Welcome to the Green MLS Tool Kit

SEE WHAT OTHERS ARE SAYING ABOUT THE GREEN MLS TOOL KIT

"I congratulate the National Association of REALTORS® for this essential toolkit that takes the next important step: translating green construction into demonstrable value for brokers and their customers all over the country."

Robert R. Jones
Chairman
National Association of Home Builders

Read full testimonials here

Welcome to the Green MLS Tool kit, a green real estate industry collaborative project. Home buyers, sellers and appraisers depend on a Green MLS for the same goal: ensuring fair value for good, green homes.

Green MLS is one solution for three different problems. Green MLS:

- Helps buyers quickly find green homes
- Makes it easy to fully promote the special features of a green home
- Supports apples-to-apples comparison when it is time to appraise a green home

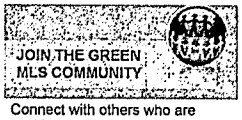
Good Green MLS is designed to support the flow of green home information/performance between the players in the marketplace. Value for green homes follows this information flow:

VALUE FOR GREEN HOMES

This toolkit addresses the recommended steps from industry experts and early Green MLS adopters to support efficient flow of green home information and value:

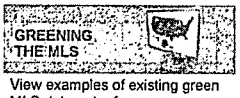
Step 1 - Cross Industry Goals & Team
Step 2 - Design for Data Integrity
Step 3 - Design for Ongoing Quality
Step 4 - Create the Green MLS Platform
Step 5 - Educate, Communicate
Step 6 - Track & Publish Market Trends

If you are just new to Green MLS please visit our **Getting Started** page. If you are already a part of the Green MLS movement please visit the **Continuous Improvement** page to learn the lessons so far about Green MLS and get suggestions to make your program even stronger.



Connect with others who are working to Green the MLS!

JOIN NOW >>



View examples of existing green MLS data entry forms.

VIEW NOW >>

Brought to you by the National Association of REALTORS® and NAR's Green REsource Council

http://www.greenmortgagecompany.com/green-mortgage-programs/fannie-mae-eem.html

Fannie Mae's Energy Efficient Mortgage (EEM)

Fannie Mae's EEM pilot is an underwriting variance that is able to be used with most of Fannie Mae mortgage products including:**Conventional Fixed Rate and Adjustable-rate Mortgages**. The same Fannie Mae product guidelines apply with the exception of the debt-to-income ratio and loan to value which allow for an additional variance to be applied to the qualifying ratios and also allowing for an adjustment to the appraised value.
Properties eligible for Fannie Mae's EEM are:

- Owner Occupied Residential Real Property
- Purchase or Refinance
- New Construction
- Purchase of existing home which are already energy efficient

When purchasing an existing property, the improvements can be completed prior to or after the close of the mortgage.
Up to 100% of improvements can be financed. Loan maximums can not exceed 15% of the value of the home.
The monthly savings resulting from energy efficient improvements is directly applied to the borrower's maximum monthly mortgage payment. This can allow borrowers to qualify for a larger mortgage or will help those whose debt-to-income ratios are borderline high for the property they are purchasing.

The New York Times nytimes.com

August 6, 2007

Mortgage Maze May Increase Foreclosures

By GRETCHEN MORGENSON

In 2003, Dianne Brimmage refinanced the mortgage on her home in Alton, Ill., to consolidate her car and medical bills. Now, struggling with a much higher interest rate and in foreclosure, she wants to modify the terms of the loan.

Lenders have often agreed to such steps in the past because it was in everyone's interest to avoid foreclosure costs and possibly greater losses. But that was back when local banks held the loans and the bankers knew the homeowners, as well as the value of the properties.

Ms. Brimmage got her loan through a mortgage broker, just the first link in a financial merry-go-round. The mortgage itself was pooled with others and sold to investors — insurance companies, mutual funds and pension funds. A different company processes her loan payments. Yet another company represents the investors as the trustee.

She has gotten nowhere with any of the parties, despite her lawyer's belief that fraud was involved in the mortgage. Like many other Americans, Ms. Brimmage is a homeowner stuck in foreclosure limbo, at risk of losing the home she has lived in since 1998.

As the housing market weakens and interest rates on adjustable mortgages rise, more and more borrowers are falling behind. Almost 14 percent of subprime borrowers were delinquent in the first quarter of 2007. Investors, fearful that these problems will hurt the overall economy, have retreated from the stock and bond markets, creating major sell-offs.

And the very innovation that made mortgages so easily available — an assembly line process known on Wall Street as securitization — is creating an obstacle for troubled borrowers. As they try to restructure their loans, they are often thwarted, lawyers say, by strict protections put in place for investors who bought the mortgage pools.

This impasse could exacerbate the housing slump, pushing more homeowners into foreclosure. That would lead to a bigger glut of properties for sale, depressing home prices further.

"Securitization led to this explosion of bad loans, and now it is harder to unwind and modify them even where it is in the best interests of both the borrower and the investors," Kurt Eggert, an associate professor at the Chapman University School of Law in Orange, Calif., said in an interview. "The thing that caused the problem is making it harder to solve the problem."

Creating difficulties is the complex design of mortgage securities.

Some homeowners have problems simply identifying who holds their mortgages. Others find the companies that handle their loan payments, known as servicers, are unresponsive, partly because modifying loans cuts into profits.

Even if circumstances suggest fraud when a loan was made, lawyers say, the various parties protect each other by refusing to produce documents.

Compounding the problem is a law stating that when a loan is passed to another party, that entity cannot be held liable for problems.

“I don’t think there is anything in the entire securitization process that is at all focused on the borrower’s interest,” said Kirsten Keefe, executive director of Americans for Fairness in Lending. “Everything they do is, ‘How are we going to make a profit, and how are we going to secure ourselves against risk?’ ”

The idea of pooling loans and selling them to investors dates back to 1970, but the practice has exploded in recent years. At the end of last year, $6.5 trillion of securitized mortgage debt was outstanding.

More than 60 percent of home mortgages made in the United States in 2006 went into securitization trusts. Some $450 billion worth of subprime mortgages, those made to borrowers with weak credit, went into securitizations last year.

Fifteen years ago, the last time the housing market ran into stiff trouble, government-sponsored enterprises like Fannie Mae did most of the work pooling and selling mortgage securities. These enterprises readily agree to loan modifications.

But not so in the private issues pooled and sold by Wall Street, which has fueled the extraordinary growth in the market.

The process begins with the entity that originates the loan, either a mortgage broker or lender. The loan is assigned to a company that will service it — collecting borrowers’ payments and distributing them to investors. Sometimes the servicer is affiliated with the lender, creating potential conflicts if a loan goes bad.

A Wall Street firm then pools thousands of loans to be sold to investors who want a steady stream of cash from loan payments. The underwriters separate them into segments based on risk.

Once a trust is sold, a trustee bank oversees its operations on behalf of investors. The trustee makes sure that the terms of the pooling and servicing agreement are met; this document determines what a servicer can do to help distressed borrowers.

The agreements require that any modifications to loans in or near default should be “in the best interests” of those who hold the securities.

But there is wide variation in how many loans can be modified. Some trusts have few curbs; others allow no more than 5 percent of mortgages to be changed.

Some trusts limit the frequency with which a loan can be modified or dictate a minimum interest rate. The variations help explain why borrowers are having difficulty.

Ira Rheingold, executive director of the National Association of Consumer Advocates, says companies in the chain should be held responsible. “Because Wall Street is responsible for the mess we are in, they need to bear some of that burden,” Mr. Rheingold said. “Why should people who have been funding these bad loans get a free pass?”

For now, the burden falls on people like Ms. Brimmage, a former forklift driver at an Owens-Brockway Glass Container plant in Godfrey, Ill., that closed last fall. A borrower in good standing since 1998, she said a local broker persuaded her to combine her debts in a fixed-rate loan of $65,000 in 2003.

But at the closing, she was presented with an adjustable-rate mortgage from the Argent Mortgage Company, carrying a low teaser rate for two years. When she objected, the broker assured her that rates would fall and she could get a better fixed-rate loan later. She said she believed him.

Rates did not fall. Still, Ms. Brimmage made her payments until illness struck in 2005. She then had difficulty paying the mortgage and liquidated part of her 401(k) retirement fund to keep current. Last September, she received a foreclosure notice from AMC Mortgage Services. Argent, which made the loan, and AMC are units of ACC Capital Holdings, a private company.

Clarissa P. Gaff, a lawyer for Ms. Brimmage at the Land of Lincoln Legal Assistance Foundation, hopes to cut her client’s loan and reduce the interest rate. The monthly payments have risen to $691 from $414, as the rate has jumped to 11.25 percent from the original 6.3 percent.

But the servicer has not agreed. Deutsche Bank, the trustee of the security holding the loan, says it is unable to help because it is neither the servicer nor the lender.

AMC Mortgage Services says Ms. Brimmage must pay the full amount. A spokesman for the company said that it had worked with her for two years and that it is in the interests of all involved in a mortgage to keep a loan current.

Ms. Gaff said some documents indicate that the mortgage broker who arranged the loan may have violated truth-in-lending requirements. The broker’s employer has been barred from doing business in Illinois and a handful of other states.

“We have run into this in any number of cases,” Ms. Gaff said. “The bank that holds the note as trustee claims to have no information relating to the servicer or the loan originator in spite of the fact that documents show all the parties have been working together for ages. It insulates them from liability.”

Imperiled homeowners are especially disadvantaged if they live in a state — like Georgia, California, Texas and 18 others — where foreclosures can take place without a judge’s oversight. A loan servicer in these places can push for quick foreclosure, sometimes in 40 days. Fast turnarounds are in a servicer’s interest because securitization pools do not cover the costs of modifying loans.

Lawyers trying to assist distressed homeowners sometimes find that these proceedings have been started without proof of ownership.

“There is some sort of confusion with regard to ownership in virtually each one of my subprime cases,” said

Howard D. Rothbloom, a lawyer in Marietta, Ga., who represents low-income people battling foreclosure. “Securitization has made it so complicated that everyone in the process is able to say that they don’t know what’s going on. The effect is, no poor person can afford to litigate this type of matter to bring it to a resolution, and therefore they lose their home.”

Mamie Ruth Palmer, an elderly woman in Atlanta, filed for bankruptcy in 2002 to stop a quick foreclosure sale. On Ms. Palmer’s behalf, Mr. Rothbloom is suing the trustee, Bank of New York, as well as HomEq Servicing, which withdrew its registration to do business in Georgia last fall. Mr. Rothbloom argues that Ms. Palmer’s lender levied improper costs, including $11,500 in legal fees.

Ms. Palmer is still in her home and makes mortgage payments to a bankruptcy trustee, Mr. Rothbloom said, but he has been unable to reach a settlement. Her loan stands at $51,500.

Bank of New York, like Deutsche Bank, says that the trustee’s function is an administrative one and that it is not responsible for foreclosures. HomEq did not return a phone call seeking comment.

Mr. Rothbloom said he has had cases where homeowners received foreclosure notices from entities that could not prove ownership.

“I am sure there are a lot of people who are no longer living in their homes where there was a flawed foreclosure,” Mr. Rothbloom said.

http://www.greentechmedia.com/research/ussmi/

U.S. SOLAR MARKET INSIGHT REPORT

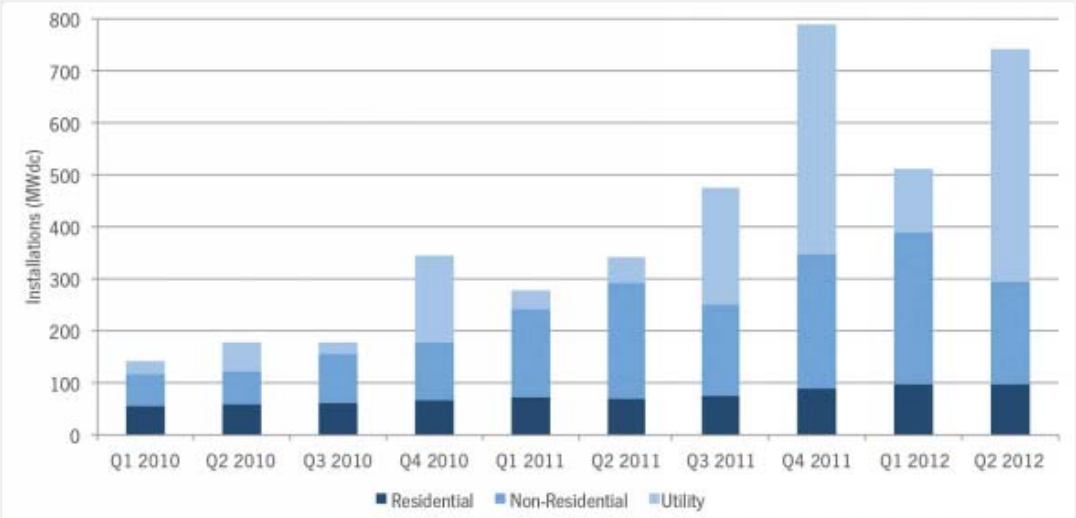
THE Q2 2012 REPORT IS NOW AVAILABLE!
Get the latest Strategic Data & Analysis Today!

U.S. Solar Market Insight™ is a collaboration between the Solar Energy Industries Association® (SEIA®) and GTM Research that brings high-quality, solar-specific analysis and forecasts to industry professionals in the form of quarterly and annual reports.

Each quarter, GTM Research gathers a complete account of industry trends in the U.S. photovoltaic (PV) and concentrating solar power (CSP) markets via comprehensive surveys of installers, manufacturers, utilities and state agencies. Annually, we supplement our PV and CSP analysis with coverage of the latest in the solar hot & cooling (SHC) and solar pool heating (SPH) markets. The result is the most relevant industry data and dynamic market analysis available.

The U.S. Solar Market Insight™ Reports are offered in two different versions– the Executive Summary and Full Report. The Full Report is available individually or as part of an annual subscription. Please find a description of each publication below, or click here to see our quarterly report Table of Contents by solar technology.

FIGURE: QUARTERLY U.S. PV INSTALLATIONS BY MARKET SEGMENT, 2010-Q2 2012



	Q1 2010	Q2 2010	Q3 2010	Q4 2010	Q1 2011	Q2 2011	Q3 2011	Q4 2011	Q1 2012	Q2 2012
Residential	56.2	59.8	62.5	66.6	73.4	69.3	74.9	90.6	97.6	98.2
Non-Residential	62.5	64.4	93.8	112.1	168.1	223.8	174.7	257.4	290.8	196.3
Utility	22.3	55.3	22.0	166.9	38.0	50.1	227.1	443.3	123.6	447.3
Total	141.0	179.5	178.3	345.6	279.5	343.2	476.7	791.3	512.0	741.7

HUD.GOV
U.S. Department of Housing and Urban Development

http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/sfh/eem/eemhog96

Energy Efficient Mortgage Home Owner Guide

THE ENERGY EFFICIENT MORTGAGE means comfort and savings. When you are buying, selling, refinancing, or remodeling your home, you can increase your comfort and actually save money by using the **Energy Efficient Mortgage (EEM)**. It is easy to use, federally recognized, and can be applied to most home mortgages. EEMs provide the borrower with special benefits when purchasing a home that is energy efficient, or can be made efficient through the installation of energy-saving improvements.

Homeowners with lower utility bills have more money in their pocket each month. They can afford to allocate a larger portion of their income to housing expenses. If you have more cash, why not buy a better, more comfortable home? There are two options with the Energy Efficient Mortgage.

The TWO SIDES of the EEM COIN

Finance Energy Improvements!

- Cost-effective energy-saving measures may be financed as part of the mortgage!
- Make an older, less efficient home more comfortable and affordable!

Increase Your Buying Power!

- Stretch debt-to-income qualifying ratios on loans for energy-efficient homes!
- Qualify for a larger loan amount! Buy a better, more energy efficient home!

WHO BENEFITS from the ENERGY EFFICIENT MORTGAGE?

Buyers:

- Qualify for a larger loan on a better home!
- Get a more comfortable home NOW.
- Save money every month from Day One.
- Increase the potential resale value of your home.

Sellers:

- Sell your home more quickly.
- Make your house affordable to more people.
- Attract attention in a competitive market.

Remodelers/Refinancers:

- Get all the EEM benefits without moving.
- Make improvements which will actually save you money.
- Increase the potential resale value of your home.

Pay for energy improvements easily, through your mortgage. Your lender can increase your loan to cover energy improvement costs. Monthly mortgage payments increase slightly, but you actually save money because your energy bills will be lower!

HERS, or Home Energy Rating Systems

A **HERS report** is similar to a miles-per-gallon rating on a car. HERS are programs which provide evaluations of an individual home's energy-efficiency. A HERS report is prepared by a trained Energy Rater. Factors such as insulation, appliance efficiencies, window types, local climate, and utility rates are used to rate the home and calculate energy costs.

A HERS Report Includes:

- Overall Rating Index of the house as it is.
- Recommended cost-effective energy upgrades.
- Estimates of the cost, annual savings, and useful life of upgrades.
- Improved Rating Index after the installation of recommended upgrades.
- Estimated annual total energy cost for the existing home before and after upgrades.

A Rating Index is between 1 and 100. A lower index indicates greater efficiency. Cost-effective upgrades are those which will save more money through energy savings than they cost to install.

A HERS rating usually costs between $300 and $800. This could be paid for by the buyer, seller, lender, or real estate agent. Sometimes the cost of the rating may be financed as part of the mortgage. No matter how the rating is paid for, it is a very good investment because an EEM could save you or your buyer hundreds of dollars each year.

THIS IS WHY the EEM WORKS

Energy-efficient homes cost less to own than non-efficient homes, though they may start off with higher price tags.

	Older existing home	Same Home with energy improvements
Home price (90% mortgage, 8% interest)	$ 150,000	$ 154,816
Loan amount	$ 135,000	$ 139,334
Monthly payment*	$ 991	$ 1,023
Energy bills	+ $ 186	+ $ 93
The true monthly		

cost of home ownership	$ 1,177	$ 1,116
Monthly savings		- $ 61

Estimated mortgage payments are based upon principle and interest only, and do not include taxes and insurance. Value indicated here is for comparison only, and will vary from home to home.

Many homes qualify for energy upgrades. This home qualified for $4,816 in upgrades. With the EEM, lenders recognize the savings the upgrades will bring. Borrowers may use these potential savings like extra cash, and add the cost of upgrades into the mortgage, paying them off easily as part of the monthly mortgage payment. Once the upgrades are installed the potential savings turn into real savings.

Another EEM option is for the lender to allow higher qualifying ratios for borrowers who will occupy a property meeting certain standards for energy efficiency. When the home has been built or retrofitted in conformance with the International Energy Conservation Code (IECC) standards for 2000 or later, then the lender may "stretch" the borrower's qualifying ratios. A debt-to-income ratio "stretch" means that a larger percentage of the borrower's monthly income can be applied to the monthly mortgage payment. That means the buyer has more borrowing power based up on the same income.

WHAT the EEM DOES for a BUYER'S BORROWING POWER

For a standard home without energy improvements:

Buyer's total monthly income	$5,000
Maximum allowable monthly payment 29% debt-to-income ratio	$1,450
Maximum mortgage at 90% of appraised home value	$207,300

For an energy-efficient homes (2000 IECC)*:

Buyer's total monthly income	$5,000
Maximum allowable monthly payment 33% debt-to-income ratio	$1,650
Maximum mortgage at 90% of appraised home value	$235,900

Added borrowing power due to the Energy Efficient Mortgage: **$28,600**

**Interest rate 7.5%, downpayment of 10%, 30-year term, principal & interest only (tax & insurance not factored.)*

In other words:

This buyer got into a home worth thousands of dollars more, just because it was energy efficient. That could mean a home with more space, in a better location, or in better overall condition.

FHA's Energy Efficient Mortgage Program

The FHA Energy Efficient Mortgage covers upgrades for new and existing homes and is now available in all 50 states. Key features includes:

- Loan limits may be exceeded

- No re-qualifying
- No additional down payment
- No new appraisal

The FHA 203(k) loan enables a home buyer to obtain a single loan to finance both property acquisition and to complete major improvements after loan closing and can be combined with FHA's EEM.

CASE STUDY:

Customer Quote: "*The EEM was the second best thing that ever happened to me. The first best was actually being able to buy a home. This is our first home, and the EEM saved us a lot of headaches because we knew what we needed to do to the house. It's nice and comfortable now. Even my dogs are happy. I am very impressed.*" *-Pat Theard*

First-time home buyers Patricia and Mynette Theard purchased their home in California. It was built in 1940, and sold for $150,000. They got an FHA loan for 95% of the value of the property. The lender saw an opportunity for them to improve on their investment and recommended an Energy Efficient Mortgage.

A HERS Rating on the home recommended $2,300 in energy improvements including ceiling, floor and furnace duct insulation, plus a setback thermostat. The lender set aside an extra $2,300 for the improvements, bringing the total loan amount from $142,500 to $144,800. The loan closed, the Theards moved in, and the improvements were installed. The monthly mortgage payment increased by $17, but the Theards are saving $45 each month through lower utility bills.

Ask your lender about an Energy Efficient Mortgage. If they are not knowledgeable about the EEM, encourage them to learn about it, or find another lender.

WHICH BUYERS and HOMES ARE ELIGIBLE?

All buyers who qualify for a home loan qualify for the EEM. The EEM is intended to give the buyer additional benefits on top of their usual mortgage deal. The lender will use the energy efficiency of the house, as determined by a HERS rating, to determine what these benefits will be.

Energy Efficient Mortgages can be used on most homes. Availability is not limited by location, home price or utility company. Your lender will help you choose which loan type is best for you.

Get an EEM on:

- Older homes qualifying for upgrades
- New or old homes not requiring upgrades
- New construction

SOME THINGS to KEEP in MIND

It is best to have the HERS Rating done as early in the loan process as possible. This way, the Rating can be performed while other aspects of the loan are being processed. Closing the loan should not be delayed. You may get a larger tax deduction with the EEM because the interest on mortgage payments is tax deductible. This can save you more money than paying for energy upgrades with a credit card, bank loan, or cash, none of which are usually tax deductible.

Each house is as unique as its owner. Benefits derived from the EEM will vary from one house to another, and the benefits in the examples in this book may not apply in all cases. Your lender will be your best source of information on your own EEM benefits.

CASE STUDY:

Adding Energy Improvements through a Home Refinance

"*It's wonderful. We're just amazed at the difference. We've hardly used the furnace all winter. The house is much quieter too. It makes sense for everyone to do it.*" *-Caroline Chang*

In the fall of 1995, Caroline and Tommy Chang decided to refinance their 35-year-old home to take advantage of lower interest rates. Their lender suggested they get a HERS Rating on the home so they could finance energy improvements through their new mortgage deal as well.

The lender increased the loan by $8,760 to cover the cost of energy improvements. Their final loan amount was $176,400, which is higher than they could have gotten with out the EEM. The loan closed and the improvements were installed. These included double-paned windows, wall insulation, ceiling insulation, furnace duct repairs and insulation, and a few smaller items. These improvements, combined with their lower mortgage interest rate, mean the Changs will be saving about $230 per month. They will be more comfortable too!

A house could be your biggest investment ever. Use the Energy Efficient Mortgage and invest wisely.

To find out how, call the organizations listed on the back cover.

Disclaimer Statement

Publication developed by:
Pacific Gas and Electric Company
Consumer Energy Management
123 Mission Street
San Francisco, CA 94111
Phone: 800) 933-9555

Pacific Gas and Electric

Produced cooperatively by:
U.S. Department of Energy
Office of Building Technology
State and Community Programs
1000 Independence Avenue SW
Washington, DC 20585
Phone: (800) 363-3732

Department of Energy

Alliance to Save Energy
1200 18th Street, NW Suite 900
Washington, DC 20036
Phone: (202) 857-0666

Federal Citizen Information Center
Pueblo, CO 81009
Phone: (719) 948-4000 (for catalogs only)

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http://portal.hud.gov/hudportal/HUD?src=/program_offices/housing/sfh/eem/energy-r

Energy Efficient Mortgage Program

FHA's Energy Efficient Mortgage program (EEM) helps homebuyers or homeowners save money on utility bills by enabling them to finance the cost of adding energy efficiency features to new or existing housing as part of their FHA insured home purchase or refinancing mortgage.

Purpose

In 1992, Congress mandated a pilot demonstration of Energy Efficient Mortgages (EEMs) in five states. In 1995, the pilot was expanded as a national program.

EEMs recognize that reduced utility expenses can permit a homeowner to pay a higher mortgage to cover the cost of the energy improvements on top of the approved mortgage. FHA EEMs provide mortgage insurance for a person to purchase or refinance a principal residence and incorporate the cost of energy efficient improvements into the mortgage. The borrower does not have to qualify for the additional money and does not make a downpayment on it. The mortgage loan is funded by a lending institution, such as a mortgage company, bank, or savings and loan association, and the mortgage is insured by HUD. FHA insures loans. FHA does not provide loans.

Type of Mortgage:

EEM is one of many FHA programs that insure mortgage loans--and thus encourage lenders to make mortgage credit available to borrowers who would not otherwise qualify for conventional loans on affordable terms (such as first time homebuyers) and to residents of disadvantaged neighborhoods (where mortgages may be hard to get). Borrowers who obtain FHA's popular Section 203(b) Mortgage Insurance for one to four family homes are eligible for approximately 96.5 percent financing, and are able to add the upfront mortgage insurance premium to the mortgage. The borrower must also pay an annual premium.

EEM can also be used with the FHA Section **203(k) rehabilitation** program and generally follows that program's financing guidelines. For energy efficient housing rehabilitation activities that do not also require buying or refinancing

the property, borrowers may also consider HUD's **Title I Home Improvement Loan** program.

How to Get a EEM:

To apply for an FHA insured energy efficient mortgage, contact an **FHA approved lender**.

Eligible Customers:

All persons who meet the income requirements for FHA's standard Section 203(b) insurance and can make the monthly mortgage payments are eligible to apply. The cost of the energy improvements and estimate of the energy savings must be determined by a home energy rating system (HERS) or an energy consultant. The cost of an energy inspection report and related fees may be included in the mortgage. Cooperative units are not eligible.

EEM can also be used with FHA's Section 203(h) program for mortgages made to victims of presidentially declared disasters. The mortgage must comply with both Section 203(h) requirements, as well as those for EEM. However, the program is limited to one unit detached houses.

Eligible Activities:

EEM can be used to make energy efficient improvements in one to four existing and new homes. The improvements can be included in a borrower's mortgage only if their total cost is less than the total dollar value of the energy that will be saved during their useful life. Other eligibility requirements may be found in the **Homeowner's Guide**.

Eligibility Requirements

- The borrower is eligible for a maximum FHA insured loan, using standard underwriting procedures. The borrower must make a 3.5 percent downpayment. This 3.5 percent downpayment is based on the sales price or appraised value. Any upfront mortgage insurance premium can be financed as part of the mortgage.
- Eligible properties are one to four unit existing and new construction. EEMs may be added to some other loan types, including streamline refinances.
- The cost of the energy efficient improvements that may be eligible for

financing into the mortgage is the lesser of A or B as follows:

A. The dollar amount of cost-effective energy improvements, plus cost of report and inspections, or

B. The lesser of 5% of:

- The value of the property, or
- 115% of the **median area price** of a single family dwelling, or
- 150% of the conforming Freddie Mac limit.

- To be eligible for inclusion in the mortgage, the energy efficient improvements must be cost effective, meaning that the total cost of the improvements is less than the total present value of the energy saved over the useful life of the energy improvement.
- The cost of the energy improvements and estimate of the energy savings must be determined by a home energy rating report that is prepared by an energy consultant using a Home Energy Rating System (HERS). The cost of the energy rating report and inspections may be financed as part of the cost effective energy package.
- The energy improvements are installed after the loan closes. The lender will place the money in an escrow account. The money will be released to the borrower after an inspection verifies that the improvements are installed and the energy savings will be achieved.
- The maximum mortgage limit for a single family unit depends on its location, and it is adjusted annually. Look online to find FHA's **maximum mortgage limits** by county.

Technical Guidance:

EEM is authorized under Section 513 of the Housing and Community Development Act of 1992. Program regulations are listed on the **EEM mortgagee letter** web page.

For More Information:

Visit the **FHA Resource Center** to search the FAQs, ask a question or send an email.

Return to EEM Home

FHA *PowerSaver* Pilot Program

FHA *PowerSaver* is a new mortgage insurance product from the Federal Housing Administration (FHA) that will enable homeowners to make cost effective, energy saving improvements to their homes. Homeowners are increasingly interested in making their homes more energy efficient, according to industry forecasts. But options are limited for financing improvements, especially for the many homeowners who are unable to take out a home equity loan or access an affordable consumer loan. *PowerSaver* will give more homeowners the ability to live in greener homes.

PowerSaver will enable homeowners to borrow up to $25,000 for terms as long as 20 years to make energy improvements of their choice, based on a list of proven measures developed by FHA and the U.S. Department of Energy (DOE). Examples of eligible improvements include insulation, duct sealing, energy efficient doors and windows, energy efficient HVAC systems and water heaters, solar panels and geothermal systems. FHA encourages consumers to utilize an energy audit to determine the most cost effective improvements for their home.

Loan interest rates are expected to be between 5 and 7 percent – comparable to or lower than other options available to most homeowners. *PowerSaver* loans generally will be secured by a mortgage or deed on the home that is subordinate to any existing first mortgage.

PowerSaver may make particular sense for homeowners with equity in their home who want to make cost-saving improvements that may also improve the home's value. *PowerSaver* also may appeal to homeowners who have paid off their mortgage, plan to stay in their home and want to realize the benefits of lower energy bills.

PowerSaver loans will be backed by the FHA – with significant "skin in the game" from private lenders. Federal mortgage insurance will cover up to 90 percent of the loan amount in the event of default. Lenders will retain the remaining risk on each loan, incentivizing responsible underwriting and lending standards. FHA will provide streamlined insurance claims payment procedures on *PowerSaver* loans. In addition, lenders may be eligible for incentive grant payments from FHA to enhance benefits to borrowers, such as lower interest rates.

PowerSaver loans will only be available to homeowners who have the wherewithal and motivation to make energy improvements to their home. Borrowers must have credit scores of at least 660 and their total debt to income ratios cannot exceed 45 percent. The combined loan-to-value ratio for all loans on a home, including the *PowerSaver* loan, cannot exceed 100 percent.

Participating lenders will be required to target markets that have already taken affirmative steps to expand home energy improvements. FHA and DOE will help lenders identify such markets – which exist in many suburban, rural and urban areas across the country. FHA's approval and monitoring procedures will ensure that *PowerSaver* loans are only offered by responsible, qualified lenders.

Read more about lenders participating in FHA's new *PowerSaver* pilot program.

HUD.GOV
U.S. Department of Housing and Urban Development

http://portal.hud.gov/hudportal/HUD?src=/press/press_releases_media_advisories/2010/HUDNo.10-251

HUD No. 10-251
Brian Sullivan
(202) 708-0685

FOR IMMEDIATE RELEASE
Tuesday
November 9, 2010

HUD ANNOUNCES PILOT PROGRAM TO HELP HOMEOWNERS PAY FOR ENERGY IMPROVEMENTS TO THEIR HOMES

New FHA PowerSaver Program to offer low-cost financing to credit-worthy borrowers

WASHINGTON – Vice President Joe Biden and U.S. Housing and Urban Development (HUD) Secretary Shaun Donovan today announced a new pilot program that will offer credit-worthy borrowers low-cost loans to make energy-saving improvements to their homes. Backed by the Federal Housing Administration (FHA), these new ***FHA PowerSaver*** loans will offer homeowners up to $25,000 to make energy-efficient improvements of their choice, including the installation of insulation, duct sealing, doors and windows, HVAC systems, water heaters, solar panels, and geothermal systems.

HUD and FHA developed ***PowerSaver*** as part of the *Recovery Through Retrofi*t initiative launched in May 2009 by Vice President Biden's Middle Class Task Force to develop federal actions that would expand green job opportunities in the United States and boost energy savings by improving home energy efficiency. The announcement is part of an 18-month-long interagency effort facilitated by White House Council on Environmental Quality with the Office of the Vice President, 11 departments and agencies and six White House offices.

Vice President Biden said, "The initiatives announced today are putting the *Recovery Through Retrofit*report's recommendations into action – giving American families the tools they need to invest in home energy upgrades. Together, these programs will grow the home retrofit industry and help middle class families save money and energy."

"HUD and FHA are committed to lowering the cost and expanding the availability of affordable financing for home energy retrofits," said Secretary Donovan. "*PowerSaver* will help more homeowners afford common sense, cost saving improvements to their homes, and will create jobs for contractors, installers and energy auditors across the country."

More homeowners are interested in making their homes energy efficient, according to industry forecasts. Yet options are still limited for financing home energy improvements, especially for the many homeowners who are unable to take out a home equity loan or access an affordable consumer loan. HUD today published a notice seeking the participation of a limited number of mortgage lenders in the two-year pilot program slated to begin in early 2011.

"*PowerSaver* provides lenders with a new product option to serve a potentially growing market," said David H. Stevens, FHA Commissioner. "We believe there are a number of lenders who will be interested in working with us to help save energy and money for homeowners, while creating jobs and cutting greenhouse gas emissions"

Lenders will be selected to participate in the *PowerSaver* pilot based on their capacity and commitment to provide affordable home energy improvement financing. Lenders will be required to serve communities that have already taken affirmative steps to expand home

energy improvements. HUD will help lenders identify such markets – which exist in many suburban, rural and urban areas across the country.

PowerSaver loans will be backed by the FHA – but with significant "skin in the game" from private lenders. FHA mortgage insurance will cover up to 90 percent of the loan amount in the event of default. Lenders will retain the remaining risk on each loan, incentivizing responsible underwriting and lending standards. FHA will provide streamlined insurance claims payment procedures on*PowerSaver* loans. In addition, lenders may be eligible for incentive grant payments from FHA to enhance benefits to borrowers, such as lowering interest rates.

"Home energy retrofits are good investments that save families money," said Ginnie Mae President Ted Tozer. "As the financing arm of HUD, we are proud to support this important home-improvement segment of the housing market and look forward to working with lenders and FHA to develop appropriate secondary market options."

PowerSaver has been carefully designed to meet a need in the marketplace for borrowers who have the ability and motivation to take on modest additional debt to realize the savings over time from a home energy improvement. *PowerSaver* loans are only available to borrowers with good credit, manageable overall debt and at least some equity in their home (maximum 100% combined loan to value).

To read the full text of FHA's notice, visit **HUD's website**.

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*HUD's mission is to create strong, sustainable, inclusive communities and quality affordable homes for all. HUD is working to strengthen the housing market to bolster the economy and protect consumers; meet the need for quality affordable rental homes: utilize housing as a platform for improving quality of life; build inclusive and sustainable communities free from discrimination; and transform the way HUD does business. More information about HUD and its programs is available on the Internet at **www.hud.gov** and**espanol.hud.gov**.*

U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT
WASHINGTON, DC 20410-8000

ASSISTANT SECRETARY FOR HOUSING-
FEDERAL HOUSING COMMISSIONER

May 6, 2005

MORTGAGEE LETTER 2005-21

TO: ALL APPROVED MORTGAGEES

SUBJECT: HUD's Energy Action Plan and Energy Efficient Mortgages

The Department of Housing and Urban Development's Energy Action Plan calls for the promotion of the FHA's Energy Efficient Mortgage (EEM) as a priority single family insured loan product. The EEM program recognizes that the improved energy efficiency of a house can increase its affordability by reducing the operating costs. Cost-effective energy improvements result in lower utility bills, conserve energy and, thus, make more income available for the mortgage payment. This Mortgagee Letter consolidates and clarifies existing policies on the EEM program and describes enhancements to the EEM product that have been made to make it more widely available. In addition, this Mortgagee Letter announces that to obtain "stretch ratios" for qualifying borrowers, the property must meet the 2000 International Energy Conservation Code (IECC).

The EEM program allows a borrower to finance 100 percent of the expense of a cost-effective "energy package," i.e., the property improvements to make the house more energy efficient. A cost-effective energy package is one where the cost of the improvements, including maintenance, is less than the present value of the energy saved over the useful life of those improvements. The borrower does not need to qualify for the additional financing or provide additional downpayment. There is also no need for a second appraisal that reflects the expense of the energy package and the improvements may be applied to retrofit an existing house or improve the energy efficiency of proposed construction. The present value test is a statutory requirement and, thus, actual energy savings cannot be used to determine cost effectiveness in lieu of the present value calculation of the energy savings.

The EEM may be used with Sections 203(b), 203(k)(rehabilitation mortgages), 234(c)(units in condominium projects), and 203(h)(mortgages for disaster victims) loans for both purchases and refinances, including streamline refinances. Both new and existing 1-4 family unit properties are eligible, including 1-unit condominiums and manufactured housing. The allowable EEM dollar amount is for the entire property and not based on a per unit basis for multiple unit properties.

How is the energy package designed?

The energy package is the set of improvements agreed to by the borrower based on

recommendations and analysis performed by a qualified home energy rater using a tool known as a Home Energy Rating System (HERS). The HERS must both meet the minimum requirements of the Department of Energy (DOE) approved ratings guidelines and must have achieved passing results from DOE's Building Energy Simulation Test (BESTTEST) or subsequent testing requirements.

The home energy rater must be trained to perform the physical inspection and/or diagnostic test that provide the data on the home used to develop the energy package. The home energy rater using the HERS prepares a written home energy rating report. The report, which must be provided to the homebuyer/homeowner as well as the mortgage lender, is based on the information developed from a physical inspection of the existing property to be retrofit, or from the plans and specifications of the house to be built. It provides estimates of both the costs of the improvements and the expected energy savings.

For new construction, the energy package includes those cost-effective energy improvements over and above the requirements of the 2000 International Energy Conservation Code, formerly known as the Model Energy Code. More information on this energy code can be obtained from the Department of Energy's website at http://www.energycodes.gov. The details of the energy package and supporting information are presented in a HERS Rating Report.

How is the EEM underwritten?

The mortgage is initially underwritten as if the energy package did not exist, i.e., by using standard FHA underwriting standards, qualifying income ratios, and maximum mortgage/minimum cash investment requirements without regard to the energy package. For an EEM on new construction, as well as those homes that were built to the 2000 IECC or are being retrofitted to that standard, the borrower, in addition to the cost of the improvements, can get "stretch ratios" of 33% and 45%. Also, for new construction, when qualifying the borrower, the cost of the energy package should be subtracted from the sales price (since the builder has included those improvements in the sales price) and the qualifying ratios calculated on this lower amount.

Once it is determined that both the borrower and the property qualify for a mortgage to be insured by FHA, the mortgage lender, using the energy rating report and an EEM worksheet[1] will determine the dollar amount of the cost-effective energy package that may be added to the loan amount. This dollar amount cannot exceed 5 percent of the property's value (not to exceed $8,000) or $4,000, which ever is greater. Regardless of the property's value, every borrower who otherwise qualifies can finance at least $4,000 of the costs of the Energy Package if the cost exceeds $4,000. The calculated amount will be added to the approved base loan amount to total the final FHA insured loan amount before adding any upfront mortgage insurance premium. The FHA maximum loan limit for the area may be exceeded by the cost of the energy efficient improvements.

For a streamline refinance, the borrower's principal and interest (P&I) payment on the new loan including the energy package may be greater than the principal and interest (P&I) payment on the current loan, provided the estimated monthly energy savings as shown on the HERS report

[1] See Attachment A for suggested format

exceeds the increase in the P&I.

FHA's TOTAL mortgage scorecard may also be used for underwriting EEMs. If the lender obtains an "accept" or "approve" on a mortgage loan application, FHA will recognize the risk rating from TOTAL and permit the increase to the mortgage payment without re-underwriting or rescoring provided that the lender' s Direct Endorsement (DE) underwriter attests that he or she has reviewed the calculations associated with the energy efficient improvements, and found the mortgage and the property to be in compliance with FHA's underwriting instructions.

The appraisal does not need to reflect the value of the energy package that will be added to the property for either new or existing construction. On a streamline refinance made without an appraisal, the original principal balance substitutes for an appraised value. On a Section 203(k), the after-improved value is to be used for the EEM process.

For existing properties, energy-related weatherization items (see handbook HUD 4155.1, Rev 5,1-7(C)(2) for maximum additions to the mortgage amount) may be combined with the Energy Efficient Mortgage, where the maximum dollar amount allowed under an EEM does not cover the cost of the entire energy package. The weatherization amount would be the cost of the improvements not covered by the EEM amount. With a 203(k), the excess improvements would be included in the rehabilitation work.

When is the EEM mortgage eligible for endorsement?

On *existing* properties, the FHA EEM is insurable immediately after closing. The installation of the energy package does not need to be completed before FHA insures the mortgage. However, for *new construction* the energy package must be completed before the mortgage is eligible for insurance (or after construction is complete when using FHA's Construction-Permanent mortgage).

What are FHA's requirements for escrow accounts under the EEM Program?

For *existing properties*, the lender at closing is to establish an escrow account for the energy improvements. Any funds remaining in the escrow account at the end of the construction period must be applied to pay down the loan principal. For *new construction*, there will not be an escrow account as the energy package is to be installed as part of the total construction, which must be completed prior to loan closing.

If the energy package is part of a Section 203(k) rehabilitation loan, then the escrowed amounts of the energy package must be included in the Rehabilitation Escrow Account.

In all cases, the lender is to execute form HUD 92300, Mortgagee Assurance of Completion, to indicate that the escrow for the energy efficient improvements has been established.

What are the requirements for installing the energy package?

On *existing construction*, the energy package is to be installed within 90 days of the loan

closing. If the work is not completed within 90 days (180 days is allowed for Section 203(k) rehabilitation mortgages), the lender must apply the EEM funds to a prepayment of the mortgage principal. The borrower cannot be paid for labor (sweat equity) on work that they perform, and the borrower cannot receive cash back from the mortgage transaction. On *new construction*, the installation of the energy package is included in the total construction of the house, and therefore is to be complete at loan settlement.

If the work that is done differs from the approved energy package, a change order along with a revised HERS Report must be submitted to the DE Underwriter for approval. If the changes still meet the cost-effectiveness test, no further analysis is required. If not, the funds for the work not included in the approval energy package must be used to pay down the loan principal.

What are the requirements for assuring completion of the energy package as proposed?

The lender is responsible for notifying FHA through the FHA Connection or equivalent that the improvements have been made and that the escrow has been cleared. The lender, the rater, or an FHA fee inspector may inspect the installation of the improvements. The borrower may be charged an inspection fee in accordance with the appropriate Homeownership Center (HOC) fee schedule.

What is included in the Report on the energy package?

The energy package report must provide the following information:

1. Address of the Property
2. Name of client
3. FHA Case number (if applicable)
4. Name of Lender (if applicable)
5. Type of Property
6. Whether the property is new construction or existing
7. Date of the physical inspection of the existing property or, for new construction, the date of the plan review.
8. Description of the current energy features of the property or proposed features if new construction. This must include, at a minimum, a description of the insulation R values in ceilings, walls, and floors; infiltration levels and barriers (caulking, weather-stripping, and sealing); a description of the windows (storm windows, double pane, triple pane, etc.) and doors; and a description of the heating (including water heating) and cooling systems.
9. Description of the energy package - For existing properties, those cost-effective improvements recommended to improve the energy efficiency of the property. For new construction, those cost-effective improvements to be included in the home that are over and above the requirements of 2000 IECC.
10. Estimated cost of the energy package, the useful life, and the costs of any maintenance over the useful life of the improvements.
11. The estimated present annual utility cost before the installation of the energy package (for existing property). For new construction, the estimated annual utility costs of a reference house built to 2000 IECC .

12. Estimated expected annual utility costs after the installation of the energy package.
13. Estimated annual savings in utility costs after the installation of the energy package, including the present value of the savings.
14. Names and signatures of the person(s) who inspected the property and of the person(s) who prepared the report, and the date the report was prepared.
15. The following Certification, signed by the person(s) who inspected the property and the person(s) who prepared the report:

    "I certify to the best of my knowledge and belief, the information contained in this report is true and accurate and I understand that the information in this report may be used in connection with an application for an Energy Efficient Mortgage to be insured by the Federal Housing Administration of the U.S. Department of Housing and Urban Development."

Are there additional fees associated with the EEM program?

FHA does not set the fees for the Home Energy Rating, including the physical inspection, the HERS Report, and any post-installation tests. The fees charged to the borrower for the Home Energy Rating must be customary and reasonable for the area. These fees may be included and financed as part of the energy package if the entire package, including those fees, is cost-effective. If not, such fees are considered allowable closing costs. With a Section 203(k), the rating fee and inspections would be in addition to the consultant's fee.

How will FHA know that this is an EEM?

There are two EEM designations in the FHA Connection and each is described below. Also, a copy of the HERS report is to be included in the case binder submitted for endorsement and placed behind the mortgage credit analysis worksheet (MCAW). In the Remarks section of the MCAW, the lender is to indicate that the loan is for an EEM, show the cost of the energy package and the final loan calculations.

The categories of EEMs available in the FHA Connection are:

- New Construction/HERS Improvements: For homebuyers purchasing a home to be built and financing the cost of eligible energy efficient improvements into the mortgage. The borrower is also eligible for stretch ratios when manually underwriting the loan application if the property is built according to the 2000 IECC.

- Existing Construction/HERS Improvements: For homebuyers and those refinancing their mortgages and financing the eligible energy efficient improvement into the mortgage. The borrower is also eligible for stretch ratios when manually underwriting the loan application if the property was built to or is now being retrofitted to the 2000 IECC.

HUD has requested public comment on the information collection requirements contained in this mortgagee letter and upon expiration of the comment period will submit the

requirements to the Office of Management and Budget (OMB) for approval under the Paperwork Reduction Act of 1995 (44 U.S.C. 3501-3520). When assigned, the OMB control number will be announced by HUD. In accordance with the Paperwork Reduction Act, HUD may not conduct or sponsor, and a person is not required to respond to, a collection of information unless the collection displays a currently valid OMB control number.

If you have any questions regarding this Mortgagee Letter, please contact your Homeownership Center (HOC) in Atlanta (888-696-4687), Denver (800-543-9378), Philadelphia (800-440-8647), or Santa Ana (888-827-5605).

Sincerely,

Assistant Secretary for Housing-
Federal Housing Commissioner

Energy Efficient Mortgage Worksheet

Borrower's Name:_____ FHA Case #: _____
Property Address: _____
_____

A. Qualifying Mortgage Amount	1. Mortgage (w/o MIP) (line 11d of the MCAW-PUR or line 10g from MCAW WS)	A. $_____
B. EEM Amount	*The Home Energy Rating Report will provide the information on the Recommended Energy Package, its cost, and the present value of the energy saved.* The cost of the Energy Package (not to exceed $8,000) can be added to A if the cost is less than the Present Value of the energy saved:	
	Compare Cost and PV of energy savings: 1.Cost of Energy package $____ 2. PV of Energy Saved $ _____ 3. Is PV more than Cost? Y / N If Yes, Continue:	
	1. If Cost is less than $4,000, enter the Cost in B. *(or)*	B. $ _____
	2. If the Cost is more than $4,000, but 5% of the value is less than $4,000, enter $4,000 in B. *(or)*	
	3. If the Cost is less than 5% of the value, but 5% of value is more than $4,000 enter the lesser of the cost or $8,000 *(or)*	
	4. If the Cost is greater than 5% of value, enter the lesser of 5% of value or $8,000 in B	
C. Final EEM Mortgage Amount (w/o MIP)	**Add A and B**	**C. $ _____**

REMARKS:
_____
_____
_____
_____

PV Value™

User Manual v. 1.1

Jamie L. Johnson – Solar Power Electric™
Geoffrey T. Klise – Sandia National Laboratories
9/1/2012

SAND2012-7306P

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Sandia National Laboratories

SOLAR POWER ELECTRIC

U.S. DEPARTMENT OF ENERGY

Executive Summary

This user manual describes the methods used to develop a model for appraising the value of a photovoltaic (PV) system installed on residential and commercial properties. This model follows the Income Capitalization Approach used by appraisers to determine the value of a PV system as a function of the potential energy produced over the system's lifetime. Instructions on how to properly input values into the spreadsheet tool are presented along with a detailed description of each parameter. PV Value™ is intended for use by real estate appraisers, mortgage underwriters, credit analysts, real property assessors, insurance claims adjusters, and PV industry sales staff. This user manual references version 1.1 of the "Photovoltaic Energy Valuation Model," (PV Value™) with a copyright date of August 31, 2012. The original version 1.0 was released on January 31, 2012, and has now expired. Version 1.1 has updates that were requested by users, most importantly an Excel® 2011 version for Mac OS X. This user manual has been changed to reflect the additional features in the model. Check back to www.pvvalue.com or http://pv.sandia.gov/pvvalue for newer versions of the spreadsheet tool. A new release is anticipated on or before July 1, 2013. Any questions or comments can be directed to Geoff Klise and Jamie Johnson at help@pvvalue.com. PV Value™ is a trademarked name by Jamie Johnson with Solar Power Electric™.

This project represents the results of a collaborative effort between Solar Power Electric™ and Sandia National Laboratories that was made possible through funding provided by the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy. This valuation tool will reduce non balance-of-system (BOS) market barriers to PV by reducing uncertainty about the value of a PV system. Acceptance and use of this tool by the real estate industry will contribute to the overall penetration of PV systems across the U.S.

Contents

1. SUMMARY OF VERSION 1.1 UPDATES

Mac Excel® 2011

The main update for version 1.1 was to re-do the spreadsheet and code to allow for use on a Mac running Excel® 2011. Because of these changes, this version can be used interchangeably between a PC with Excel® 2007 and 2010, and a Mac with excel® 2011. PV Value™ will not work in other versions of excel for a PC or a Mac. PV Value™ will not work in any other spreadsheet software, including OpenOffice Calc, Numbers, etc.

The best resolution to view the spreadsheet is 100%, due to the required use of Form Controls to make PV Value™ work on both operating systems. Form controls are limiting as list box and combo box text cannot be re-sized, therefore some text will be difficult to read at zoom levels less than 100%.

Property Type Choice

In this version, we added a 'Property Type' choice which will toggle certain features for both residential and commercial appraisals.

Utility Escalation Rate

The utility escalation rate is now tied to the remaining system lifetime, where a new system would use the most recent 21 years of data from the EIA (currently back to 1990) to calculate the statewide average escalation rate. For example, a system that has 10 years remaining of warranty lifetime would use the last 10 years to make that calculation. This differs from version 1.0 as it calculated an escalation rate for all remaining energy lifetimes using a 21-year spread (1990-2011).

Module Warranty

A 20-year module warranty was added. Version 1.0 only had 25 or 30 year module warranty options.

Net Present Value

The ability to calculate Net Present Value was added to allow users an additional financial metric for comparing their net cost after incentives to the calculated present value of the energy production.

2. ABBREVIATIONS & DEFINITIONS

Solar Nomenclature

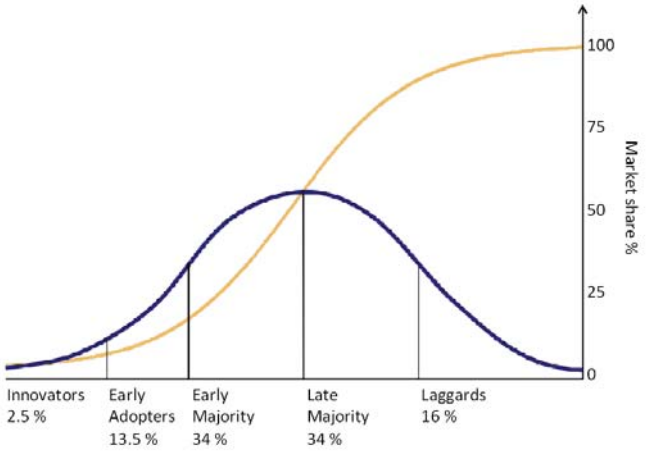
Watt	A unit of power defined as (voltage x current)	
kW	Kilowatt	1000 watts
kWh	Kilowatt hour	1000 watts for an hour
PV	Photovoltaic	
AC	Alternating Current	
DC	Direct Current	
TOF	Tilt and Orientation Factor	
STC	Standard Test Condition	

Financial Nomenclature

CAGR	Compound annual growth rate
DR	Discount rate
IRR	Internal rate of return
MIRR	Modified internal rate of return
MPB	Modified payback
NPV	Net present value
SPB	Simple payback
WACC	Weighted average cost of capital

3. VALUATION ISSUES FACING DISTRIBUTED PV

Assigning a reasonable valuation for an existing installed Solar Electric / Photovoltaic (PV) System is important for the distributed PV industry as it continues its transition from the innovation stage through early adoption and eventually to mainstream use.



Rogers bell curve showing the adoption rate for technological innovations. Distributed PV in the US is currently believed to be in the Innovators stage. (Image Credit – Wikipedia.org/diffusion of innovations)

With the consequences of the recent over valuation issue in the real estate market still making headlines, mortgage lenders and appraisers have begun to question the valuation of PV systems and the potential value of the annual energy that can be generated. There are also concerns that if separate financing is obtained by the home or commercial building owner to pay for a PV installation, the monthly loan payment may exceed the monthly energy savings, thereby creating a potential negative effect on the value of a residential or commercial building that the system is installed upon.

Often relying on the system owner's estimate of annual energy savings is difficult at best for various reasons. The system owner's expectations of annual energy production can be higher than the actual energy production measured at the point of use. This can be due to improper installation techniques or poor equipment selection by the installing contractor, sub-optimal location, current and future shading, over-estimating potential kWh production by the PV salesperson, and not the least of which can be due to overall system reliability.

3.1 APPRAISAL VALUATION METHODS

Typical metrics used for an appraisal valuation are usually based on either the sales comparison (comparable), cost or income capitalization approaches.

3.2 SALES COMPARISON APPROACH

As a general rule, a purchaser of residential or commercial property will not pay more for a given property than what a similar property can be purchased for. There is often a lack of comparable sales data on existing residential and commercial buildings with installed PV systems in the various regional multiple listing service (MLS) databases, and in some cases there may not even be a search option for renewable energy technology. It can be difficult for an appraiser to determine a value for a PV system using the principle of substitution with the sales comparison approach.

This should improve once the various MLS database providers add search options for renewable technologies such as PV, and more residential and commercial buildings with PV systems are put on the market and close escrow. Some examples of solar features added to MLS data entry fields can be found at the Green MLS Tool Kit. http://greenthemls.org/index.cfm

3.3 COST APPROACH

It is also often difficult when using the cost approach to calculate the replacement cost of the PV system due to the following reasons: the installed cost quoted by competing solar companies can vary by 20 – 30% or more, the incentives that are used to bring down the installed net cost may also vary from time to time although generally they have been declining, and the beneficial effect of tax credits (and accelerated/bonus depreciation for commercial systems) can vary from one system owner to another due to differing effective federal tax rates.

The replacement cost is often relied on by insurance companies in order to determine a replacement value. If the PV installation is recent, then the replacement cost can sometimes be higher than the original PV installation net cost, which could be due to the ending of a PV rebate program, a decline in the rebate amount, or the PV system owner qualifying for a rebate on the original PV system (due to incentive program rules, they may not be able to qualify for a second rebate on a replacement PV system).

It is also important to note that in many cases PV installations are done before the end of the year in order for the prospective PV system owner to lighten their tax burden through the use of the 30% federal tax credit, state tax credits (and accelerated/bonus depreciation for commercial systems). If a replacement PV system is needed, the PV system owner may no longer be in the same tax situation and may not be able to utilize the tax write off.

3.4 INCOME CAPITALIZATION APPROACH

The income approach is based on the idea that the value of a property is equal to the capitalized value of the net income stream generated by that property. Applying this approach to PV looks at what one may be willing to pay today for the opportunity to receive future cash flows using a discounted cash flow model. This model needs to adequately consider the present value of projected future energy production along with estimated operation and maintenance costs that are anticipated to occur during the solar module power production warranty timeframe.

The residential or commercial building owner or purchaser's weighted average cost of capital (WACC) is used along with a risk premium spread to determine a discount rate for the present value calculation. For residential properties, the purchaser's WACC is then calculated based off of a readably available benchmark interest rate such as the Fannie Mae or Freddie Mac 30-year fixed rate 60-day commitment (if the purchaser is using a 30-year fixed rate purchase mortgage). Regardless of the benchmark chosen, for the purpose of this model it should closely mirror the cost of borrowing for the purchaser of the income stream.

Note: Although some states have eliminated real property taxes on renewable energy systems, as accurate valuations become necessary for PV systems due to lending requirements, it might be easier to assign a value to the PV system if the Standard Test Condition (STC) kW size, along with the month and year of the installation is listed on the respective real property assessors website, just like other pertinent data which may be useful for appraisal purposes.

Using the income approach, a reasonable valuation can be arrived at through the observation of visible installed components and a review of the latest system performance test and installation documentation, including a digital shading analysis. This information should have been provided by the installing contractor to the original system owner after the system was successfully commissioned.

If a system performance test has not been performed within the past 12 months, and/or a digital shading analysis is not available, and the value of the system is critical, both should be performed by a trained and certified solar PV installer who works for a properly licensed contractor.

Currently there are two organizations that certify installers: The North American Board of Certified Energy Practitioners (NABCEP) has over 2100 certified solar PV installers nationwide. NOTE: NABCEP currently has 2 different certifications for the PV industry, Solar PV Installer™ and PV Technical Sales Professional™. www.nabcep.org

Underwriters Laboratory (UL), which certifies electricians through their UL University personal certification program. www.uluniversity.us

4. CALCULATING THE FUTURE ENERGY PRODUCTION

4.1 GRID-TIED SOLAR ELECTRIC (PV) SYSTEM BASICS

First a word of caution – PV Systems can operate at lethal voltages approaching 600 volts or more and should only be accessed by qualified personnel such as a trained and certified solar PV installer who works for a properly licensed contractor.

A grid-tied PV system (without battery backup) usually consists of one or more modules which may be wired together in series or parallel to form an array which is then connected to an inverter. The modules convert sunlight energy into DC voltage, which must then be converted by a power conditioning unit (inverter) to the same AC voltage that is required at the point of use.

Solar PV systems are most often found mounted on a rooftop and may also occasionally be mounted on a ground rack or solar canopy. They are installed so that ideally the modules are tilted near the local latitude and if in the northern hemisphere oriented towards true south. To achieve the maximum potential annual energy production the modules also need to have unshaded access to the sun during the peak solar insolation (or peak sun hours) time of 9am to 3pm solar time.

It is important to note that two otherwise similar solar PV systems of equal size and cost that are installed at a different tilt and orientation from each other and which also have different amounts of shading, will not necessarily produce equal amounts of energy, and in some cases may have dramatically different annual energy production figures.

4.2 DIFFERENT TYPES OF SOLAR

The two photographs shown here outline some of the differences between solar PV and solar thermal. Typically a home will have either one or the other, though sometimes both solar PV and solar thermal will be present.

The example shown in the above photo is of a grid-tied solar electric (PV) system. PV module sizes vary and it is difficult to estimate the total system size in watts just by casual observation. This PV array consists of 11 PV modules rated at 230 watts STC each. (Photo Credit – Solar Power Electric™)

This photo shows two other non-PV solar collector types, a solar pool heater in the bottom left and a solar domestic hot water heater in the upper right. Although the solar water heater in the upper right may look similar to the PV modules in the grid tied example, the copper tubing extending off the upper right and bottom left of the collector indicates that these are hot water collectors. (Photo Credit – The Leveredge)

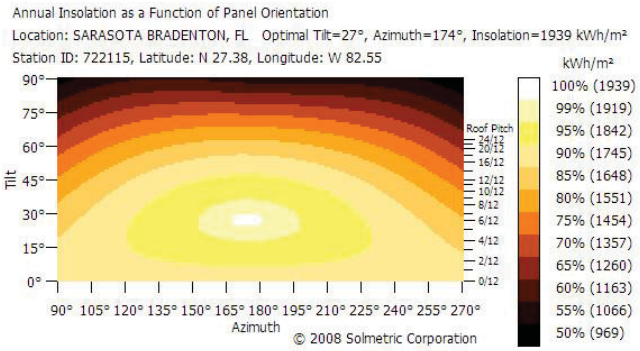
4.3 TILT & ORIENTATION FACTOR

The tilt angle of the modules with respect to the horizontal plane, along with the direction the array faces with respect to south (the orientation or azimuth) will also have an impact on the potential solar insolation available and is expressed as a tilt and orientation factor or TOF.

Tilt and orientation are expressed in degrees. For example if the PV modules are within the same plane as the roof surface and you have a roof pitch of 6/12 the tilt angle would be expressed as a slope of 26.6°. The rooftop may or may not be facing true south. If the system is facing true south and you are in the northern hemisphere, true south would be expressed as an azimuth of 180°.

Roof Pitch	Tilt Angle (°)
1/12	4.8
2/12	9.5
3/12	14.0
4/12	18.4
5/12	22.6
6/12	26.6
7/12	30.3
8/12	33.7
9/12	36.9
10/12	39.8
11/12	42.5

In the following example for Sarasota FL, in order to receive 100% of the available solar insolation the optimal tilt angle is 27° and for the azimuth it is 174°.



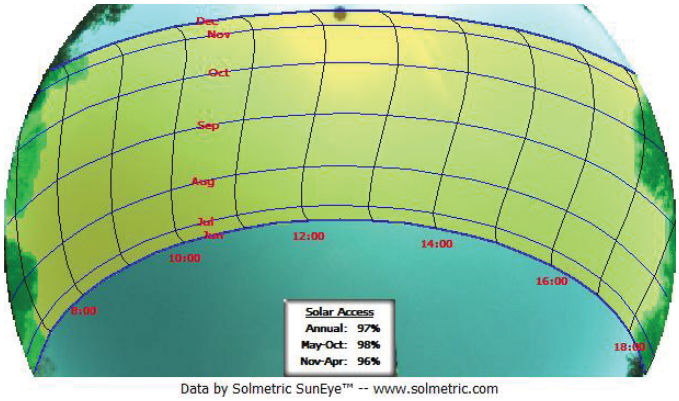
Using the above graph of annual insolation for Sarasota FL, an array installed with a tilt angle of 22.6° (5/12 pitch) and an azimuth of 90° (east facing) would experience a loss of nearly 11% of the available solar insolation resulting in a TOF of 89%.

4.4 SHADING

Shading can be a critical factor in determining the potential energy output and may greatly affect the amount of solar insolation that the system receives. A proper digital shading analysis, including a sun graph showing any shading obstructions, should have been performed by the installing contractor before beginning the design and installation process, and should have been provided to the original system purchaser.

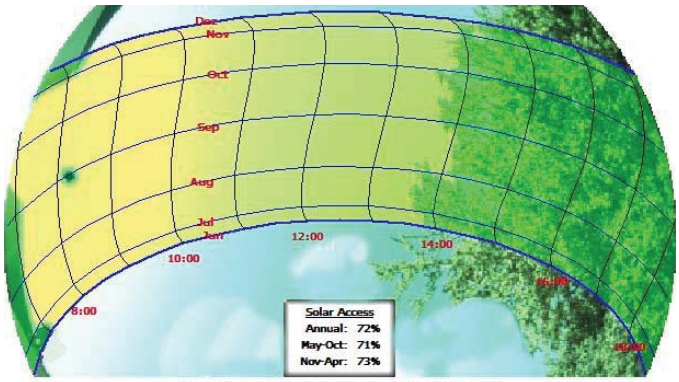
In the following examples using the Solmetric Suneye™ 210 digital shade analysis model, the TOF was set to 100% in order to determine the total effect of any shade obstructions.

Shading is referenced as a percent of total solar insolation available, so if 5% shading is observed then the percent of the total solar insolation available would be 95%.



Data by Solmetric SunEye™ -- www.solmetric.com

Solar Access Graph with minimal visible shading (3%) right at sunrise and sunset. Most of the shading in this photo is due to mature trees which were not on the surveyed property. The graphs are relatively easy to read with only half the months shown due to the overlapping nature of the spring and fall equinox. This photo was taken in December just after 12pm solar time. (Photo Credit – Solar Power Electric™)



Data by Solmetric SunEye™ -- www.solmetric.com

Solar Access Graph with shade starting at 1:30pm in the summer and 2pm in the winter and continuing through the rest of the day. The potential solar insolation in this example is reduced by nearly 30%. This will have a major impact on the potential energy production and must be accounted for in the valuation model. This photo was taken in March just after 8:00am solar time. (Photo Credit – Solar Power Electric™)

Solar Access Graph with minor shade in the winter months until 8:30am and again in the early afternoon between 3:30 and 4:00pm solar time. This is a panoramic shade graph taken with the Wiley Asset Shade Tool. (Photo Credit – Solar Power Electric™)

4.5 DESIGN, PERMITTING & INSTALLATION

The proper design, legal permitting, code compliant installation, and commissioning of a PV system by a properly trained, licensed and certified contractor and a final inspection by a local electrical inspector all play a key role in the long term success of the PV system and can have an impact on the future energy production.

Designing and installing a PV system can involve varying degrees of complexity depending on the size, local site limitations or other factors. However, determining if the PV system is designed or installed correctly is beyond the intent of this article.

A study commissioned by NYSERDA (McRae et al., 2008) found that, "The initial program PV installations of NABCEP-certified installers had fewer problems than those of non-certified installers."

Legal permitting and the inspection of PV systems is usually required and performed by the local municipality or Authority Having Jurisdiction (AHJ). It is important to verify that a permit has been issued and also that a final inspection has been passed before attempting to assign a value to an existing PV installation.

If a completed PV system is encountered that has not been properly permitted (if required by the AHJ) or was permitted but the final inspection has not been passed, the value may be suspect and/or difficult to determine - similar to any other unpermitted or unfinished major construction improvement project.

4.6 CALCULATING FUTURE ENERGY PRODUCTION

Although there are many reasons that one may choose for installing PV, the primary reason that most PV systems are installed is for the current value of the future solar energy kWh production.

That production can be accurately estimated using an equation that takes into account:

1) The average hourly solar radiation received at a specific location which is based on up to 30 years of measured data.

2) The hourly measured temperature for the same location.
3) The tilt and orientation factor (TOF) with respect to optimal.
4) Shading factor expressed as a fraction of total solar resource, ie. 95% would be shown as 0.95.
5) And normal losses experienced in the conversion of DC to AC which are expressed as a derate factor.

There is a web based program called PVWatts™ that can estimate the future solar energy production using a similar analysis model. The algorithm was initially developed by Sandia National Laboratories as PVFORM (Menicucci, 1985) and is now maintained by the National Renewable Energy Laboratory (NREL) and available online in two different versions:

Version 1 provides data from major cities throughout the U.S. to calculate the estimated energy production.[1] Simply select the closest city to the location of the solar PV system. For example, In Punta Gorda, FL the closest city available would be Tampa.

Version 2 flex viewer uses satellite radiation data, and provides solar radiation estimates down to individual 40 by 40 kilometer cells.[2] Simply enter the zip code that the solar electric system is located in and click "go," then click on "Send to PVWatts™" and it will pass the solar radiation data into the PVWatts™ calculator for determining the first year energy production. This version improves accuracy compared to Version 1 due to its ability to provide data which is measured closer to location of the array.

A third version of PVWatts™ is available within NREL's System Advisor Model (SAM) and is used in the valuation model spreadsheet. The main difference in this version is the use of the Perez et al. (2002) 10 kilometer satellite data, which can be accessed from NREL's Solar Power Prospector.[3] In order to call PVWatts™ within a spreadsheet, NREL's Developer Network web service is used to pass input values from the spreadsheet and return outputs such as first year energy production and electricity rates. Currently, PV Value™ only uses PVWatts™ with the 10 kilometer satellite data through the web service.

The results from PVWatts™ are considered for the purposes of this valuation tool a fairly accurate estimate for crystalline silicon modules, which currently make up the majority of installed residential and commercial solar electric systems. For systems using thin film modules, which have a different temperature coefficient factor, a calculation would need to be made to account for the difference between the standard temperature coefficient used in PVWATTS™ of -0.05%/C° and the lower temperature coefficient of the specific thin film module. If the thin film modules are flush mounted, then a separate calculation for increased module temperatures would also need to be made. Currently, there is no standard way to do this with the version of PVWatts™ accessed through PV Value™.

Net metering is worth mentioning though it is not included in the valuation tool. If the utility offers net metering and the customer has a signed net metering agreement in place, then any excess energy which is produced but not used at the time can be distributed to the utility for later use. When production is lower than the customer's usage or non-existent, such as at night, the excess energy previously distributed to the utility is used first and credit is given on a kWh per kWh basis.

4.7 MODULE DEGRADATION

It is well known within the solar industry that modules degrade with age starting from the first day of production. Although improvements have been made in the manufacturing process over the years, recent research by NREL (Jordan and Kurtz, 2011; Osterwald et al., 2006) demonstrate that the energy output of higher quality crystalline silicon modules degrade at rates of 0.1% to 0.9% per year, and currently for some thin film modules the rate of yearly degradation can be 1% or more.

Although this may not have a large effect on the first year of energy production, when calculated over the module warranty timeframe the cumulative effect of module degradation on lifetime energy production will be significant and needs to be factored into the valuation model.

[1] http://rredc.nrel.gov/solar/calculators/PVWATTS/version1/
[2] http://www.nrel.gov/rredc/pvwatts/version2.html
[3] http://maps.nrel.gov/node/10/

Until more research data is available which justifies a lower annual degradation rate, a conservative valuation may factor in an annual degradation rate of 0.5% (Osterwald et al., 2006) for crystalline silicon and 1% for thin film modules. The calculation is cumulative so that for a crystalline silicon module during year 10, the module could be expected to produce at 95% of its rated capacity. This is one area that a certified PV installer can assist the appraiser through a review of the system's condition at the time of appraisal compared with data provided from the original commissioning report.

4.8 UTILITY RATE ESCALATION PERCENT

In most areas of the country the retail rate charged by the local utility has been increasing steadily over much of the past decade. The rate of escalation in any location in the U.S. can be determined by obtaining at least the 20 year history from the Energy Information Agency's (EIA) "Average Price by State Provider, 1990-2010" and "Average Retail Price of Electricity to Ultimate Customers by End-Use Sector, by State – Table 5.6.B."[4] The history file lists the yearly residential, commercial and Industrial rates for each state in nominal terms.

YEAR	Residential	Commercial
1990	7.77	6.66
1991	7.91	6.77
1992	7.75	6.58
1993	7.99	6.69
1994	7.78	6.35
1995	7.82	6.39
1996	7.99	6.63
1997	8.08	6.62
1998	7.89	6.38
1999	7.73	6.22
2000	7.77	6.25
2001	8.59	7.08
2002	8.16	6.64
2003	8.55	7.13
2004	8.99	7.61
2005	9.62	8.16
2006	11.33	9.91
2007	11.22	9.75
2008	11.65	10.14
2009	12.30	10.86
2010	11.52	9.80

Average retail rates of electricity for FL from the EIA website shown in ¢/kWh. Rates shown are through 2010.

Timeframe	Residential	Commercial
20 YR CAGR	1.99%	1.95%
10 YR CAGR	4.01%	4.60%
5 YR CAGR	3.67%	3.73%

20, 10 & 5 year compound annual growth rate (CAGR) or escalation rate of retail rates in FL, calculated from the EIA website data.

As shown in the previous table, electric utility rates for this location in Florida have risen more over the past 5 to 10 years, and knowing that the percent of rate escalation will have a measurable impact on the present value of the future energy production (since we are performing a valuation based on 20, 25 or 30 years of future energy production) it is generally not an acceptable practice to take the shorter term averages and extrapolate out for the long term for newer PV systems For an older PV system, version 1.1 has been changed to allow for an escalation rate calculation that matches the remaining PV module warranty lifetime.

In the valuation tool, the 1990 state average electricity rate and the most recent electricity rate as reported by the EIA are used in determining the Compound Annual Growth Rate (CAGR). For example, the escalation rate for a valuation performed now would use the time period of 1990 to 2011 (21 years) along with the CAGR equation as shown below. Version 1.1 of the tool has been modified so the CAGR calculation matches the remaining PV module warranty lifetime. For example, if the PV system being appraised today has 5 years of remaining warranty lifetime, the escalation rate is calculated between 2011 (the most recent EIA data from the time of this publication) and 2006.

$$UEsc_{rate} = \frac{(starting\ electricity\ rate)^{\left(\frac{1}{\#\ of\ years}\right)}}{(ending\ electricity\ rate)} - 1$$

4.9 DISCOUNT RATE

The discount rate chosen will have an impact on the present value calculation and is based on the PV system purchasers WACC. The WACC for appraising a residential property can be calculated by using the Fannie Mae or Freddie Mac 15 or

[4] http://www.eia.doe.gov/cneaf/electricity/epa/average_price_state.xls
http://www.eia.gov/electricity/monthly/excel/epmxlfile5_6_b.xls

30 year fixed rate 60 day commitment and the purchaser's basic investment rate of return during the estimated life of the project. This is to compensate for risk associated with owning the PV system, and is expressed as a basis point spread which is added to the debt interest rate. A custom discount rate can be entered for systems that are not tied to the Fannie Mae or Freddie Mac rates. For appraising commercial PV systems, the custom option is the only option available.

An important note about other instruments: Treasury yields are currently AAA rated by some rating agencies and assume no risk other than a rare catastrophic event. They are not used in this example to calculate a discount rate assumption on PV projects as they do not accurately reflect an available borrowing rate which is accessible to the PV system purchaser.

Risk spreads should be utilized in a way that accurately takes into account an acceptable investment rate of return along with adequate compensation for unforeseen risks associated with an investment in a PV system. Unforeseen risks can include accidental module breakage, windstorm damage, corrosion of or damage to electrical components requiring replacement, roof replacement requiring the PV system owner pay for removal and reinstallation of a roof mounted PV system. A range of 50 to 200 basis points is the default setting for this valuation tool to compensate for risk, with the average being 125 basis points. Once more data becomes available a detailed analysis will be performed to improve on this range.

4.10 OPERATION & MAINTENANCE EXPENSES

PV systems require periodic maintenance that ranges from washing the dirt off of the modules during periods of minimal rain, to replacing the inverter if it fails after the warranty has expired. Although modern crystalline silicon modules have a standard 20, 25 or 30 year power warranties and sufficient data exists indicating continued performance over that timeframe, grid-tied inverters usually only have a 10 or 15 year warranty (though some are now offered at 25 years) and the potential for replacing the inverter after the warranty term has ended must be accounted for. Although the inverter rarely fails the day after the warranty expires, and some inverter models based on existing designs have data showing they can last up to 20+ years if installed and maintained properly, using a 15 year replacement cycle for the inverter and including labor charges in the cost can also be used to conservatively estimate the operation and maintenance expenses for residential and small commercial systems.

Note: some inverters with promising new designs have been introduced in recent years with warranty terms of 20 or even 25 years. It is currently unknown due to lack of manufacturer and inverter operating history if the inverter will last for the longer warranty period or if the manufacturers will still be in business to cover the longer warranty in the event of a failure during the warranty timeframe. Until more data becomes available a conservative approach entails taking the existing data with a 15 year timeframe for the replacement cycle on these newer inverters with a 20 or 25 year warranty.

O&M expenses are usually figured on a cost per watt basis, with small PV systems (under 5kW) and PV systems with micro-inverters or DC optimizers having a higher O&M cost per watt than a medium sized residential or commercial PV system. Commercial PV systems larger than 100kW that utilize central inverters can have an even lower replacement cost per watt.

System Size In kW	15 year O&M cost per watt
< 5kW and Microinverter	75¢+
5 kW to 25 kW	55¢
25 kW to 100kW	50¢
>100 kW	35¢

Estimated O&M expenses for small to medium size systems based on current 2011 inverter and labor cost data from solar electric projects in FL.

O&M expenses are figured using a present value calculation on a 15 year replacement cycle in year 16, so that the O&M expense in year 16 on a 10kW system would be $5,500.00 for the replacement cycle, before the present value calculation is performed. Since the cost is incurred later and will be paid for with inflated dollars, the future O&M expenses may be discounted using the chosen discount rate.

The model is built to use the range of O&M costs expressed in cents per watt in the above table. If the user has other information on these costs, there is an option to override the default values.

Note: Current estimates for O&M expenses are expected to drop in the next few years as the Department of Energy's SunShot goals are met, with a goal of reducing the installed cost of solar energy systems by about 75%.

4.11 SALVAGE VALUE

The value of the components at the end of 20, 25 or 30 years (the standard module warranty period) is similar to other rapidly advancing technologies which have reached the end of their warranty period, and although the PV system may continue to produce energy at a reduced rate for 40+ years (a bonus for the system owner at that time), electrical codes, efficiencies and manufacturing practices will have changed over the years. These factors combined with an expired warranty could render the technology obsolete. Currently there is no existing, reliable secondary market in place that can assign a value to mass produced 25+ year old modules and inverters. In its absence, a scrap value of the components (metals) could be used. Since a present value calculation over20, 25 or 30 years must also be used against the scrap value, the end result adds very little to the valuation and therefore is not included in the model.

4.12 VALUATION MODEL FOR THE INCOME APPROACH

(© 2010 Solar Power Electric™)

The method of valuation for the income approach uses the present value of the future energy production from PVWatts™. This is accomplished using the following formula for each year over the remaining life of the project:

$$\left((E_{kWh} * Deg_{rate} * U_{rate} * UEsc_{rate} * Disc_{rate}\right) - O\&Myr16 * Discrate$$

E_{kWh} – Annual Energy Output (kWh)
Deg_{rate} – Module Degradation rate (%)
U_{rate} – Current Utility Rate (¢/kWh)
$UEsc_{rate}$ – Utility Escalation Rate (%)
$Disc_{rate}$ – Discount Rate (%)
$O\&M_{yr16}$ – O&M Expenses for year 16 (¢)

The degradation rate is calculated starting in the first year, the utility rate escalation % and the discount rate are calculated starting in the first month of year 2, and the O&M expenses are calculated for year 16 only. If the appraisal is made in year 15 and beyond, an option comes up asking the user whether the inverter has been replaced. If it has been replaced before the 15-year warranty period, the appraisal range of value estimate will be higher. If it has not been replaced within the 15-year warranty period, the O&M amount will then be discounted for the remaining warranty lifetime of the panels, which will result in a lower appraisal range of value estimate.

For example, if the solar electric system is 3 years old and the module warranty is for 25 years, the present value of the future energy production would be calculated for years 4 through year 25 to determine the total remaining value of future energy production, remembering to account for the first 3 years of module degradation in the calculation. If a recent custom derate factor is available which accounts for actual module degradation up to the current time frame, then in this example the first 3 years of module degradation would not need to be factored in.

5. EXCEL® SPREADSHEET INSTRUCTIONS

PV Value™ – Photovoltaic Energy Valuation Tool v. 1.1

An Excel® spreadsheet has been created to perform the calculations used in the valuation model. Version 1.1 has the ability to be used in both Excel® 2011 for Mac and Excel® 2007 and 2010 for Windows. No other spreadsheet programs or earlier versions of excel have been tested and therefore may not allow the spreadsheet to open or work property. A link for downloading the spreadsheet is provided in the resources section.

Note: due to the rounding of values in the spreadsheet, if you are checking the end result with a financial calculator you may experience a difference of a few cents per year.

You must have macros enabled, data connections allowed and internet access in order for the spreadsheet to function properly. User input cells are yellow, calculated value cells are green and user defined cells used to override calculated data are orange.

5.1 ANALYSIS TAB

Introduced in version 1.1 is the ability to state what type of PV system is being appraised, either residential or

commercial. Making this choice will give the user the ability to select what *type* of residential or commercial property is being appraised (only for record-keeping) and certain features will change to ensure the proper inputs are available and used in the estimate of value.

Selecting **Residential** allows the user to choose between the FNM 15- and 30-year 60-day commitment rates and a custom rate. The utility rate and escalation rate default to the residential calculations, which the user can override with a custom rate option.

Selecting **Commercial** gives the user only a custom rate option. The utility rate and escalation rate default to the commercial calculations, which the user can override with a custom rate option.

The choice between 'residential' and 'commercial' also impacts what can be seen for the net present value (NPV) calculation, which is described in more detail below.

Starting out with the solar resource calculation, you will see seven user input cells that will need to be defined in order to calculate the number of kWh's produced per year. The inputs are as follows:

Zip code – Where the PV system is located.

System size in watts – This is calculated at STC. A 5.06kW array would be input as 5060 watts.

Derate Factor – The model defaults to 0.77, which is the same as the PVWatts™ standard derate. However if direct shading is observed or if the value is critical, then it is recommended that a custom derate factor with a digital shading analysis be performed by a certified PV installer who is properly licensed. There is a space in the spreadsheet that allows entry of a Commissioning Report number, which will change the derate factor to a user input override cell. Entering this number into the spreadsheet verifies that a certified PV installer inspected the system to provide a custom derate factor.

Module degradation rate – This is defaulted to 0.5 and reflects a 0.5% annual degradation rate more common for crystalline systems. For thin-film PV, see the above section on appropriate degradation rates.

Array type – The choices are: fixed, 1-axis or 2-axis. Most PV installations are fixed and will not track the sun. If a tracker is encountered then the number of axis will need to be selected. 1-axis is typically east to west with the tilt angle fixed. 2-axis tracks east to west and also changes the tilt angle to where the direct component of the solar irradiance is perpendicular to the array at all times.

Array tilt – if left unchecked this will be calculated as the local latitude. The default setting is to have the box checked, however the user must check the box and input the actual module tilt to get an accurate calculation if the module tilt is known. If the module is mounted flat with no tilt, check the box and make sure the array tilt is set to 0.0.

Array azimuth – this is defaulted to 180° or true south. Input the azimuth angle that the array faces. In some cases, the module will be a few degrees off of south so knowing the azimuth angle is important.

Click outside of the yellow cells and then on the button "Click to Calculate PV Production." This will call PVWatts™ using the Perez (2002) model through the SAM interface as available at developer.nrel.gov You should now see kWh Produced/Year for the PV system.

NOTE: If any of these parameters are changed, don't forget to click the"Click to Calculate PV Production" button to ensure the energy production estimate is correct.

Discount rate – For residential properties, the discount rate calculation allows for either the current 15- or 30-year fixed rate 60-day commitment from Fannie Mae as the WACC along with a basis point calculation that accounts for an investment rate of return for the risk that is assumed through purchasing the income stream. If the magenta cell states "rate is out of date" click on "update FNM rate" and the discount rate will be automatically updated. The rates are not updated by Fannie Mae on the weekends and so an estimate on Saturday or Sunday will reflect the rate posted on the previous Friday. A custom rate option is also available for residential properties.

For estimating value for a commercial property, the FNM rates are hidden and only a custom option is available.

Utility rates – Under remaining inputs, the electricity rate data needs to be accounted for. This is done automatically by selecting either the residential or commercial averages as reported within PVWatts™ and clicking on the "Current Utility Reported Electricity Rate." The current utility rate in ¢/kWh for the state the PV system is located in will be updated. The residential and commercial utility escalation rates can also be selected, and are calculated using the CAGR equation. As there are over 330 electric utilities nationwide and rates vary within each state, there is a user defined inputs option for ¢/kWh and utility escalation rates that will override the PVWatts™ and EIA specific data if the rate is not current. If a user defined utility escalation rate is used, it is important to make that calculation as a CAGR before using as input to the model and not as an average annual growth rate. It is recommended to use the default escalation rate calculation. A source of information that can be used to determine current average utility rates is OpenEI.

O&M expenses – The O&M expenses are automatically calculated based on the PV system size in watts using inverter & labor pricing data. If a different value is anticipated, then a user defined input is available. Select the checkbox and input the new value in whole cents per watt (¢/W) and this will override the automatic calculation.

Added in version 1.1 is an option for a 20 year module warranty. Most module warranty terms will be for 25 years. However there are some manufacturers that offer 20 or 30 year terms. Select the term of the module warranty from the drop down box and input the PV system age in years.

If the age of the system is 15 years or greater, there is an option to select if the inverter has been replaced. If it has not been replaced then the eventual inverter replacement expense must be accounted for in the calculation.

Lease to purchase – There is an option to look at a Lease to Purchase, where the value can be calculated for the remaining energy in years after the lease is bought out, based on the module warranty period. This option does not currently account for the purchase price of the PV system. It is anticipated that a future version will have a more robust calculation for this scenario.

After all of the user defined data cells have been input correctly the present value of the expected lifetime energy production will be calculated as the "Appraisal Range of Value Estimate."

Average Net Present Value (Version 1.1)

On line 58, there is now an option to calculate the average net present value (NPV) for residential and commercial systems.

The NPV is the sum of all positive and negative cash flows which are discounted to the present value.

For the netting effect the negative initial cash flow is based on the prospective PV system purchaser's true cost once all tax credits, treasury grant, rebates, depreciation, bonus depreciation, taxes on rebate and loss of utility energy bill tax deductions (for commercial businesses) are factored in.

In order to calculate the initial cost, a basic understanding of Internal Revenue Code sections 25D, 48, and other sections that directly relate is necessary. Excerpts from the Internal Revenue Code as related to solar are presented in the appendix.

When the **Residential** radio button is selected, the user will see three boxes, the first having inputs for showing both the gross cost of the system and any applied rebates before determining the net cost using the current 30% investment tax credit. There are two methods shown for determining the average NPV, where essentially either state or federal income taxes are either paid or not paid on the rebate amount. If there is no rebate available, then the net cost will be the same. See excerpts from the Internal Revenue Code section 136 in the Appendix for more detail on IRS treatment of subsidies.

When the commercial radio button is selected, the user will see the input for showing both the gross cost of the system and any applied rebates as well as two other boxes that are not in the residential analysis area. These include the MARCS Half Year depreciation schedule; Also, there is a calculation of the average NPV based on the system cost inputs, tax rates, energy deduction loss and a DCF analysis of the depreciation schedule. The Energy Deduction Loss is based on IRC section 162(a) which allows a business to deduct the electricity

expense as a write off, though if they are generating that energy instead of purchasing it from the utility, the corresponding amount can no longer be treated as a write off.

About the Authors:

Jamie L. Johnson is the General Manager of Solar Power Electric™, a FL state certified unlimited electrical contractor. He holds both NABCEP Certifications for Solar PV Installer™ and PV Technical Sales Professional™. Mr. Johnson has over 15 years of experience in the financial services sector beginning his career with the IRS, and then spending over a decade working in the mortgage banking and asset management industry.

Geoffrey T. Klise is a staff member at Sandia National Laboratories in the Earth Systems Analysis Department. His research area involves providing system level analysis techniques to manage technical and policy related issues in solar energy technologies, biofuels, climate change and energy-water interactions.

5.2 RESOURCES & REFERENCES

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EIA Average Price by State by Provider, 1990-2010 http://www.eia.gov/electricity/monthly/excel/epmxlfile5_6_b.xls

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APPENDIX

OTHER FINANCIAL ANALYSIS METHODS USED FOR SOLAR PV

INTERNAL RATE OF RETURN

An internal rate of return (IRR) calculation is related to the NPV calculation where the NPV equals zero and the discount rate at that point becomes the IRR. In general it is assumed that when comparing projects of equal duration and risk the project with the highest IRR should be chosen.

Caution should be used with comparing a PV project to other investment opportunities based solely on the IRR as a project with a large initial negative cash flow in the first year may produce a lower IRR compared to a project with a small initial negative cash flow. However, the project with the large initial negative cash flow may have a higher NPV upon reaching the end of its life cycle, and therefore a higher return in the number of dollars on capital invested.

There are issues associated with using IRR with a PV project. IRR assumes that the positive cash flow will be reinvested immediately at the IRR. This is often not the case since there is rarely another project with a comparable IRR waiting to be started on a monthly or annual basis.

Another issue is that with multiple negative cash flows during a project life such as with an inverter replacement cost during year 16, the IRR may return multiple values based on the negative and positive cash flows.

Due to this a modified internal rate of return might be a better approach for PV projects.

If a high IRR is the sole reason for choosing to invest in a PV project compared to investment vehicles with a low rate of return such as a certificate of deposit, then another look at the other financial analysis methods mentioned here may be warranted.

MODIFIED INTERNAL RATE OF RETURN

The modified internal rate of return (MIRR) is just that, a modified version of the IRR which resolves two of the issues mentioned previously regarding the IRR as it relates to PV projects. The first assumption is the potential for multiple rates of return due to multiple positive and negative cash flows, and second is the assumption that all positive cash flows will be reinvested at the stated IRR.

For example, in the case of a business that has a PV system installed with net metering, the positive cash flows may be in the form of a lowered utility bill which frees up cash flow to invest within the business. Rarely is the cash flow reinvested at the same rate of return as the IRR and in some cases the cash flow may simply be paid out to the business owner as a return of capital and reinvested in low risk, low rate of return investments.

In the modified version it is assumed that positive cash flows will be reinvested at a chosen fixed rate of return which is less than the MIRR, and negative cash flows are discounted to present value using the WACC, thereby producing a single rate of return which may more closely resemble purchaser's financial situation.

SIMPLE PAYBACK

The simple payback (SPB) is often used within the PV sales industry to calculate the time it takes for the purchaser of a PV system to recoup their original investment. This method of analysis has limitations that must be understood before being relied upon.

Simple payback is just that, it does not include a discounted cash flow model, nor does not take into account risk, lost opportunity costs, O&M expenses, or module degradation. The assumed electricity cost per kWh is fixed during the payback period.

It is simply the initial upfront non-discounted net cost of the PV project divided by the annual fixed non-discounted cash flow (annual kWh times the fixed utility rate). The end result is displayed in years or fractional years.

Caution is warranted when using only a simple payback analysis on a PV project as the PV system owners actual payback in years will often take longer once all of the other financial considerations are taken into account.

MODIFIED PAYBACK

A case can be made for a modified payback analysis which would allow a prospective PV system purchaser to determine when they would recoup their original investment.

This modified payback or MPB would take into account many of the financial considerations that are excluded from the SPB model.

The MPB is fairly easy to calculate from the present value and NPV analysis results, it is the time in years it takes for the negative cash flow (as determined in the NPV and PV calculations) to be equaled by the present value of the positive cash flow.

This may produce multiple payback timeframes, since the initial investment may be recouped before the inverter is scheduled to be replaced. If this is the case, once the inverter is replaced a new investment cycle is started with a new payback timeframe determined. If the initial investment is not recouped before the inverter is replaced, then a single payback timeframe would be produced.

The MPB timeframe will often be considerably longer than the SPB timeframe. However, it should be a more accurate presentation of the prospective PV system purchaser's recoupment of their actual investment.

Prospective PV system purchasers may find that the cost to replace an old technology inverter near the end of the PV systems life cycle in a small number of cases may not make sense, and in fact it may make more sense financially to upgrade the entire PV system at that time using current technology as it is likely that efficiencies will have improved, costs will have come down and life cycle timeframes will most likely have been extended.

RETURN ON INVESTMENT

Return on investment or ROI is a return calculated in percentage terms on the total investment. It can be calculated over a single annual period or annualized over multiple years.

Sometimes it is also used in a more unconventional sense to show the total return over an investment timeframe. This unconventional use can be somewhat meaningless to an investor. For example if the total ROI is 50% that may sound like a great investment. However, if that total return is over a 30 year timeframe and has not been annualized, then that may not be considered by some as a great ROI.

ROI calculations are difficult to perform accurately when multiple positive or negative cash flows are involved during an annual time period. In the scenario where multiple positive or negative cash flows are involved then the MIRR may be more appropriate.

FINANCIAL MODEL SUMMARY

Some things simply can't be quantified into a financial model, such as when a business owner chooses to install a PV system so they can advertise that they are a green business and most or all of their electricity needs are met with PV, or when a homeowner installs a PV system in order to be the first home on their street to generate electricity from the sun.

There are other considerations such as what happens if the utility rates go up faster than the long term growth rates. If this happens then several of the financial models presented may underestimate the value or financial return to the PV system owner.

No financial model is perfect, and each model presented here does contain flaws. However when presented together, a more accurate picture will emerge and allow a prospective PV system purchaser to make better informed decisions.

INTERNAL REVENUE CODE SECTIONS RELATING TO SOLAR

Brief excerpts of the IRS notice(s) or IRC sections are shown, although readers are encouraged to visit the IRS website and read each section thoroughly in order to determine how each section applies to their individual situation.

"The following is not to be construed as tax advice, readers are advised to consult with their own legal and tax professionals"

NOTE: As of January 2012, the IRS has not issued official guidance for several of the IRC sections mentioned below.

RESIDENTIAL SECTIONS

Section 25D (from IRS Notice 2009-41) http://www.irs.gov/irb/2009-19_IRB/ar08.html
Section 25D provides a tax credit to individuals for residential energy efficient property. The amount of a taxpayer's section 25D credit for a taxable year beginning after December 31, 2008, is equal to 30 percent of the qualified solar electric property expenditures made by the taxpayer during the taxable year.

Qualified solar electric property expenditures are further defined as expenditures for property which uses solar energy to generate electricity for use in a qualifying dwelling unit.
A qualifying dwelling unit is defined as a dwelling unit that is located in the United States and is used as a residence by the taxpayer.

The notice further states that a taxpayer claiming a credit with respect to an expenditure, is responsible for determining whether the expenditure appropriately relates to a qualifying dwelling unit and cannot rely on a manufacturer's certification for that purpose.

Section 136 Energy Conservation Subsidies Provided by a Public Utility
Gross income shall not include the value of any subsidy provided (directly or indirectly) by a public utility to a customer for the purchase or installation of any energy conservation measure.

Notwithstanding any other provision of this subtitle, no deduction or credit shall be allowed for, or by reason of, any expenditure to the extent of the amount excluded under subsection (a) for any subsidy which was provided with respect to such expenditure. The adjusted basis of any property shall be reduced by the amount excluded under subsection (a) which was provided with respect to such property.

Energy conservation measure - In general for purposes of this section, the term "energy conservation measure" means any installation or modification primarily designed to reduce consumption of electricity or natural gas or to improve the management of energy demand with respect to a dwelling unit.

The term "dwelling unit" has the meaning given such term by section 280A(f)(1).

The term "public utility" means a person engaged in the sale of electricity or natural gas to residential, commercial, or industrial customers for use by such customers. For purposes of the preceding sentence, the term "person" includes the Federal Government, a State or local government or any political subdivision thereof, or any instrumentality of any of the foregoing.

Exception: This section shall not apply to any payment to or from a qualified cogeneration facility or qualifying small power production facility pursuant to section 210 of the Public Utility Regulatory Policy Act of 1978.

See IRS PLR2010350003 for more clarity. Note: Private letter rulings only apply to the taxpayer that requested the ruling and are not to be applied to or relied on by other taxpayers.

Section 280A(d)(1) Use as residence defined
In general for purposes of this section, a taxpayer uses a dwelling unit during the taxable year as a residence if he uses such unit (or portion thereof) for personal purposes for a number of days which exceeds the greater of 14 days, or 10 percent of the number of days during such year for which such unit is rented at a fair rental. A unit shall not be treated as rented at a fair rental for any day for which it is used for personal purposes.

Section 280A(d)(2) Personal use defined
For purposes of this section, the taxpayer shall be deemed to have used a dwelling unit for personal purposes for a day if, for any part of such day, the unit is used—
For personal purposes by the taxpayer or any other person who has an interest in such unit, or by any member of the family (as defined in section 267(c)(4)) of the taxpayer or such other person;

By any individual who uses the unit under an arrangement which enables the taxpayer to use some other dwelling unit (whether or not a rental is charged for the use of such other unit); or
By any individual (other than an employee with respect to whose use section 119 applies), unless for such day the dwelling unit is rented for a rental which, under the facts and circumstances, is fair rental.

Section 280A(f)(1) Dwelling unit defined
For purposes of this section, In general the term "dwelling unit" includes a house, apartment, condominium, mobile home, boat, or similar property, and all structures or other property appurtenant to such dwelling unit.
Exception the term "dwelling unit" does not include that portion of a unit which is used exclusively as a hotel, motel, inn, or similar establishment.

COMMERCIAL SECTIONS

Section 48(a) Business Investment Tax Credit (Energy Credit)
The energy credit for any taxable year is the energy percentage of the basis of each energy property placed in service during such taxable year. The energy percentage is 30 percent in the case of energy property but only with respect to periods ending before January 1, 2017.

The term "energy property" means any property which is equipment which uses solar energy to generate electricity. The construction, reconstruction, or erection of which is completed by the taxpayer, or which is acquired by the taxpayer if the original use of such property commences with the taxpayer, with respect to which depreciation (or amortization in lieu of depreciation) is allowable.

In the case of any property with respect to which the Secretary makes a grant under section 1603 of the American Recovery and Reinvestment Tax Act of 2009. No credit shall be determined under section 45 with respect to such property for the taxable year in which such grant is made or any subsequent taxable year.

Any such grant shall not be includible in the gross income of the taxpayer, but shall be taken into account in determining the basis of the property to which such grant relates, except that the basis of such property shall be reduced under section 50 (c) in the same manner as a credit allowed under subsection (a).

Section 50(c)(1) and (3)(a) Reduction in basis for credits and grants.
If a credit is determined under this subpart with respect to any property, the basis of such property shall be reduced by the amount of the credit so determined. Special rule - In the case of any energy credit—only 50 percent of such credit shall be taken into account.

Section 168 Accelerated Cost Recovery System (5 Year Accelerated Depreciation)(100% and 50% Bonus Depreciation)

Section 162(a) Trade or business expenses
In general there shall be allowed as a deduction all the ordinary and necessary expenses paid or incurred during the taxable year in carrying on any trade or business.

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ENERGY EFFICIENCY FINANCING - MODELS AND STRATEGIES

Pathways to scaling energy efficiency financing from $20 billion to $150 billion annually

UPDATED: MARCH, 2012

PREPARED BY CAPITAL E FOR THE ENERGY FOUNDATION

By Greg Kats, Principal Author,
Aaron Menkin, Jeremy Dommu and Matthew DeBold

PARTNERS

AMERICAN COUNCIL FOR AN ENERGY-EFFICIENT ECONOMY (ACEEE)

APPRAISAL INSTITUTE

CITIGROUP

JPMORGAN CHASE

NATIONAL ASSOCIATION OF STATE ENERGY OFFICIALS (NASEO)

ACEEE American Council for an Energy-Efficient Economy | Appraisal Institute® | citi | JPMorgan Chase & Co. | NASEO National Association of State Energy Officials — Energy's Washington Voice

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TABLE OF CONTENTS

ABSTRACT

Increasing energy efficiency financing represents one of the largest and most important opportunities for the US to expand economic growth and job creation. Relative to almost all other investments, it cost effectively creates more distributed jobs, reduces energy costs for businesses and households of all income levels, cuts air pollution and enhances domestic security.

The potential for cost-effective energy efficiency (EE) investments in the US is on the order of $150 billion a year[1]. Investment at this level would, within a decade, save American businesses and households $200 billion annually and create more than 1 million new full time jobs[2]. After decades of public and private support, however, current energy efficiency financing is only about $20 billion per year, less than one-fifth its cost effective potential[3].This investment gap represents an enormous opportunity to strengthen the economy, increase competitiveness of US businesses while creating jobs and strengthening exports. The critical step to close this gap is to make EE financing a mainstream financial asset class with a high degree of standardization, predictability and scale. Leading financial institutions recognize the opportunity to develop financial products in this area and are increasingly committed to expand financing for energy efficiency. To do so, banks are seeking to develop efficiency performance data and build scalable efficiency financing models.

For building owners, energy efficiency offers the opportunity to lower operating costs, increase occupancy, enhance building quality and increase financial returns. Standards such as LEED and Energy Star reflect and foster increasing interest in making buildings greener and more energy efficient. However, the vast majority of EE opportunities remain unfinanced due to split incentives, insufficient credit and limited data, among other reasons.

The Obama Administration, with Congressional authorization, has invested billions of dollars into energy efficiency as part of its stimulus funding. This funding, however, peaks by the end of 2011 and will disappear in 2013. A recent approach to rapidly expanding EE funding, called the PACE program (Property Assessed Clean Energy) prompted over 20 states to pass legislation allowing

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[1]Energy Expenditures by End-Use Sector (2008, U.S. EIA) = Residential: $256.95-bil (100% from buildings), Commercial: $192.25-bil (100% from buildings), Industrial: $272.32-bil (~15% from buildings). Total Building Energy Expenditures (2008) = ~$500-bil. 2011 building energy expenditures are somewhat higher than in 2008. Efficiency measure assumptions: 40% average energy savings, average 7 year payback, investments take place over ten years. After 10 years, new technologies, increasing population and rising energy prices will require the same or increasing levels of investment and efficiency savings.

Source: U.S. Energy Information Administration, "State Energy Data, 2008," June 2010, http://www.census.gov/compendia/statab/2012/tables/12s0934.pdf.

[2]7 jobs created per $1-mil invested annually in EE. Source: "The Economic Benefits of Investing in Clean Energy," Robert Pollin, James Heintz, and Heidi Garrett-Peltier, Department of Economics and Political Economy Research Institute (PERI) University of Massachusetts, Amherst (June, 2009).

[3] Market is inclusive of EE projects and services that involve a third party and/or a separate financing mechanism (internal fund, third party financing). Inclusive of ~$8 billion annual ESCO market.

cities to use liens on home value to enable community-wide EE funding. Objections by the Federal Housing Finance Agency (FHFA) and others have, in the view of most experts, largely closed this PACE option for residential efficiency financing. The large unmet opportunity, the imminent reduction of federal EE funding and the demise of residential PACE make the need to develop scale efficiency financing imperative.

In late 2010, the Energy Foundation engaged Capital E to better understand the existing and potential models/mechanisms to scale EE financing and their potential to dramatically expand and more efficiently deploy private capital in the space. Capital E has been working closely with 30 private, public and NGO partners to identify and co-develop the most promising mechanisms to scale efficiency financing over the next three to five years. As part of the May, 2010annual ACEEE Energy Efficiency Finance Forum, Capital E ran a highly-structured meeting of 25 leaders from banks, regulatory agencies, project developers and industry organizations to co-design new mechanisms for energy efficiency financing. Findings from this on-going collaborative work have been captured in this report, which is intended to provide a succinct, structured description of existing and emerging models and strategies for energy efficiency financing. The structured format and links to best available documents and studies are intended to facilitate understanding and application of best practices in energy efficiency financing. In addition to narrative explanations, this document contains summary tables of models and strategies.

METHODOLOGY

The first phase of this work was a survey of literature to identify the viable, existing and potential strategies to scale EE financing. This report draws from and seeks to build upon the large body of often excellent, ongoing work and analysis by banks, national laboratories, NGOs such as the American Council for an Energy-Efficient Economy (ACEEE) and the Alliance to Save Energy, Federal/State agencies, think tanks and others. A range of experts have contributed to and have helped shape this document:

Peter Krajsa - AFC First

R. Neal Elliot and Steven Nadel - American Council for an Energy-Efficient Economy (ACEEE)

Bill Garber – Appraisal Institute

Peter Fox Penner - Brattle Group

Dan Adler - CalCEF

Jeanne Clinton andAndrew Schwartz - California Public Utilities Commission

Jigar Shah - Carbon War Room

Neil Zobler - Catalyst Financial

Bracken Hendricks - Center for American Progress

Michael Eckhart,Alfred Griffin andBruce Schlein – Citigroup

Chris Lord - Consultant

Jake Baker - Deutsche Asset Management

Bob Epstein – E2

John MacLean - Energy Efficiency Finance Corporation

Rick Counihan – EnerNOC

Dana Bourland – Enterprise Community Partners

Jeff Eckel and John Christmas - Hannon Armstrong

David Carey - Harcourt Brown & Carey

Francis Sullivan – HSBC

Granville Martin – JPMorgan Chase

Kimberlee Cornett - Kresge Foundation

Art Rosenfeld - Lawrence Berkeley National Lab

Malcolm Woolf - Maryland Energy Administration

Bob Hinkle - Metrus Energy

Neal Parikh –Morgan Stanley

Donald Gilligan - NAESCO

Jeff Genzer –NAESCO/NASEO

Brandon Belford - National Economic Council, The White House

Robin Roy and Phil Henderson - NRDC

Jeffrey Pitkin - NYSERDA/NASEO Financing Task Force

Matt Arnold – PricewaterhouseCoopers (PwC)

JP McNeil - Renovate America

Steve Schiller - Schiller Associates

Claire Broido Johnson - Serious Capital

Mike Niver - Solar City

Sean Patrick Neill – Transcend Equity Development Corp.

IvoSteklac - Tendril Inc.

David Wooley and John Wilson - The Energy Foundation

Jon Anda – UBS

Brenna Walraven - USAA Real Estate Company (Former Chair of BOMA International)

Kevin McCarty – U.S. Conference of Mayors

Gil Sperling, Stockton Williams, Richard L. Kauffman and Chris Lohmann- U.S. Department of Energy

Roger Platt, Jason Hartke and Scott Horst – U.S. Green Building Council

Michael Karlosky and Wayne Seaton – Wells Fargo.

This report provides a structured and succinct summary of energy efficiency financing models and strategies applicable to the Residential (R), Commercial (C), Industrial (I) and the Federal/Municipalities, Universities, Schools and Hospitals - MUSH (F/M) sectors, including links to some of the best current literature on each of the models or strategies described. For the purposes of this analysis, models are defined as arrangements amongst institutions and market players to finance and implement energy efficiency projects. Strategies are defined as tools to scale efficiency financing which bring down capital and/or transaction costs and increase the deployment of funding to efficiency projects. The following models and strategies are reviewed and summarized in this document.

Models

1. Energy Savings Performance Contracting (ESPC)
2. Energy Services Agreements
3. State/Municipal Loan Programs
4. Sustainable Energy Utilities
5. Carbon Market Funding
6. Mortgage-Backed EE Financing
7. Preferential Terms for Green/EE Buildings
8. Utility On-bill Financing
9. Property Assessed Clean Energy (PACE) - Commercial
10. Property Assessed Clean Energy (PACE) – Residential
11. Unsecured Consumer Loans

STRATEGIES

1. Intermediary Aggregated Scale Purchasing
2. Revolving Loan Fund
3. Preferential Loans
4. Risk Reallocation
5. E-Loan
6. Point of Purchase Interest Rate Buy-down
7. Re-Align Incentive Structure

The review describes each model and indicates its limits to scale, sources of funds, program administration structure, repayment vehicle and project risk allocation. The analysis summarizes the level to which a model is currently being deployed, its potential to enable large investments in energy efficiency, as well as market-enabling actions that could facilitate greater investment. Strategies are described, best-case examples provided and applicable models are identified. The order in which the models and strategies are displayed in this report does not reflect potential or preference. Energy Service Performance Contracting is listed first due to its widespread adoption, while subsequent models are clustered to reflect similarity.

Analysis and key stakeholder co-development has informed the identification of new financing mechanisms that could potentially drive additional billions of dollars in energy efficiency financing within a three to five year time frame. Using the results of this report and on-going collaboration, Capital-E is co-developing mechanisms with key private and public stakeholders. These mechanisms include:

- Green Ginnie Mortgage Backed Securities (MBS)
- Making Energy Efficiency a Standardized Asset Class
- CO2 to Energy Efficiency (EE)

See www.cap-e.com for more information.

PART I: ANALYSIS OF ENERGY EFFICIENCY FINANCING MODELS

ENERGY SAVINGS PERFORMANCE CONTRACTING

DESCRIPTION: Energy Savings Performance Contracting (ESPC) is a method for developing and implementing comprehensive energy efficiency projects (which may also include renewable energy, cogeneration, and/or water efficiency measures). An ESPC is typically provided by an Energy Service Company (ESCO). ESCOs have traditionally developed, implemented, and often helped arrange financing for projects. However, the role of ESCOs will change as result of the Dodd-FrankWall Street Reform and Consumer Protection Act. ESCOs will not be able to administer programs or originate loans unless they are registered Municipal Financial Advisors, which few will be. The administrator/originator role will be taken by third-party companies who will add a full finance consulting service to their loans, or to specialty brokers. After project completion, the ESCO monitors energy savings and maintains upgrades over many years. The savings produced typically exceeds the loan payments over the term of the contract, which is typically 10 to 20 years. During the contract, the customer shares in a portion of the savings. After the contract term, the customer ceases payments and enjoys all of the residual energy savings. In nearly all ESPC projects implemented in public buildings, the ESCO guarantees the savings to the customer. The guarantee creates a financial commitment for the ESCO to ensure the performance of retrofits during the contract term. If retrofits produce less than the guaranteed savings, the ESCO will pay the difference. The value of savings in excess of the guaranteed savings remains with the customer.

ESPC projects typically take several months to develop; these projects involve complex contracts and blend funds from several sources. Funding sources include utility incentives/rebates, public revolving loan funds, state/federal government grants, bonds, tax equity, loans, and leases. ESPC projects usually have relatively long paybacks periods (10+ years). ESPCs are most often used for projects in federal government buildings and in public institutions, such as municipalities, universities, schools and hospitals (collectively known as the MUSH market). Such facilities are either owner-occupied or leased for long terms, do not have a first lien and have a good credit quality.

Since building owners with strong credit or access to low cost debt commonly prefer to self-finance, ESPCs have been slow to catch on in the commercial buildings market. For example, Malkin Properties considered third party financing to renovate the Empire State Building (a renovation that produced a 38% reduction in annual energy costs), but ultimately decided to self-finance to avoid the financing costs. ESPCs are increasingly being applied in commercial buildings for which owners prefer to outsource energy efficiency.

Specialized lending institutions or other third party financiers provide a combination of debt and tax equity financing for ESPC projects that meet a tightly negotiated set of criteria (e.g. length of agreement, measurement and verification methodology, etc.) and other prescribed risk characteristics (e.g. ownership of project assets, shared savings structure, performance guarantees, etc.). Financing is available for large-scale projects executed by credit-worthy ESCOs and investment-grade hosts. The financing is secured by the assets installed, or is recourse to the host. Investors have securitized ESPCs for sale to capital markets but have not done so at scale.

EXAMPLES: *ESCOs* - Johnson Controls, Honeywell Building Services, Ameresco

Financiers- Hannon Armstrong, Bostonia Group

Level of Funding	100%
Timing of Funding	Upfront
Type of Funding	Private Debt and Equity, Utility Incentives
Repayment Vehicle	Billing per ESPC
Sectors	Largely serves Federal and MUSH (F/M) markets with limited activity in the Commercial and Industrial markets.
Current Funding/Rate of Growth	Currently $6-$7-bil industry (LBNL). Projected to grow to $20-$23-bil by 2020 according to The Cleantech Group.
Institutional Players	Energy Services Companies, Lending Institutions, Specialized Investors, Utilities, Governments, MUSH and Commercial Property Owners

ADVANTAGES: Reduces project risk for customers. Enables financing of comprehensive retrofits. ESCOs have a 30-year track record of project execution leading to the development of standard contracts and processes. ESPCs can easily be combined with other incentive programs to enhance the project returns. ESPCs rely on rigorous monitoring/verification and detailed data collection. Most ESCOs base measurement and verification requirements on the IPMVP (International Measurement and Verification Protocol). The IPMVP provides an industry-developed, consensus standard of 4 different M&V approaches, which provides a common basis for negotiating, specifying and guaranteeing energy and water efficiency savings. The IPMVP is mandated for all federal energy ESPC programs and is widely used internationally. *Disclosure: Greg Kats Co-founded the IPMVP with Art Rosenfeld, and served as its founding Chair.*

DISADVANTAGES/BARRIERS TO SCALE: The process of reaching agreement on an ESPC requires substantial negotiation and documentation. There are substantial transaction costs associated with establishing baseline energy use and validating energy savings. Projects must be approved and developed on a case-by-case basis requiring credit analysis on each borrower's ability to pay. It is difficult to finance smaller projects (<$500k) because ESCOs aren't interested and the investment does not justify underwriting costs to lenders.

MARKET ENABLING MEASURES: Government or private parties can provide full or partial loan guarantees on owner default, reducing risk of financing commercial energy savings performance contracts.

SOURCES AND LINKS*: DOE Energy Efficiency and Renewable Energy Solution Center: Energy Services Performance Contracts:* http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/ESPC.html

Energy Efficiency Paying The Way: New Financing Strategies Remove First-Cost Hurdles: CalCEF Innovations - Bob Hinkle and David Kenny – February, 2010 - http://www.fypower.org/pdf/CALCEF-WP-EE-2010.pdf

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http://www.evo-world.org/index.php?option=com_content&task=view&id=272&Itemid=60&lang=en

Energy Efficiency and the Finance Sector: A Survey on Lending Activities and Policy Issues. UNEP Finance Initiative's Climate Change Working Group, January 2009:
http://ccsl.iccip.net/energy_efficiency.pdf

ENERGY SERVICES AGREEMENTS

DESCRIPTION: Energy Services Agreements (ESA) build on the historical use of PPAs in power plant project finance and, more recently, in renewable energy project finance. Third party entities negotiate ESAs, arrange/provide capital, develop projects and manage installed equipment for large industrial and commercial projects. An SPE is typically established for each single large energy efficiency deal. The SPE is capitalized by third party investors and finances the costs of the efficiency improvement. The host signs an ESA with a project developer and agrees to pay either a fixed or floating rate for the energy savings received. A floating rate is equal to a percentage (e.g. 80%) of their actual utility rate. A fixed payment is based on a cost per avoided energy basis (e.g. dollars per kWh avoided or dollars per therm of natural gas avoided). The host agrees to make payments for contractual terms of their agreement (e.g. 5-15 years). During this period, the SPE retains ownership of the installed equipment and returns cash flows to investors. The fund owns all environmental attributes (e.g. CO2), government grants/rebates, and certain tax benefits where allowable by law. This structure enables energy efficiency to be treated as a service and an off-balance sheet transaction. Investors commonly obtain multiple tax benefits including typical losses during the first year, depreciation and any federal, state or utility incentives. New Federal Accounting Standards Board (FASB) pronouncements on service contract accounting may limit or modify this structure by placing the risk on the obligor's balance sheet. Since many projects yield equity rate of returns, the opportunity exists for private equity to provide up front financing if there were sufficient ability to aggregate contracts, monitoring and services.

The MESA structure is an ESA model that has gained recent traction. An SPE is established for a large commercial building owner to make monthly payments equal to the agreed historical energy expense. Energy savings are utilized by the project developer to pay utility bills and provide investors with a return on their investment. Private equity investors are actively financing projects through this structure.

EXAMPLES: Energy Harvest, Metrus Energy, Clean Feet, Transcend Equity Development Corp, Green City Finance.

Level of Funding	100%
Timing of Funding	Upfront
Type of Funding	Private Debt and Equity
Repayment	PPA payments or Service Charge
Sectors	Residential, Industrial and Commercial
Current Funding/Rate of Growth	Growing but still at a small scale
Institutional Players	Commercial and Multi-Family Property Owners, Specialized Investors, Project Developers, Utilities

ADVANTAGES: Transactions are currently off-balance sheet to the host. Credit exposure can be limited by a loss reserve and/or by retaining title to the physical assets throughout the contract

period. Since an SPE is used, risk is limited to the amount of investment for each individual deal. Building owners can make necessary capital improvements at no up-front cost.

DISADVANTAGES/BARRIERS TO SCALE: Since many large deals require the establishment of a SPE, there are higher transaction costs. Many commercial and industrial building owners prefer to self-finance efficiency projects. Additional costs are incurred to monitor and calculate energy savings achieved by comparing actual energy consumption of the retrofit to a calculated and agreed-upon benchmark, which potentially requires an independent auditor to verify the energy savings achieved. The model is typically not appropriate for small investments such as at the residential level. New FASB pronouncements on service contract accounting could severely limit this models' scale potential. Not currently at scale sufficient for large institutional investors.

MARKET ENABLING MEASURES: Public entities enable the use of PPAs to finance EE. Increase the installment of smart-grid or other software that automatically captures reduction in energy consumption due to EE investment. Arrange private equity funds that invest in project pools financed through standardized ESA structures. Create sufficient aggregation and scale to support a securitized debt market

SOURCES AND LINKS: *Department of Energy: Energy Efficiency and Renewable Energy Financing Guide:*http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/PPA.html

Energy Harvest Capital Management, LLC: Confidential Business Plan PowerPoint Deck

*Solar Power Purchase Agreements:*http://www.epa.gov/greenpower/buygp/solarpower.htm

Metrus Website: http://metrusenergy.com/

*Transcend Equity Website:*http://www.transcended.com/mesa_solution.asp

Energy Efficiency Paying The Way: New Financing Strategies Remove First-Cost Hurdles: CalCEF Innovations - Bob Hinkle and David Kenny – February, 2010 - http://www.fypower.org/pdf/CALCEF-WP-EE-2010.pdf

STATE/MUNICIPAL LOAN PROGRAMS

DESCRIPTION: The American Recovery and Reinvestment Act (ARRA) allocated $11.6-bil in FY 2010 to state and local governments to finance energy efficiency programs. While programs take many forms, states (often directed through their energy offices) typically allocate an initial funding pool from the general fund, federal grant allocations or ratepayer funds. County/city governments, utilities, local non-profits and/or Community Development Financial Institutions (CDFIs) typically handle loan origination and program administration. Programs like Portland's Clean Energy Works Program (CEWP) make loans to homeowners to cover up-front project costs (minus available state incentives); homeowners pay the loan back via an additional charge on their utility bills. Pennsylvania's Keystone HELP program offers secured loans for basic retrofit improvements (windows, HVAC, etc.) at 5-7% interest over 3, 5 or 10-year terms. Lower rates (e.g. 3%) are offered for improvements that meet prescribed standards (e.g. Building Performance Institute). Whole home improvements meeting minimum energy reduction requirements (e.g. 20%) also receive lower interest rates. The most successful programs create green job through workforce development programs for needed contracting work.

EXAMPLES: Portland Clean Energy Works Program (CEWP), Pennsylvania Keystone HELP, Maryland Clean Energy Center Home Owner Loan Program, Texas LoanSTAR (loans to Save Taxes And Resources) Program.

Level of Funding	Up to 100%
Timing of Funding	Program dependent
Type of Funding	Loans, rebates and tax benefits financed through federal grants, rate-payer funds, bond issues, state general funds, utility cost recovery or systems benefits charges.
Repayment Vehicle	Differs by program
Sectors	Commercial, Residential, Industrial
Current Funding/Rate of Growth	ARRA directed $3.1-bil into state energy programs, with funding dropping sharply in 2012.
Institutional Players	Utilities, State/Municipal Governments, State Energy Organizations, Community Development Financial Intuitions, Third Party Administrators, Economic Development Organizations/Departments, Departments Of Labor, Housing Development Authorities.

ADVANTAGES: State programs facilitate collaboration across numerous governmental departments, agencies, economic development organizations, private contractors and third party program administrators. Model concentrates energy efficiency information and program offerings into a trusted, single source. Successful efforts consolidate disparate energy efficiency funding programs. There is substantial administrative and technical support available through the DOE and EPA. Certain program types (CEWP, Keystone HELP) enable access secondary sources of capital.

DISADVANTAGES/BARRIERS TO SCALE: Funding is limited to the amount granted, creating temporary programming. High level of coordination is required amongst departments and

organizations. Statewide efforts may create redundancies with third party administrated or municipal efforts. Benchmarking and tracking energy usage on a state scale depends on the quality of metering infrastructure. The majority of states have statutes proscribing local government entities from lending public dollars for private purposes (The New Rules Project, 2009). The growth of CEWP, and its replication to other regions, will depend on the ability to access secondary sources of capital (e.g. bank debt, state municipal bond issuances, and foundation investments) that value the risk-return profile of home energy performance improvement projects.

MARKET ENABLING MEASURES: Create a standardized program so that loans originated through multiple state programs can be consolidated and sold to the secondary market (e.g. Warehouse for Energy Efficiency Loans (WHEEL program)- developed by theEnergy Programs Consortium and the Pennsylvania Department of Treasury. Consider use of a credit facility or loan loss reserve.

SOURCES AND LINKS: *Compendium of Best Practices: Sharing Local and State Successes in Energy Efficiency and Renewable Energy from the United States*: Renewable Energy and Energy Efficiency Partnership (REEEP), Alliance to Save Energy, American Council on Renewable Energy (ACORE) – 4/2010 – Pg. 43 http://www.reeep.org/16672/compendium-of-u-s-best-practices.htm

States Stepping Forward: Best Practices for State-Led Energy Efficiency Programs: American Council for an Energy-Efficient Economy – Michael Sciortino - September, 2010 – http://www.aceee.org/research-report/e106

The Growing Landscape of State Energy Efficiency Programs: A New Taxonomy: American Council for an Energy-Efficient Economy - Michael Sciortino and Maggie Eldridge – 2010 - http://www.aceee.org/proceedings-paper/ss10/panel08/paper28

Energy Efficiency Paying The Way: New Financing Strategies Remove First-Cost Hurdles: CalCEF Innovations - Bob Hinkle and David Kenny – February, 2010 - http://www.fypower.org/pdf/CALCEF-WP-EE-2010.pdf

Keystone HELP® ENERGY EFFICIENCY Loan Program Guidelines: Pennsylvania Dept. of Environmental Protection, Treasury, Housing Finance Agency - November, 2010

American Recovery and Reinvestment Act Website: DOE EERE: U.S. Department of Energy - http://www1.eere.energy.gov/recovery/

SUSTAINABLE ENERGY UTILITIES

DESCRIPTION: A Sustainable Energy Utility (SEU) administers financing programs, offers technical assistance, and provides financial incentives to building owners to implement efficiency measures and support renewable energy installations. For example, the Delaware SEU was created in 2007 by legislation enabling a $30-mil bond authority. The SEU pre-screened financeable energy efficiency and renewable energy projects and established measurement and verification standards. Set up costs were funded in part by an increase in the charge for energy efficiency and renewables paid by Delaware utility customers. Among other programs serving the MUSH market, the SEU covers the incremental costs between conventional and high-efficiency technologies. ESCOs work with MUSH building owners to commit to giving the SEU 33% of projected savings created by the installed measures for 3 to 5 years. After the contracted period, the owner retains 100% of the savings. This structure has financed $27-mil in energy savings for building owners. The SEU offers incentives to developers of renewable energy equal to the difference between the cost of an equivalent conventional energy supply and the renewable energy installed. In exchange, developers provide the SEU with 25% of the Renewable Energy Credit (REC) proceeds generated by the project. The Delaware SEU has helped finance 10 MW of solar through this structure. The State of Delaware has created 1,000 jobs through this program.

Under the guidance of Citigroup, the Delaware SEU pooled distributed EERE projects and leveraged the State of Delaware's AAA credit rating to issue the first energy efficiency tax-exempt bond in the U.S. ($72-mil in proceeds). This transaction solved the credit problem often faced by large financial institutions looking to invest in EE. Since Delaware accepted the credit risk for the projects, investors were able to assess the risk of the bond based on a known, rated entity as opposed to based on multiple ESCOs/hosts with different credit ratings. This structure enables efficient pricing of the bond and fits the profile of an investment for which municipal financing groups are already comfortable.

In 2008, the District of Columbia passed a bill to create a Sustainable Energy Trust Fund to be managed by a Sustainable Energy Utility. A non-bypassable monthly surcharge assessed to electric and natural gas ratepayers amounting to roughly $20-mil per year will fund new financing programs. The DC SEU has been tasked with developing financing programs to overcome barriers to EERE investment for all building types for all demographic segments in the District. The DC SEU is currently reviewing 10 to 15 financing programs to be considered for implementation starting in 2012.

EXAMPLES: Delaware Sustainable Energy Utility, District of Columbia SustainableEnergy Utility

Level of Funding	100%
Timing of Funding	Up front
Type of Funding	Covers up front cost
Repayment Vehicle	Shared savings agreement
Sectors	Commercial and Residential

Current Funding/Rate of Growth	$100 mil+ invested to date with more funding expected as existing programs expand and new programs are formed
Institutional Players	State Government, Contractors, Non-Profits, Banks, Bond Investors

ADVANTAGES:Large job creator. Leverages public funding to access capital markets.Overcomes credit disaggregation challenge often faced by investors. Consolidates technical assistance, program information and program administration into a single entity.Enables building owners to receive energy efficiency improvements at no up-front cost.

DISADVANTAGES/BARRIERS TO SCALE: Few SEUs have been established since the Delaware SEU was created in 2007. Requires state-level authorization of bonding authority to create statewide entity.

MARKET ENABLING MEASURES: Promote deployment of standardized SEUs across multiple states or municipalities. Work with existing SEUs and municipal finance groups within banks to coordinate energy efficiency tax-exempt bond issuances.

SOURCES AND LINKS: *Sustainable Energy Utility - A Delaware First*: http://www.seu-de.org/docs/SEU_Final_Report.pdf

Energy Conservation Initiative: Bond issue supports energy conservation, job creation – University of Delaware: http://www.udel.edu/udaily/2012/aug/SEU-081911.html

U.S. Department of Energy Program Information: Sustainable Energy Utility: http://www.ymp.gov/savings/sustainable-energy-utility

CARBON MARKET FUNDING

DESCRIPTION: Building energy efficiency is the single largest, low-cost opportunity for CO2 reductions. For CO2 value to drive increased EE (Energy Efficiency) investments, building owners should receive or be able to monetize the value of the associated CO2 reductions when they make EE investments. A mechanism that would enable third-party intermediaries to efficiently document, aggregate, and obtain CO2 reduction value on behalf of business, industry, real estate and municipal clients would allow building owners, companies, etc. investing in electrical or natural gas efficiency to receive the value of the associated CO2 reductions at the point of investment. This would offset a significant portion of the capital cost of EE investments and increase the depth and volume of energy efficiency investments. This model would ultimately create a market transformation where energy efficiency investments are implemented exclusive of carbon pricing.

The proliferation of energy management and demand response firms such as EnerNOC, Tendril and Efficiency 2.0 are representative of a new and fast growing pathway to motivate and guide energy efficiency. Careful analysis of DR is required to determine if it actually reduces carbon emissions. In some places (e.g., PJM) DR that involves load shifting actually increases carbon emissions because it shifts loads from gas peaking units to coal base load units. These firms have the capacity to serve as efficient, low cost aggregators to deliver, measure and ensure EE savings – and therefore provide a pathway to allow distributed EE investors, including companies and real estate owners to directly to earn the value of CO_2 reductions that result from their CO2 investments. The suggested model involves recognizing and leveraging EE aggregation and motivation entities by qualifying them to act as intermediaries to aggregate the value of the CO2 on behalf of their clients.

CO2 markets, including California and the Regional Greenhouse Gas Initiative (RGGI), have set-aside accounts that indirectly recognize and financially reward the emissions reductions benefits associated with specific EERE investments. Starting in 2013, the California Air Resources Board (CARB) will auction a portion of emissions allowances to the electricity sector. It is foreseen that the proceeds from the auctions will be used for a number of programs, including the financing of energy efficiency retrofit rebates and incentives. This solution, however, is limited to only specific EE measures and does not allow for more holistic efficiency retrofits.

Enabling companies and building owners to earn the value of CO2 reductionseffectively moves the CO2 value under a cap and trade program from a point of low impact to a point of high impact. The anticipated price of CO2 in California (floor price $10/ton of CO2, expected to eventually exceed $30/ton) means that the value of CO2 reduction, if sold forward for 5 or 10 years, can cover a significant portion (e.g. 30-50%) of the cost of EE upgrades, resulting in more and deeper retrofits.

EXAMPLES: N/A – not currently in practice

Level of Funding	In the range of 15% to75% of the project cost (based on CO2 price of $10 to $50/ton, respectively)
Timing of Funding	Upfront
Type of Funding	Revenue
Repayment Vehicle	None

Sectors	Commercial, Industrial and Residential
Current Funding/Growth	N/A

ADVANTAGES: Offsets a significant portion of the capital cost of EE investments, increasing depth and volume of energy efficiency investments, enabling the market for CO2 to function more efficiently and cost effectively. It would also accelerate the adoption of smart grid technology and solutions. It would strengthen US competitiveness, and security, accelerating job growth.

DISADVANTAGES: Utilities may object to this model. It requires coordination amongst market regulators, utilities and independent groups. If set up incorrectly, it could create substantial transactions costs. Model limited to locations with an active and robust carbon markets (e.g. California).

MARKET ENABLING MEASURES: Continue to work with a broad coalition of California organizations, businesses, real estate groups, national labs, and state entities to co-design and implement a pilot. Then, bring pilot to scale.

SOURCES AND LINKS: *Capital E Website*: http://www.cap-e.com/Capital-E/CO2_to_Energy_Efficiency.html

Greening our Built world Sections 1.3 and 4.3: http://www.cap-e.com/Capital-E/Resources_%26_Publications.html

MORTGAGE-BACKED EE FINANCING

DESCRIPTION: Mortgage-backed EE financing such as an Energy Efficient Mortgage (EEM) provides additional borrowing capacity and/or better terms to borrowers buying a new energy efficient home or investing in energy improvements in their existing home.

In the case of an EEM, the financing is rolled into the home mortgage. The mortgage in effect is extended to provide a single low cost source of capital to finance cost-effective, energy saving measures as part of a refinanced or new mortgage. The cost of energy improvements and an estimate of energy savings must be determined by a Home Energy Rating System (HERS) or an energy consultant,and, under the current Federal Housing Administration (FHA) EEM product, cannot exceed 5% of the home value. Mortgages provide for repayment periods that are typically between 10 and 30 years, thus amortizing the costs of the energy efficiency improvement over the typical mortgage term. An EEM can be obtained when purchasing a home or refinancing an existing mortgage. Additional borrowing capacity is provided to the borrower under an EEM based on the assumption that the energy savings exceeds the amortized cost of the energy efficiency improvements, resulting in an NOI positive investment that improves the borrower's ability to pay, hence lowering default risk. This reduced risk can potentially justify a lower interest rate, which in turn further reduces the default risk. Energy Star Mortgage programs in Maine, New York, and Colorado inject capital into mortgage products to "buy down" the interest rate charged to borrowers as an incentive to finance energy improvements.

PowerSaver is a new pilot loan program from the Federal Housing Administration (FHA). FHA PowerSaverhas begun providing federal loan insurance and other incentives to FHA Title I Property Improvement Program lenders to deliver home improvement loans. Funds are available to directly lower interest rates and lower servicing costs for loan originators. In eligible markets, homeowners can borrow up to $25,000 in first or secondary lien loans for 15-20 year terms. Initial interest rates have been between 3 and 9%. By leveraging existing state and local programs, these rates could be further reduced.FHA mortgage insurance will cover up to 90% of the loan amount in the event of default through streamlined claims procedures. Private lenders will retain the remaining risk on each loan. PowerSaver borrowers must have good credit, manageable debt and at least some equity in their home. While FHA has engaged in initial conversations with Ginnie Mae and other entities on secondary market options, challenges remain in creating liquidity for PowerSaver investors.

EXAMPLES: Colorado Energy Star Mortgage, U.S. Department of Housing and Urban Development Energy Efficient Mortgage Program, HUD PowerSaver Pilot, Community Preservation Corporation Green Financing Initiative, New Resource Bank.

Level of Funding	100%
Timing of Funding	Upfront
Type of Funding	Loan
Repayment Vehicle	Mortgage
Sectors	Residential and Commercial
Institutional Players	Lending Institutions, Mortgage Companies, Homeowners

ADVANTAGES: Long mortgage terms enable efficient access to low cost capital and can allow for lower monthly payments on energy efficiency measures. The cost of energy efficiency measures can be combined with existing home refinancing or home purchase, reducing transaction costs otherwise associated with pursuing a separate loan for efficiency improvements. Interest on loans is tax deductible to the borrower in the majority of cases. Energy efficiency measures typically enhance a borrower's ability to pay since the monthly energy bill reductions typically exceed the additional monthly payments associated with the energy efficiency improvements. Enhanced ability to pay may warrant preferential interest rates. The New Resource Bank, for example, provides preferential terms for green/energy efficient commercial loans for this reason.

DISADVANTAGES/BARRIERS TO SCALE: Homebuyers are often overwhelmed with other issues and unable to think about energy improvements at time-of-sale or refinancing. Many lenders are not knowledgeable about and/or are unconvinced of the NOI-positive impact of efficiency measures and are therefore reluctant to offer EEMs or to provide preferential terms for EEMs. High transaction costs can make smaller projects unfeasible. EEMs are currently limited to residential properties of 1 to 4 units.

MARKET ENABLING MEASURES: Municipalities can provide capital to buy-down interest rates or reduce end-user transaction costs. The Federal home lending institutions can offer loan loss reserves for EEMs. Obtaining more data on the risk profile of investments in energy efficiency and the improved effects of EEM on the borrower's ability to pay will enable more mortgage-backed EE financing. Aggregate demand for such products to attract more banks to offer preferential terms. Mortgage lenders could offer a property-secured, EE loan as part of refinanced mortgages for gross-leased and owner occupied commercial properties within pension fund and REIT portfolios. These refinanced mortgages could be securitized into a green mortgage backed security.

Capital E is working with Forsyth Street Advisors, U.S. Department of Housing and Urban Development (HUD) and the U.S. Department of Energy to develop a new EEM product called a Green Ginnie Mortgage Backed Security (MBS). Ginnie Mae (Ginnie) is a government corporation within the U.S. HUD. Ginnie guarantees the principal and interest payments on mortgage-backed securities collateralized by cash flows from single and multifamily mortgages insured by the Federal Housing Administration (FHA) and other federal agencies. Approved private lenders issue securities for which Ginnie Mae provides guarantees that are explicitly backed by the U.S. Government. This reduces required yields and reduces the interest rate that lenders charge for underlying mortgages. The Green Ginnie MBS involves structuring and creating a market for FHA and Ginnie Mae insured MBS comprised entirely of certified green single family or multi-family mortgages. This new mechanism involves incorporating a Green Mortgage Aggregator and targeted investors into the existing FHA/Ginnie Mae insurance programs. A Green Ginnie MBS would create a tangible financial incentive for the acquisition, construction, and/or retrofit of green/energy efficient homes, apartments, and other FHA-insured properties.

SOURCES AND LINKS: *DOE Energy Efficiency and Renewable Energy Solution Center: Energy Efficient Mortgages:*
http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/energyefficientmortgages.html

U.S. Department of Housing and Urban Development:
http://www.hud.gov/offices/hsg/sfh/eem/eemhome.cfm

*The New Resource Bank:*https://www.newresourcebank.com/

*Institute for Market Transformation:*http://www.imt.org/residential-finance.html

*Community Preservation Corporation Green Financing Initiative:*http://www.communityp.com/green-financing-initiative

*Value Beyond Cost Savings: How to Underwrite Sustainable Properties - Scott R. Muldavin:*http://www.greenbuildingfc.com/Documents/Value%20Beyond%20Cost%20Savings--Final.pdf

PREFERENTIAL TERMS FOR GREEN/EE BUILDINGS

DESCRIPTION:A growing body of research and data show that green/energy efficient buildings have lower operating costs, yield higher operating income, possesslower risk of default and have higher asset values than conventional, non-green buildings. A study by the Australian Property Institute, Property Funds Association, Jones Lang LaSalle and CB Richard Ellis on 366office buildings in Sydney and Canberra Australia, found that buildings with the highest (5 star) NABERS energy rating, were valued 9% higher than comparable, non-NABERS rated buildings. As a result of their integrated design process, green/EE buildings typically have less risk of building system failures, which reduces the risk of uninsured events or work shut downs due to system failures. Additionally, green buildings have broadly documented health and productivity benefits with associated reduced employee sick days and enhanced worker productivity. These benefits broadly improve tenant's operating margins and appear to create a valuable brand for property owners that can drive occupancy and rents.

In spite of this body of information, mortgage lenders and insurance providers largely do not recognize the lower risk/higher return attributes of investments in green/EE buildings. Convincing these parties that green buildings warrant preferential terms involves developing and delivering robust data on the performance of green properties/mortgages as compared to non-green properties/mortgages. Sufficient data would presumably serve as rationale for offering lower cost financing/insurance premiums. Preferential terms would in turn drive expanded EE and green building investment. Being a first mover in this area could be attractive to institutional investors to receive positive PR benefits and gain access to a high-quality demographic with substantial opportunities for add on services and brand loyalty.

EXAMPLES: Fireman's Fund Green Building Insurance Product, New Resource Bank. *Disclosure: Greg Kats is a co- founder of the New Resource Bank.*

Level of Funding	100%
Timing of Funding	Upfront
Type of Funding	Preferential Loan or Insurance Terms
Repayment Vehicle	Mortgage or Insurance Policy
Sectors	Residential, Commercial and Industrial
Current Funding/Rate of Growth	Very few financial institutions currently offering preferential terms
Institutional Players	Lending Institutions, Mortgage Companies, Insurance Companies, Building Owners

ADVANTAGES: Utilizes existing and efficient market channels to deploy capital to energy efficient building owners. Does not involve public institutions.Involves no new program structure or bureaucracy.

DISADVANTAGES/BARRIERS TO SCALE: Few banks currently recognize or are developing data to quantify the risk reduction characteristics of green/energy efficient buildings.

MARKET ENABLING MEASURES: Capital E has published one of the most rigorous studies on the costs and benefits of green buildings to date "Greening Our Built World: Costs and Benefits" (170 buildings). The study and book demonstrate that the average additional cost of green buildings is $4 to $5 per square foot and that the NPV from energy savings over 20 years alone is almost 3x greater than the cost premium. With industry partners, Capital E is greatly expanding this database and making it publicly accessible/searchable. The Green Building Database project provides a standard template for building owners to enter data on the performance of green buildings and non-green baselines. Users will be able to analyze data to quantify the costs and benefits (comparing green to non-green buildings). The intent is to collect data on >1,000 international green buildings within 2 years and >2,000 buildings within 3 years. The database will serve as a tool for investors and building owners to better understand the risks and returns of energy efficiency/green building projects and serve as rationale for preferential terms. More information is available at cap-e.com.

SOURCES AND LINKS: *Fireman's Fund Green Insurance Products*:http://greenriskadvisor.ffido.com/microsite/

*The New Resource Bank:*https://www.newresourcebank.com/

*Greening our Built world Sections 1.3 and 4.3:*http://www.cap-e.com/Capital-E/Resources_%26_Publications.html

*Community Preservation Corporation Green Financing Initiative:*http://www.communityp.com/green-financing-initiative

"*Building Better Returns: A Study of the Financial Performance of Green Office Buildings in Australia,"* The Australian Property Institute and Property Funds Association, 2011: http://www.nsw.api.org.au/c/apinsw?a=sendfile&ft=n&fid=1315792182&sid=

Green Building Database Summary: http://www.cap-e.com/Capital-E/Green_Building_Data.html

UTILITY ON-BILL FINANCING

DESCRIPTION: Under Utility On-Bill Financing, the utility or a third party financier covers the upfront cost of an energy efficiency upgrade and the customer repays the investment through a charge on their monthly utility bill. On-bill repayment overcomes program set-up barriers by leveraging the existing billing relationship that utilities have with customers and builds on theaccess utilities have to information about energy usage and payment history. Most utility-administered on-bill financing programs, offer low or no interest loans and short repayment periods (e.g. at most 36 months). There are two different types of on bill financing: *loans tied to the customer* - if the customer moves, the balance must be paid; and *loans (tariffs) tied to meter*–if the customer moves, the next building occupant has an obligation to pay.

From 2000 to 2007, United Illuminating offered loans to small commercial and industrial customers to finance projects that offered a minimum of 20-30% savings and 2 to 5 year paybacks. The utility offered zero-interest loans to cover 60-70% of project cost and provided rebates for the remaining 30-40%. The program drew on funding provided by the Connecticut Energy Efficiency Fund, which raised money via a monthly surcharge on the electric bills of Connecticut ratepayers. The default rate on these loans were less than 1%.

From 2002 to 2004, Public Service Company of New Hampshire and New Hampshire Electric Cooperative offered a Pay-As-You-Save (PAYS) Program pilot. The utility covered the upfront cost of installing and purchasing lighting, heating, cooling and other energy efficient equipment. A PAYS Delivery Charge (PDC) was calculated and added to the utility bill of participating customers. The PDC was tied to the meter and was equal to 2/3 of estimated savings projected from the installed measures. The charge remained on the customer's bill until the PDC is fully repaid.

Since 1989, National Grid has offered on-bill financing to small business customers in Massachusetts and Rhode Island. The program targets lighting, water heating, and refrigeration systems. National Grid covers 70% of project cost. The customer finances the remaining 30% with an interest free loan paid back on their utility bill. The loan remains interest free for up to 24 months and customers are given a 15% discount if they pay the loan off in the first month.

EXAMPLES: Sempra Utilities, United Illuminating, Manitoba Hydro (Loans); Midwest Energy How$mart (tariff), PAYS Programs, National Grid, NStar

Level of Funding	Varies by program
Timing of Funding	Upfront
Type of Funding	Loan, Tariff
Repayment Vehicle	Utility Bill
Sectors	Residential, Industrial and Commercial
Current Funding/Rate of Growth	Repayment terms and loan size vary based on customer type
Institutional Players	Utilities, Lending Institutions, Homeowners, Commercial Property Owners

ADVANTAGES: Energy savings gained from efficiency improvements and the monthly payment amount are displayed on the same bill, making it easy for customers to compare savings to loan payments. The threat of disconnecting utility service in the case of default can provide security for lenders but is politically contentious and generally not carved out. Allowing customers to make EE loan payments on their utility bill reduces customer engagement barriers and promotes program participation. Numerous utility-administered on bill financing programs offer 0% interest financing, expanding the range of feasible efficiency projects. Some utility programs offer increased incentives to participants who implement multiple EE measures, incentivizing deeper savings. Utilities have established customer relationships enabling them to administer programs at a lower administrative cost relative to standalone efforts run by municipalities or third parties.

DISADVANTAGES/BARRIERS TO SCALE: Capital providers are sometimes leery of structures in which the utility collects the funds and distributes collections to the lenders because (1) the collection practices of utilities may differ markedly from those of lenders, and (2) in the case of partial bill payment by a customer, utilities might pay themselves before paying the lender. It is difficult and expensive for utilities to change their billing system, creating barriers to adoption. Many utilities are reluctant to serve the role of loan originator and collector. Utilities and their regulators are reluctant to take on any risks associated with making loans to customers using their own capital or ratepayer funds. Utilities are concerned about the potential of servicing customer complaints about failed EE equipment. While a tariff is transferable across changes in property ownership, it is more complicated to secure the legislation necessary to set it up. Nonetheless, successful programs are typically oversubscribed due to program inefficiency and lack of funding access.

MARKET ENABLING MEASURES: Fund programs with public capital. Provide credit enhancements (e.g. loan guarantees, loan loss reserves, etc.) to reduce risks to financier and attract private capital. PUC's can mandate that utilities allocate a portion of utility capital funds for efficiency investments and/or establish dedicated public purpose surcharges to finance efficiency loans.

SOURCES AND LINKS: *DOE Energy Efficiency and Renewable Energy Solution Center: On-Bill Repayment Programs:*http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/OnbillRepayment.html

Mayor's Training Program Case Study: Case study prepared by Michael A. Hyams, Columbia University - April 2009:http://energy.sipa.columbia.edu/researchprograms/urbanenergy/documents/On%20bill%20Financing%20FINAL.pdf

Energy Efficiency Paying The Way: New Financing Strategies Remove First-Cost Hurdles: CalCEF Innovations - Bob Hinkle and David Kenny – February, 2010:http://www.fypower.org/pdf/CALCEF-WP-EE-2010.pdf

Process Evaluation of the Pilot "Pay As You Save" (PAYS) Energy Efficiency Program, GDS Associates, 2003: http://www.paysamerica.org/PAYSProgramEvaluationReportFINAL12-15-03_GDS.pdf

PROPERTY ASSESSED CLEAN ENERGY (PACE) – COMMERCIAL

DESCRIPTION: TheCommercial PACE programs allow local governments, when authorized by state law, to fund energy improvements on multi-family (>4 units), commercial and industrial properties with long-term loans. Required state legislation extends the land-secured financing model to energy efficiency and renewable energy projects, allowing municipalities to make loans to property owners for retrofit projects. The loan is secured by a lien on the owners' property and is paid back via a charge on the property tax bill. Municipal loan pools are funded by issuing bonds and/or with state/federal grant funding. The mortgage holder's consent is required before Commercial PACE applications are approved and assessments are placed. Based on credit and project specification guidelines provided by the DOE, reduced monthly energy bills should more than offset the additional charge on the monthly property tax bill (e.g. monthly energy savings > monthly loan payment).

A consortium assembled by the Carbon War Room, a market-based environmental non-profit, is actively demonstrating an innovative, regional approach to Commercial PACE financing. In this model, a project developer (e.g. Ygrene Energy Fund) obtains the rights to market PACE financing to building owners within a municipal jurisdiction. A credit-worthy contractor (e.g. Lockheed Martin) implements efficiency measures. The contractor guarantees energy savings and works with a third party (e.g. Energi Insurance Services) to underwrite an insurance policy to back their guarantee (e.g. Hanover Re). A capital provider (e.g. Barclays Capital) offers low-interest (e.g. 7%), short-term loans to finance projects. Loans are bundled into long-term bonds and sold to institutional investors (e.g. pension funds). This model is currently being tested in Sacramento, CA and Miami, FL and is expected to finance up to $650-mil in efficiency projects over the next few years.

EXAMPLES: Palm Desert Energy Independence Program - Palm Desert, CA; Sonoma County Energy Independence Program (SCEIP) - Sonoma County, CA; Green Finance SF - San Francisco, CA; Boulder County Climate Smart Loan Program, Boulder, CO; Miami, FL and Sacramento, CA pilot programs

Level of Funding	Maximum loan per project is program dependent. Minimum loan amounts at least $2,500.
Timing of Funding	Upfront
Type of Funding	Loans pools financed by a pooled municipal bond, stand-alone municipal bond or privately funded owner arranged bond.
Repayment Vehicle	Property tax bill
Sectors	Multi-Family Residential (>4 units), Commercial and Industrial
Current Funding/Rate of Growth	As of March 2011,$9.7M had been approved for Commercial PACE funding (Clinton Climate Initiative). Growth potential unclear.
Institutional Players	Energy contractors, ESCOs (projects >100k sf), multi-family/commercial property owners, municipal tax assessor's office, municipal program administrators, community development financial institutions, insurance providers, project

	developers, banks and institutional investors.

ADVANTAGES: Loan security through a tax lien enables beneficial terms (6-8% interest, long repayment periods – average 10-20 yrs.), and facilitates cash flow positive projects (i.e. monthly energy savings > monthly loan payments). Some institutional investors are interested in funding this model if there is sufficient scale (e.g. >$100-mil). Debt obligation transfers with ownership, which enables investments in longer payback measures and lifted debt payment requirements at sale or refinance. Provides employment boost for participating municipalities.Streamlines application process, which lowers relative transaction costs.Facilitates community-wide investments in energy efficiency.Enables certain property owners to deduct payments from income tax liability.Taps into large sources of capital such as municipal bonds. FHFA grievances do not impact Commercial PACE, since mortgage consent is a prerequisite to funding.

DISADVANTAGES/BARRIERS TO SCALE: A major limiting factor in scaling this model is that the Mortgage holder's consent is required before PACE applications are approved and assessments are placed. The program is available only to property owners. Portable items (e.g. screw-in light bulbs, movable refrigerators, etc.) are not eligible for PACE financing. There are significant legal and administrative expenses to municipalities to start programs, which typically take 6-12 months. Not appropriate for investments below $2,500 due to minimum fixed origination and administrative costs. May not be appropriate for small towns and cities since scale is required to amortize set up costs.

MARKET ENABLING MEASURES: For the state governments that have yet to enable PACE programs, pass changes in land secured financing laws. At least one bank with a large portfolio of commercial loans has reached out to building owners to solicit interest in Commercial PACE loans. This experience has demonstrated that Class A building owners would rather self-finance projects than take out PACE loans. Successful execution of this approach within a defined set of buildings could overcome challenges of securing the consent of first mortgage holders.

SOURCES AND LINKS: *Clean Energy Finance Guide for Residential and Commercial Building Improvements, Third Edition, Ch-13 Commercial Property-Assessed Clean Energy (PACE) Financing* – Department of Energy - Finance Technical Assistance Team:http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/default.html

Commercial Property Assessed Clean Energy (PACE) Primer – Department of Energy Office of Energy Efficiency and Renewable Energy:http://www1.eere.energy.gov/wip/pdfs/commercial_pace_primer.pdf

"Tax Plan to Turn Old Buildings 'Green' Finds Favor", Justin Gillis, New York Times, September 19, 2011: http://www.nytimes.com/2011/09/20/business/energy-environment/tax-plan-to-turn-old-buildings-green-finds-favor.html?ref=justingillis

PROPERTY ASSESSED CLEAN ENERGY (PACE) – RESIDENTIAL

DESCRIPTION: Residential PACE programs allow local governments, when authorized by state law, to fund energy improvements on low-density residential properties (up to 4 units) with long-term loans. Required state legislation extends the land secured financing model to energy efficiency and renewable energy projects, allowing municipalities to make loans to residential property owners for retrofit projects. The loan is typically secured by a lien on the owners' property and is paid back via a charge on the property tax bill. Municipal loan pools are funded by issuing bonds and/or by state or federal grant funding (i.e. ARRA). This loan is given a first lien position and takes precedence over the mortgage in the event of default. Recent grievances filed by Fannie Mae and Freddie Mac on the first lien position of PACE loans among other concerns by FHFA and others have effectively stopped Residential PACE programs. Many experts consider the program indefinitely terminated. Based on credit and project specification guidelines provided by the DOE, the reduced monthly energy bills should more than offset the additional charge on the monthly property tax bill.

EXAMPLES: Sonoma, CA; Babylon, NY; Orange County, CA

Level of Funding	Maximum loan per project is program dependent. Efficiency projects typically range from $10k - $20k without solar systems, $20k - $45k with solar systems.
Timing of Funding	Upfront
Type of Funding	Consumer loan pools financed by federal grant awards, municipal bond proceeds or appropriations
Repayment Vehicle	Property tax bill
Sectors	Single family residential, small multi-family (up to 4 units) and small commercial
Current Funding/Rate of Growth	Residential PACE is frozenindefinitely. Since 2008, approximately $60-mil in PACE Financing has been originated in cities across the U.S.
Institutional Players	Energy Contractors, Homeowners, Residential Property Owners, Municipal Tax Assessor's Office, Municipal Program Administrators, Community Development Financial Institutions

ADVANTAGES: The tax lien adds security to PACE loans and enables more attractive financingterms (6-8% interest, long repayment periods – average 15-20 yrs.). Better terms enable cash flow positive projects (i.e. monthly energy savings > monthly loan payments), and reduces the borrower's risk of default. The debt obligation transfers with ownership, enabling investments in longer payback measures. Municipalities can streamline application process and facilitate community-wide investments in energy efficiency. Some property owners are allowed to deduct payments from their income tax liability.

DISADVANTAGES/BARRIERS TO SCALE: Available only to property owners. Portable items (e.g., screw-in light bulbs, standard refrigerators, etc.) are not eligible for financing. There are relatively high legal and administrative expenses to start programs, which typically take 6-12 months. Not

appropriate for small improvement projects due to significant fixed origination and administrative costs.

FHFA, Freddie Mac and Fannie Mae filed objections to PACE, taking issue with the senior position of PACE loans. This has frozen the vast majority of residential PACE programs nationally. The prevailing view is that these objections have killed Residential PACE.

MARKET ENABLING MEASURES: Demonstrate to home loan banks that energy reductions created by PACE-funded retrofits are NOI positive (loan repayment < energy savings) and therefore enhance a borrower's ability to pay. Pursue federal legislative or executive action to resolve the FHFA opposition.

SOURCES AND LINKS: *DOE Guidelines for Pilot PACE Financing Programs* – May 7, 2010:http://www1.eere.energy.gov/wip/pdfs/arra_guidelines_for_pilot_pace_programs.pdf

Local Governments and Federal Agencies Clash Over Property Assessed Clean Energy Programs – Cynthia Boland, Esq., Distributed Energy Financial Group LLC., September, 2010:http://www.defgllc.com/content/Publications/reports.asp

Compendium of Best Practices: Sharing Local and State Successes in Energy Efficiency and Renewable Energy from the United States - Renewable Energy and Energy Efficiency Partnership (REEEP), Alliance to Save Energy, American Council on Renewable Energy (ACORE) – April, 2010 – Pg. 45:http://www.reeep.org/16672/compendium-of-u-s-best-practices.htm

Energy Efficiency Paying The Way: New Financing Strategies Remove First-Cost Hurdles – CalCEF Innovations - Bob Hinkle and David Kenny – February, 2010:http://www.fypower.org/pdf/CALCEF-WP-EE-2010.pdf

Status Update – Pilot PACE Programs – July, 2010:http://www1.eere.energy.gov/wip/pace.html

UNSECURED CONSUMER LOANS

DESCRIPTION: A sizable portion of efficiency upgrades, particularly for less capital-intensive investments, are financed using existing cash reserves, savings from residents, or appropriations from government entities. Residential retrofits are also being funded utilizing unsecured consumer loans. These loans fall into three main categories: credit card financing, contractor liens, and unsecured home improvement loans. A contractor lien involves an installment contract in which payments are due over an extended period of time. Unsecured home improvement loans are of growing interest to federal policy, philanthropy, and commercial entities. The Fannie Mae Energy Loan provides higher interest rates than secured loans, but offers terms of up to 10 years. Fannie purchases these loans through specialized energy lenders, such as AFC First. Similar products are also offered through other sources, such as GE Money and Enerbank.

For unsecured efficiency loans to scale, mechanisms must exist to aggregate and sell loans to a secondary markets. One initiative to create this mechanism is the "Warehouse for Energy Efficiency Loans" or "WHEEL" program, under development by the Energy Programs Consortium and Pennsylvania Treasury Department. The mechanism will facilitate the purchase of unsecured energy efficiency retrofit loans, aggregate loans for between six and twelve months and sell the portfolio of loans to capital market investors, possibly in a securitized structure. The goal is to create a national program, where WHEEL is buying loans from all states, packaging and selling them.

EXAMPLES: Fannie Mae Energy Loan, GE Money, Enerbank, Maryland Clean Energy Center (MCEC) MHELP program, Warehouse for Energy Efficiency Loans (WHEEL) mechanism.

Level of Funding	Up to 100%
Timing of Funding	Upfront
Type of Funding	Consumer loans or self-financing
Repayment Vehicle	Credit Card Bill, Contractor Agreement or Loan Payment
Sectors	Residential
Institutional Players	Building Owners, Lenders, Credit Card Companies

ADVANTAGES: Easier access to capital.

DISADVANTAGES/BARRIERS TO SCALE: Higher interest rates. Good credit scores required to borrow. Requires initiative of home/building owner to investigate and select efficiency measures.

SOURCES AND LINKS: *AFC First Energy Loan*:
http://energyloan.net/index.phphttp://energyloan.net/index.php

Maryland Clean Energy Center:http://mcecloans.com

MODELS SUMMARY

The following matrix arrays all models analyzed, providing a summary characterization of each model. Heading categoriesinclude: *Building Sector, Source of Program Funds, Program Administrator, Loan Originator, Repayment Vehicle, Project Risk Profile, Level of Establishment* and *Growth Potential*as well as suggested *Market Enabling Actions*. Program Administrator is the coordinating entity. The Loan Originator reviews loan applications and decides which projects get financing. Project Risk Profile explains which entities carry the performance and financial risks as well as the recourse in the transaction. The suggested growth potential of a given model reflects conversations with study Advisors and national energy efficiency experts and indicates the potential to channel additional billions of dollars into energy efficiency within the next 3 to 5 years.

Energy Service Performance Contracting is listed first due to its maturity. Subsequent models are clustered to reflect similarity to each other.

MODEL NAME	BUILDING SECTOR				SOURCE OF PROGRAM FUNDS	PROGRAM ADMINISTRATOR	LOAN ORIGINATOR	REPAYMENT VEHICLE	PROJECT RISK PROFILE	MARKET ENABLING ACTION	LEVEL OF ESTABLISHMENT	GROWTH POTENTIAL
	C	I	R	F/M								
Energy Service Performance Contracting (ESPC)	X	X		X	Private Debt and Equity Utility Incentives	Third Party Specialized Broker	Third Party Specialty Investor Special Purpose Entity (SPE)	Service Contract	Performance Risk - ESCO Recourse - Assets Installed, Unsecured Financial Risk - Lender, SPE	PPA Arrangements Loan Guarantees Loan Loss Reserve Standardize M&V	Well established	LARGE
Energy Services Agreements (ESA)	X	X			Private Debt and Equity	Project Developer	Specialty Investors Special Purpose Entity (SPE)	Terms of PPA or Service Agreement	Performance Risk - SPE Recourse - Equipment Installed, Unsecured Financial Risk - SPE, Investors	Enable public entities to use ESAs to finance EE projects.	Few examples	LARGE
State/Municipal Loan Programs	X	X	X		State/City Appropriations Federal Grants State/City Bond Financing Tax Appropriations Revolving Loan Fund	Government Agency Government Funded Entity (GFE)	Government Agency GFE Local Bank	Loan Payments to GFE or Bank Some programs such as cost sharing or grants require no pay back.	Performance Risk - Host Recourse - Unsecured, Equipment Installed Financial Risk - Host, City/State	Rate Buy Down Preferential Terms Federal Loan Guarantees Loan Loss Reserve	Well established	LIMITED
Sustainable Energy Utility	X		X	X	Electric Bill Surcharge Bonding Authority Shared Savings	Sustainable Energy Utility	Sustainable Energy Utility	Shared Savings	Performance Risk - SEU, Building Owner Financial Risk - SEU, State	Establish bonding authority for SEU setup nationally	Few examples	LARGE

MODEL NAME	BUILDING SECTOR				SOURCE OF PROGRAM FUNDS	PROGRAM ADMINISTRATOR	LOAN ORIGINATOR	REPAYMENT VEHICLE	PROJECT RISK PROFILE	MARKET ENABLING ACTION	LEVEL OF ESTABLISHMENT	GROWTH POTENTIAL
	C	I	R	F/M								
Carbon Market Funding	X	X	X		Carbon Markets	Utility ESCO PUC/PSC Competitive Mechanism	N/A	N/A	N/A	Establish in one or a few markets (e.g. California), establish criteria relating to monitoring, performance, bonding and aggregation.	New model	LARGE
Mortgage-Backed EE Financing	X		X		Mortgage Lenders	Mortgage Lenders Federal Housing Administration (FHA) U.S. Department of Housing and Urban Development (HUD)	Mortgage Lenders	Mortgage bill	Performance Risk - Host Recourse - Property Financial Risk - Mortgage Lender, FHA	Develop and pilot Green Ginnie MBS Rate Buy Down Preferential Terms E-Loan Origination Offer commercial EE mortgage	Few examples	LARGE
Preferential Terms for Green/EE Buildings	X	X	X		Insurance Companies Mortgage Lenders	Insurance Companies Mortgage Lenders	Mortgage Lenders	Mortgage Bill Insurance Policy	Performance Risk - Host Recourse - Property Financial Risk - Mortgage Lender or Insurance Company	Develop useful data for institutional investors/ insurance providers to help meet requirements for pursuing preferential terms.	Few examples	LARGE

MODEL NAME	BUILDING SECTOR				SOURCE OF PROGRAM FUNDS	PROGRAM ADMINISTRATOR	LOAN ORIGINATOR	REPAYMENT VEHICLE	PROJECT RISK PROFILE	MARKET ENABLING ACTION	LEVEL OF ESTABLISHMENT	GROWTH POTENTIAL
	C	I	R	F/M								
Utility On-bill Financing	X	X	X		Utility funds Third party financing Bond proceeds	Utility Third party	Utility Third party	Utility bill	Performance Risk - Host Recourse - Utility service Financial Risk - Host and utility, third party financial institution or bond holders	Loan guarantees Loan loss reserves PUC mandate PUC bond issue Establish leveraged fund	Well established	LARGE
Property Assessed Clean Energy (PACE) - Commercial	X	X			State/City Government Money Federal Grants Investors	Government Agency Government Funded Entity (GFE) Third Party	Government Agency GFE Investor	Property Tax Bill	Performance Risk - Host, Contractor, Insurance Provider Recourse - Property Financial Risk - Government Agency, Investor, GFE	State policy to enable PACE programs Secure consent amongst large first lien mortgage holders Work with mortgage holders to offer PACE financing	Few examples	LARGE
Property Assessed Clean Energy (PACE) - Residential	X		X		State/City Government Money Federal Grants Specialty Investors	Government Agency Government Funded Entity (GFE) Third party administrator	Government Agency GFE Investor	Property Tax Bill	Performance Risk - Host Recourse - Property Financial Risk - Government Agency, Investor or GFE	State policy to enable PACE programs Acceptance by FHFA and Home Loan Banks of PACE's First Lien Position	Few examples	LIMITED
Unsecured Consumer Loans			X		Unsecured Loans/Lines of Credit Contractor Liens	Financing coordinated by building owner	Building Owner Lenders Contractors	Credit Card Bill Contractor Agreement Home Improvement Loan Payment	Performance Risk - Building Owner Recourse - none Financial Risk - Building Owner, Lenders	Loan guarantees, Loan loss reserves	Well established	LIMITED

PART II: STRATEGIES

INTERMEDIARY AGGREGATED SCALE PURCHASING

DESCRIPTION: Intermediary Aggregated Scale Purchasing aggregates purchases of efficiency products by providing interest rate deductions, facilitating bulk purchase discounts or mandating more stringent performance requirements across a buying group (e.g. churches, real estate portfolios, etc.). One developing example of aggregated buying is the Clinton Climate Initiative, which takes a holistic approach to deploy climate change solutions, such as building retrofits and outdoor lighting, with a global reach. A second, newer example is the Global Cool Cities Alliance, which seeks to counter the heat island effect in urban areas by promoting use of highly reflective materials/paints on rooftops and other surfaces to reflect sunlight, decrease temperature, and reduce cooling loads. The use of reflective paints/materials decreases energy bills, CO2 emissions, ozone formation, and provides highly cost effective, substantial cost savings. The Evangelical Environmental Network Climate Initiative educates, coordinates and arranges funding for energy efficiency upgrades of houses of worship. All these models work towards scalable solutions that when implemented on a widespread basis could reduce costs and provide higher financial returns.

APPLICABLE MODELS: All

EXAMPLES: Clinton Climate Initiative, Global Cool Cities Alliance, Evangelical Environmental Network, Carbon War Room's Green Capital – Global Challenge Initiative, MintoUrban Communities, Inc. (MUCI) Energy Management Program.

ADVANTAGES: Reduces the cost of financing or purchase of energy efficiency upgrades.

DISADVANTAGES: Difficult to set up and coordinate. Large entities already have strong buying power, making aggregation more valuable to smaller entities.

SOURCES AND LINKS: *Global Cool Cities Alliance, Strategy and Operations Plan*: http://www.whiteroofsalliance.org/

Clinton Climate Initiative:http://www.clintonfoundation.org/what-we-do/clinton-climate-initiative/

*Evangelical Environmental Network:*http://climateprogress.org/2010/09/27/churches-going-green-greg-kats-greening-our-built-world/

MintoUrban Communities: an Energy Efficiency and Environmental Leader: http://oee.nrcan.gc.ca/publications/commercial/m92-263-2003e.cfm?attr=20

REVOLVING LOAN FUND

DESCRIPTION: A revolving loan fund (a revolver) is a facility that lends capital to fund energy efficiency/green building and/or renewable energy improvements; loan repayments recapitalize the funding pool to enable additional lending. Revolvers can be administered by a range of entities, but are most commonly government-sponsored and managed. They commonly offer lower interest rates and/or more flexible terms than are available from capital markets and typically focus on financing efficiency upgrades such as lighting, insulation, and heating and cooling system upgrades. In addition, many universities, including Harvard, have established revolving loan funds to finance energy efficiency retrofits in their campus buildings.

Revolving loan funds can be capitalized through state bond proceeds, treasury investments, or ratepayer funds. While over 30 states have established loan programs for efficiency or renewable energy financing, their ability to attract borrowers has varied widely based upon numerous factors including interest rates, loan terms, credit requirements, and marketing effectiveness. Program administrators typically set the interest rate for these funds either by pegging the rate to state borrowing rates, or by using program funds to buy down the interest rate to lower levels. The majority of loan terms are 10 years or less. Some programs require loans to be secured by additional collateral, while others create loan loss reserve funds to limit losses in case of defaults.

APPLICABLE MODELS: State/Municipal Loan Programs

EXAMPLES: Rhode Island Energy Loan Program, State of Arizona Energy Efficiency Revolving Loans, Maryland Energy Administration Clean Energy Loan Program, Harvard Green Campus Funds, Bank of America, Texas Loan Star Fund.

ADVANTAGES: In the MUSH or commercial markets, revolving loan funds provide a method to use operational budget allocated for energy expenses to fund capital investments in energy efficiency upgrades. For universities or lending institutions, such as Bank of America, revolving loan funds provide larger loans for commercial building retrofits and upgrades. Corporations or other large entities can create a revolving fund to overcome obstacles between operating and capital budgets- this was part of the rationale used by Bank ofAmerica and Harvard in developing a revolving loan fund to support upgrades at their own facilities.

DISADVANTAGES: Simple revolving loan funds, funded directly with public funds (such as ARRA funds), do not leverage private capital, and also tend to "revolve" quite slowly (based on the loan term length). This means that public dollars may have a relatively limited impact in the near term compared to the potential to leverage private funds by using the public funds as a credit enhancement. This limitation can be overcome by additional debt to leverage increased investment.

SOURCES AND LINKS: *DOE Solution Center State and Municipal Revolving Loan Funds*: http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/RevolvingLoanFunds.html

Harvard Green Campus Fund:http://green.harvard.edu/loan-fund

*National Renewable Energy Laboratory, Revolving Loan Fund Webinar:*http://www.nrel.gov/applying_technologies/state_local_activities/webinar_20090826.html

PREFERENTIAL LOANS

DESCRIPTION: Preferential loans involve the use of data by lending (or insurance) institutions to evaluate if and how much green/EE buildings merit preferential interest or insurance terms. The thesis is that energy efficient buildings reduce net operating expenses for a home or businesses due to decreased utility bills, thus increasing the disposable income of tenants. Improved building NOI (due to lower utility costs), brand enhancement and/or market preference (e.g. for healthier work buildings), may translate into higher building value and/or lower risk. In case of default, the higher building value would reduce loss risks to lenders. Analysis by CoStar indicates a considerable value creation/differentiation for green and energy efficient buildings that indicate that preferential loan terms and/or insurance rates appear warranted, with similar findings being documented in "Greening Our Built World".

APPLICABLE MODELS:Mortgage-Backed Financing, Preferential Loan and/or Insurance Terms for Green and/or EE buildings.

EXAMPLES: The New Resource Bank.

ADVANTAGES: Helps encourage energy efficiency and greening upgrades through existing, efficient market channels. Firms that are first movers in offering lower rates for green/efficient buildings will gain access to desirable client demographics and increased brand loyalty.

DISADVANTAGES/BARRIERS: Depends on increasing the quantity/quality of data documenting reduced utility bills, lowered health costs or other benefits and on the credit worthiness/default rate of their occupants. Improved and expanded data could lead to the development of a well-recognized underwriting standard for EE loans, which would facilitate the large-scale proliferation of preferential terms. Even with the availability of additional data supporting the rationale for lower rates to reflect lower risks, lending institutions are typically slow to modify lending practices and would require a large volume market for their preferential loan products.

SOURCES AND LINKS: *Coalition for Green Capital:* http://www.coalitionforgreencapital.com/

Costar Green Study: 2008 http://www.costar.com/uploadedFiles/Partners/CoStar-Green-Study.pdf

Building Rating.org - Institute for Market Transformation and Natural Resource Defense Council: http://www.buildingrating.org/

*Article: Chancellor Aiming to Reveal Structure of Green Investment Bank by Christmas – Guardian - November 4, 2010:*http://www.guardian.co.uk/environment/2010/nov/04/osborne-green-investment-bank-structure

Greening our Built World: Greg Kats, Section 1.10- Property Value Impacts on Green Buildings, p. 76

New Resource Bank:https://www.newresourcebank.com/content/energy-efficiency-home-equity-financing

RISK REALLOCATION

DESCRIPTION: Use of Insurance instruments, such as loan guarantees or loan loss reserves to cost effectively reduce or reallocate risk of energy efficiency financing in order to lower cost and enable scale financing.

A loan loss reserve fund provides partial or full risk coverage for EE loans. This additional security enhances the risk profile of EE projects and motivates financial institutions to offer EE financial products. In the event of a default, the investor is able to recuperate their loss from the reserve fund, broadening access to capital and lowering interest rates. The fund is typically organized by a government agency or government-sponsored agency and can be capitalized with public funds, such as the American Recovery and Reinvestment Act (ARRA) stimulus funds. Loan loss reserve funds take a portfolio approach to credit structuring. The loan loss reserve approximates the anticipated default rate on all the loans in the portfolio, so a reserve fund equal to 2% to 10% of the portfolio can support third party financing that is 10 to 50 times larger than the size of the reserve. A loan guarantee offers insurance against loan default.

APPLICABLE MODELS: State/Municipal Loan Programs, ESPC (credit risk coverage), Mortgage-Backed Financing

EXAMPLES: FHA PowerSaver, Bellingham Whatcom County Washington Loan Loss Reserve

ADVANTAGES: Reduces repayment risks to lenders in the case of default or partial default. Leverages private capital and offers greater opportunity to scale financing. Can result in better terms and lower borrowing rates.

DISADVANTAGES: These are difficult to price, involve significant transaction costs (e.g. evaluating risk and monitoring) and need to be done at scale to be efficient. Incentives must be in place to appropriately distribute risk and to prevent excess losses in the case of default or partial default.

SOURCES AND LINKS: *Structuring Loan Loss Reserve Funds for Clean Energy Finance Programs - John MacLean, Energy Efficiency Financing Corp., January, 2010:*http://www.cap-e.com/Capital-E/Energy_Efficiency_Financing_Resources_files/Loss_Reserve_Funds_MacLean_Presentation_011510.pdf

E-LOAN

DESCRIPTION: Highly-automated origination and a qualification system developed and used to reduce cost and time of processing large volume of efficiency loan origination, monitoring and servicing (e.g. use of e-loan type strategy of electronic automation, screening, sourcing, etc). Turnkey service providers can offer financing and professional services to ensure that municipalities incur no incremental costs or unnecessary program risks. Online portal(s) allows applicants to easily and rapidly submit and, if qualifying, obtain loans for eligible energy efficiency upgrades.

Renovate America is a young San Diego-based firm applying an e-loan approach to originating, qualifying, servicing and monitoring energy efficiency financing and projects. Its sole current product is to serve as a full-service provider to municipalities administering PACE programs. The firm identifies and qualifies projects, offers third party financing, and monitors/administers loans repaid through property tax bills under municipality-sponsored PACE programs. It earns revenue by receiving a fee at the time of origination and by recognizing a gain on sale at the time the EE project is permanently funded. This approach reduces transactions costs and leverages the e-loan software-based, low transaction cost strategy developed by E-Loan for conventional mortgage origination. While the Renovate America model is currently only applied to PACE financing, the strategy of using sophisticated e-loan origination and e-servicing could be utilized in other EE financing models (e.g. third party, utility, or municipal sponsored program). Renovate's reliance on PACE is a risk given uncertainty around the future of Residential PACE even in locations where the program has already been authorized.

APPLICABLE MODELS:Loan-based models

EXAMPLES: Renovate America, Green Door

ADVANTAGES: Reduces loan origination, servicing and administrative costs. Greatly simplifies the process of obtaining a loan. Works well with aggregated buying models for specific energy efficiency technologies.

DISADVANTAGES: More complex or custom retrofits may not be eligible for pre-approval using an e-loan model since further review would be required. Requires significant up-front investment to develop data management, processing and servicing capabilities.

SOURCES AND LINKS: *Renovate America*, http://www.renovateamerica.com/

POINT OF PURCHASE INTEREST RATE BUY-DOWN

DESCRIPTION: Financing by municipal sponsors and utilities used to "buy-down" the interest rates of qualified loans used for purchases of energy efficiency upgrades (Energy Star HVAC, Windows, etc.). The borrower receives a lower interest rate on a loan used to purchase/install equipment, and also obtains technical information and access to pre-qualified contractors. Payment from a municipal sponsor provides an effective, below-market interest rate. The municipality facilitates lending and helps reduce energy consumption, often in accordance with state mandates. If adequate capital is obtained to buy-down rates, the program has large potential for scale. A scale program could secure volume discounts and might demonstrate and leverage lower insurance, health and/or default risks/costs to help justify such a program.

APPLICABLE MODELS: State/Municipal Loan Programs

EXAMPLES: Colorado Governor's Energy Office: ENERGY STAR for New Homes

ADVANTAGES: Offers mechanism for obtaining better terms for borrowers to finance energy efficiency retrofits than would otherwise be available.

DISADVANTAGES: Program scale is limited by funds available to achieve rate buy downs. Even with potential buying power and secondary benefits, this strategy is unlikely to become self – financing.

SOURCES AND LINKS: *Department of Energy Solutions Center*: http://www1.eere.energy.gov/wip/solutioncenter/financialproducts/ThirdPartyLoans.html

Upgrading America's Homes: Comprehensive Residential Energy Upgrade Financing: Greg Kats and David Carey. http://www.cap-e.com/Capital-E/Resources_%26_Publications.htmlhttp://www.cap-e.com/

RE-ALIGN INCENTIVE STRUCTURE

DESCRIPTION: A split incentive often occurs in many tenant-occupied property. A tenant responsible for paying utility bills is unlikely to invest in capital-intensive efficiency upgrades since they would be improving a building they do not own and may not continue to occupy in the future. Further, under triple net commercial leases, an owner is indifferent to improving the efficiency of an investment property in which they are not responsible for paying the energy bills.

Tenants have no financial incentive to commit to a financing structure that requires them to make payments beyond the end of their lease. This split incentive can be overcome by using a loan or long-term financing vehicle that attaches to the building itself. In this strategy, a new tenant becomes responsible for servicing the EE payments on the space once they begin the lease term.

There is an emerging form of retrofit financing in public housing and federally subsidized, privately owned multifamily residential property used to overcome split incentives that can broadly be described as a "shared savings approach." The property manager calculates a more accurate (i.e. lower) tenant "utility allowance" (the assumed amount in energy bill that is automatically deducted from tenant rent, as required under federal rules) and utilizes the proceeds from higher rents to make energy improvements to the property, sharing some of the savings with the tenant. This mechanism has been used in several properties and could expand rapidly with support from the Department of Housing and Urban Development (HUD) who is actively considering it.

APPLICABLE MODELS: PACE, Utility On-bill Financing, State/Municipal Loan Programs

EXAMPLES: U.S. Department of Housing and Urban Development (HUD), PACE Models, On-Bill Financing Programs (tariffs)

ADVANTAGES: Removes and overcomes split incentive between owners and tenants. Creates methods where owner and tenant can share savings from energy efficiency thus creating financial benefits for each party.

DISADVANTAGES: More complexities and higher transactions costs in setting up a shared savings approach.

SOURCES AND LINKS: *Center for American Progress, Green Housing Report:*
http://www.americanprogress.org/issues/2008/12/green_housing_report.html

STRATEGIES SUMMARY MATRIX

The following matrix summarizes characteristics of the strategies analyzed in this study. Heading categories include: a *Strategy Description, Applicable Building Sectors, Examples, Applicable Models* as well as the *Level of Establishment* and *Growth Potential*. The suggested growth potential of a given strategyreflects conversations with study Advisors and national energy efficiency experts and indicates the potential to channel additional billions of dollars into energy efficiency within the next 3 to 5 years.

STRATEGY NAME	DESCRIPTION	BUILDING SECTOR				EXAMPLES	APPLICABLE MODELS	LEVEL OF ESTABLISHMENT	GROWTH POTENTIAL
		C	I	R	F/M				
Intermediary Aggregated Scale Purchasing	Encouraging aggregated purchases of efficient products by providing interest rate deductions or mandating more stringent performance requirements across a buying group (e.g. churches, real estate portfolio). Aggregated buying can facilitate bulk purchase discounts to decrease project costs.	X	X	X	X	Clinton Global Initiative Evangelical Environmental Network Multi-City/State Carbon War Room's Green Capital - Global Challenge initiative	* All	Well established	**LIMITED**
Revolving Loan Fund	A revolving loan fund (RLF) is an established loan-fund for EERE investments in which loan repayments recapitalize the funding pool.	X	X	X	X	Rhode Island Energy Loan Program Arizona Energy Efficiency Revolving Loans Maryland Energy Administration Clean Energy Loan Program Bank of America Harvard Texas Loan Star	* State/Municipal Loan Programs	Well established	**LIMITED**
Preferential Loans	The use of data to convince insurance & lending institutions that the lower risks &/or higher returns of green buildings merit preferential interest rates & insurance terms. Energy efficient buildings reduce operating expenses for a home or business, increasing NOI hence decreasing risk. Since the occupant of an energy efficient building should have increased capital available (i.e. energy savings > monthly loan payment), they may be more credit worthy & deserve better debt terms.	X	X	X		New Resource Bank Green Banks	* Mortgage-Backed Financing * Preferential Terms for Green/EE Buildings	Few examples	**LARGE**

STRATEGY NAME	DESCRIPTION	BUILDING SECTOR				EXAMPLES	APPLICABLE MODELS	LEVEL OF ESTABLISHMENT	GROWTH POTENTIAL
		C	I	R	F/M				
Risk Reallocation	Use of insurance mechanisms such as loan guarantees or financial instruments, such as loan loss reserves, to lower overall program & loan costs. A loan loss reserve provides partial risk coverage to motivate investors to offer energy efficiency financing products. In the event of default, a loss reserve serves to limit investor losses. Similarly, a loan guarantee offers insurance against loan default wherein a third party takes responsibility for payment in case the primary borrower defaults.	X	X	X	X	Loan Loss Reserve Loan Guarantees; Evan Mills Research (LBNL) FHA Powersaver Program Bellingham/Whatcom County Washington	* State/Municipal Loan Programs * Mortgage-Backed Financing * ESPC (credit risk coverage)	Well established	**LARGE**
E-Loan	Scale origination used to reduce transaction costs via electronic automation of loan sourcing & servicing. Turnkey service providers offer financing & professional services to reduce municipality costs or program risks. Online portals allow applicants to easily apply for & obtain loans for applications that meet origination criteria.			X		Renovate America Green Door	* Loan-based models	New strategy	**LARGE**
Point of Purchase Interest Rate Buy-Down	Financing by a municipality or utility is used to "buy-down" the interest portion of qualified energy efficiency loans, providing better terms to borrowers as an incentive to buy more energy efficient products (e.g. Energy Star HVAC, windows). The investor receives payment from a municipal sponsor to lower the effective interest rate on energy efficiency loans (e.g. 6.9% as opposed to 11.9%). While the program helps to facilitate lending for energy efficiency projects, it is limited to the size & scope of funding available to buy down rates. Once funding is exhausted, the program must end or new capital secured.	X		X		Colorado Governor's Energy Office: ENERGY STAR for New Homes	* State/Municipal Loan Programs	Well established	**LIMITED**
Re-Align Incentive Structure	Tenants have no financial incentive to commit to a financing structure that requires them to make payments beyond the end of their lease. This split incentive can be overcome by using a loan or long-term financing vehicle that attaches to the building itself. In this strategy, a new tenant becomes responsible for servicing the EE payments on the space once when they begin the lease term.	X		X		U.S. Department of Housing and Urban Development (HUD) PACE Models Shared Savings Approach	* Utility On-bill Financing, * State/Municipal Loan Programs * PACE	Few examples	**LIMITED**

APPENDIX

MODEL SUMMARY II

The following matrix summarizes, in greater detail than Table 1, the models discussed in this study. Heading categories include: a brief *Description, Applicable Building Sectors, Examples, Limits to Scale* as well as the *Level of Establishment* and *Growth Potential*. The suggested growth potential of a given model reflects conversations with study Advisors and national energy efficiency experts and indicates the potential to channel additional billions of dollars into energy efficiency within the next 3 to 5 years. Energy Service Performance Contracting is listed first due to its widespread use, while subsequent models are clustered to reflect similarity.

MODEL NAME	DESCRIPTION	BUILDING SECTOR				EXAMPLES	LIMITS TO SCALE	LEVEL OF ESTABLISHMENT	GROWTH POTENTIAL
		C	I	R	F/M				
Energy Service Performance Contracting (ESPC)	Energy Service Companies (ESCOs) develop, implement & arrange financing for comprehensive energy projects. The ESCO monitors energy savings & often maintains the upgrades over time. The savings produced typically exceeds the loan payments over the term of the contract, which is typically 10 to 20 years. The savings produced by the project are usually sufficient to repay the capital costs with a minority of savings going to the host. Once the contract ends, the owner keeps all energy savings.	X	X		X	ESCOs: Ameresco; Honeywell; Siemens; Johnson Control; FINANCIERS: Hannon Armstrong, Bostonia Group	* Generally not applied to residential or small commercial. * Large transaction costs associated with reaching agreement on ESPCs. * Dodd-Frank bill will limit ESCOs ability to originate loans to finance projects.	Well established	LARGE
Energy Services Agreements (ESA)	Third party entities negotiate ESAs, arrange/provide capital, develop projects and manage installed equipment for large industrial and commercial projects. An SPE is typically established. The SPE is capitalized by third party investors and finances the costs of the efficiency improvements. The host signs an Energy Service Agreement with a project developer and agrees to pay either a fixed or floating rate for the energy savings received. The host agrees to make payments for contractual terms of their agreement (e.g. 5-15 years). During this period, the SPE retains ownership of the installed equipment and returns cash flows to investors. This structure enables energy efficiency to be treated as a service and as an off-balance sheet transaction.	X	X			Energy Harvest Fund; Metrus Energy; Transcend Equity Development Corporation; Clean Feet; Green City Finance	* Small projects have higher transaction costs & are more difficult to implement. * Many commercial and industrial building owners prefer to self-finance EE projects. * Requires complex measurement & verification of energy savings. * New FASB pronouncements on service contract accounting could severely limit scale potential. * Requires very large individual projects or aggregation of many projects to gain interest from institutional investors.	Few examples	LARGE
State/ Municipal Loan Programs	Commonly involve city/state allocating funds from general fund, federal grants or rate payer funds & aligning state energy offices, county/city governments, utilities & non-profits to originate loans & conduct program administration. Portland Clean Energy Works Program (CEWP) makes loans to home owners to cover up-front project costs (minus available state incentives). Homeowners pay the loan back via a supplemental charge on their utility bills. The most successful programs have driven green job creation through workforce development programs for needed contracting work.	X	X	X		Portland Clean Energy Works Program; PA Keystone HELP; CO Governor's Energy Office: ENERGY STAR for New Homes; MD Clean Energy Center Home Owner Loan Program; Texas LoanSTAR Program	* ARRA grants funding most active programs. * State efforts can create redundancies with utility or other Government-funded efforts. * Benchmarking/tracking energy savings on state scale is contingent upon quality metering infrastructure. * Majority of states have statutes limiting local governments from lending public money for private purposes. * Scale of programs depend on access to secondary capital (e.g. bank debt, bond issuances, & foundation investments).	Well established	LIMITED

MODEL NAME	DESCRIPTION	BUILDING SECTOR				EXAMPLES	LIMITS TO SCALE	LEVEL OF ESTABLISHMENT	GROWTH POTENTIAL
		C	I	R	F/M				
Sustainable Energy Utility	A Sustainable Energy Utility (SEU) administers financing programs, offers technical assistance, and provides financial incentives to building owners to implement efficiency measures and support renewable energy installations. The SEU is created by legislation enabling a bonding authority and/or a utility bill surcharge. Among other programs, SEUs cover the incremental costs between conventional and high-efficiency technologies. The SEU offers incentives to developers of renewable energy equal to the difference between the cost of an equivalent conventional energy supply and the renewable energy installed.	X		X	X	Delaware Sustainable Energy Utility; DC Sustainable Energy Utility	* Few SEUs have been established to date. * Requires state-level political initiative to issue bond authority necessary to create entity.	Few examples	LARGE
Carbon Market Funding	Award the value of C02 reductions to firms that lower their emissions through investment in efficiency or renewable energy. By selling their anticipated future emission reductions on the forward market, firms can pay for a significant portion of the up-front capital investment.	X	X	X		N/A – not currently in practice	* A liquid forward market for carbon reductions must exist. * Utilities & NGO's may object. * Requires coordination amongst market regulators, utilities & M&V aggregators. * If set up incorrectly, could create substantial transactions cost. *Limited to areas with active carbon market.	New model	LARGE
Mortgage-Backed EE Financing	Mortgage-backed financing such as Energy Efficient mortgages (EEM) provide additional borrowing capacity or better terms on mortgages to borrowers buying a new home certified as energy efficient or investing in energy improvements in their existing home.	X		X		EE/Green Mortgage; Col. Energy Star Mortgage; New Resource Bank, FHA Powersaver, Community Preservation Corp. Green Financing	* Utilizing existing home equity to backstop efficiency investments occur only during purchase of new home or refinancing. * Lack of secondary market for EE mortgages.	Few examples	LARGE
Preferential Terms for Green/EE Buildings	A growing body of research and data shows that green/energy efficient buildings have lower operating costs, yield higher operating income, possess lower risk of default and have higher asset values than conventional, non-green buildings. Additionally, green buildings have broadly documented health and productivity benefits with associated reduced employee sick days and enhanced worker productivity. These benefits broadly improve tenant's operating margins and appear to create a valuable brand for property owners that can drive occupancy and rents. If institutional investors and insurance funds believe that green buildings merit preferential terms, building owners could access lower cost financing/insurance for their energy efficient buildings.	X	X	X		Fireman's Fund Green Building Insurance Product; New Resource Bank.	* Banks do not currently see this as a great opportunity to mitigate risk, drive NOI, enhance borrower credit, etc.	Few examples	LARGE

MODEL NAME	DESCRIPTION	BUILDING SECTOR				EXAMPLES	LIMITS TO SCALE	LEVEL OF ESTABLISHMENT	GROWTH POTENTIAL
		C	I	R	F/M				
Utility On-bill Financing	Upfront cost of an EE upgrade covered by a utility or other entity (e.g. third party financial institution) & customer repays investment (principal & interest) through a supplemental charge on their monthly utility bill. On-bill repayment allows for a streamlined process leveraging utility's existing customer relationships and access to information about energy usage & payment history. The repayment programs can be either loans-function like personal loans as when customer moves, full balance is paid- or tariffs (attached to meter so when a customer moves, next customer at meter continues to repay).	X	X	X		Sempra Utilities; United Illuminating; Manitoba Hydro; Midwest Energy How$mart; PAYS Programs; National Grid; Nstar	* Risk-averse utilities reluctant to play role of lender or change billing mechanisms. * Traditional utility business model provides disincentive for utilities to encourage energy efficiency. * Market enabling actions largely policy based. * Successful programs are typically oversubscribed due to limited, unleveraged funding. * Utilities do not want to service customer complaints about failed EE equipment.	Well established	LARGE
Property Assessed Clean Energy (PACE) - Commercial	Once authorized by state law, Commercial PACE programs allow local governments to fund EE improvements on multi-family (>4 units), commercial & industrial properties with long-term loans. The loan is secured by a lien on the property & is paid back via a charge on the property tax bill. Municipal loan pools are funded by issuing bonds and/or accepting state/federal grant funding (i.e. ARRA). Based on credit & project specification guidelines provided by DOE, reduced monthly energy bills should more than offset the additional charge on the monthly property tax bill.	X	X			Palm Desert Energy Independence Program; Sonoma County Energy Independence Program (SCEIP); Green Finance SF; Boulder County Climate Smart Loan Program; Boulder, CO; Miami, FL and Sacramento, CA Pilots	* Mortgage holder consent is required on each transaction (major limitation). * Available only to property owners; renters cannot access program directly. * Cannot finance portable items (e.g. screw-in light bulbs, etc.). * Not appropriate for investments below $2,500 due to minimum origination & administrative costs. * May be inappropriate for small towns/cities, scale required to reduce costs.	Few examples	LARGE
Property Assessed Clean Energy (PACE) - Residential	Once authorized by state law, Residential PACE programs allow local governments to fund EE improvements on low-density residential properties (up to 4 units) with long-term loans. Loan pools funded by issuing bonds and/or accepting state or federal grant funding (i.e. ARRA). Loan secured by a lien on the property & is paid back via a supplemental charge on the property tax bill. Based on credit & project specification guidelines provided by the DOE, reduced monthly energy bills should more than offset the additional charge on the monthly property tax bill. Since 2008, establishing legislation passed in more than 20 states.	X		X		Sonoma, CA; Babylon, NY; Orange County, CA	* Available only to property owners; renters cannot access program directly. * Cannot finance portable items (e.g., screw-in light bulbs, etc.). * High legal/administrative startup costs. * Not appropriate for small improvement projects due to minimum origination/ administrative costs. * FHA, Freddie Mac & Fannie Mae filed grievances with PACE, has frozen majority of residential PACE programs nationally.	Few examples	LIMITED
Unsecured Consumer Loans	A sizable portion of efficiency upgrades, particularly for less capital-intense investments, are financed using existing cash reserves, savings from residents, or appropriations from government entities. In the absence of self-financing, residential retrofits are also being funded utilizing unsecured consumer loans. These loans fall into three main categories; credit card financing, contractor liens, and unsecured home improvement loans.	X	X	X		Fannie Mae Energy Loan; GE Money; Enerbank; Maryland Clean Energy Center (MCEC) MHELP program; WHEEL Program	* Higher interest rates, good credit scores required to borrow *Requires initiative of homeowner to investigate and select efficiency measures.	Well established	LIMITED