

ENABLING INVESTMENTS IN ENERGY EFFICIENCY

A study of energy efficiency programs that
reduce first-cost barriers in the residential sector

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List of Acronyms

AMI – Area Median Income
Berkeley FIRST – Berkeley Financing Initiative for Renewable and Sustainable Technology
BPI – Building Performance Institute
CEA – Cambridge Energy Alliance
CEMF – Clean Energy Municipal Financing
CEELF – California Energy Efficiency Loan Fund
CIEE – California Institute for Energy and Environment
CPUC – California Public Utilities Commission
DSIRE – Database of State Incentives for Renewables & Efficiency
EFS – Energy Finance Solutions
EIM – Energy Improvement Mortgage
EPC – Energy Programs Consortium
ESCO – Energy Service Company
FEC – First Electric Coop
FICO – Fair Isaac Corporation
GHG – Greenhouse Gas
HPwES – Home Performance with Energy Star
LCC – Life Cycle Cost
NPV – Net Present Value
MECO – Maui Electric Company
NYSERDA – New York State Energy Research and Development Authority
OBF – On-Bill Financing
PAYS® – Pay As You Save Program
PG&E – Pacific Gas & Electric
RIC – Retail Installment Contract
SMUD – Sacramento Municipal Utility District
TIP – Tariffed Installation Program
VEIC – Vermont Energy Investment Corporation
VGS – Vermont Gas Systems
VGS – Vermont Gas Systems
VSECU – Vermont State Employees Credit Union

Abstract

Energy efficiency has a vital role to play in addressing our daily resource needs and creating a vibrant future for our society. This paper focuses on the first-cost barriers to increased energy efficiency in residential homes. Loans and other financing options will be important to enable the efficiency improvements to meet many of the goals of the California Public Utilities Commission's *Energy Efficiency Strategic Plan*. This study reviews existing, terminated, and proposed financing programs and reveals several limitations of these programs including: limited applicability of the programs to households most in need, low participation rates, difficulty assuring that savings will exceed payments, limited support for comprehensive energy retrofits, the inability of many programs to cover their costs, and issues particular to on-bill financing (OBF) programs. The author concludes with recommendations for improving the impact of financing programs in California.

Executive Summary

Energy efficiency has a vital role to play in addressing our daily resource needs and creating a vibrant future for our society. At the household level, electricity and fuel prices are rising, squeezing budgets especially for the poorest families. On a macro level, energy efficiency is repeatedly pointed to as the obvious first step in managing our energy supply and addressing climate change. Energy efficiency has also been highlighted as a vital opportunity for job creation in a new “green” economy.

An important arena for the transformation to a more energy efficient economy is in the residential building sector, which accounts for 30% of non-transportation energy use¹, 32% of electricity use², and 6% of greenhouse gas (GHG) emissions³ in California. Energy codes for new construction and incentive-based programs to voluntarily exceed code requirements have been effective tools to increase energy efficiency levels in new construction. However, improving the efficiency of our existing building stock is perhaps more important; buildings have many-decade lifetimes and today’s existing buildings will continue to be a majority of all buildings in 2050. Without a focused effort to reduce energy demand in existing buildings, it may be virtually impossible to meet GHG reduction targets or other goals, such as the California Public Utilities Commission’s goals to reduce energy use in existing homes by 40% and install low-energy heating and cooling systems in 50% of new and existing homes by 2020.⁴

Despite the tremendous potential for reducing energy consumption in the building sector, energy efficiency programs have often met with disappointing results. There are several barriers to improving the energy efficiency of homes. In fact, over the last 30 years there has been a contentious debate over why consumers and businesses forego “cost-effective” energy efficient products and practices, and what role public policy and enabling programs (such as financing programs) should play in influencing these decisions. Barriers to improving the efficiency of homes include:

- **Transaction costs** – The time and effort required to get enough information to make a decision, apply for financing, and arrange for the work to be done may simply not be perceived as worth the return in energy savings.
- **Lack of information** – Many customers do not know how to implement energy efficiency measures or understand and have confidence in the benefits of a project.
- **Uncertainty of energy savings** – On *average*, a set of measures might produce a predictable level of savings, but savings can never be perfectly predicted for an individual home.
- **Split incentives** – Split incentives occur when the decision-maker does not receive many of the benefits of a measure. An example is the case of rental property owners who lack incentives to invest in building efficiency upgrades because it is the tenant who pays the utility bill.
- **Initial capital investment** – The first cost of a project may deter investment, either because the resident does not have access to capital or they choose to make higher-priority investments.

This study reviews 18 residential efficiency financing programs in the U.S. and Canada with an emphasis on residential on-bill financing (OBF) programs to better understand the potential for addressing what is

¹ EIA 2005

² California Public Utilities Commission. *California Long Term Energy Efficiency Strategic Plan* (2008)

³ California Air Resources Board: 2004 Greenhouse Gas Inventory

⁴ California Public Utilities Commission. *California Long Term Energy Efficiency Strategic Plan* (2008)

often perceived to be one of the most important barriers –first cost. A description and analysis of each program can be found in Appendix A. This research revealed several limitations of these programs including: limited applicability of the programs to households most in need, low participation rates, difficulty assuring that savings will exceed payments, limited support for comprehensive energy retrofits, the inability of most programs to cover their costs, and issues particular to OBF programs.

Limited Applicability of Programs for Households Most in Need

It is relatively easy to provide a loan program for those who are educated, motivated, and credit-worthy – but these are exactly the people who are least in need of financing. There has been little success in addressing the financial barriers faced by those most in need of financing, including those with the highest energy cost burdens as a percentage of income, low or fixed incomes, poor credit, and those in rental housing. Many programs have credit requirements that include credit rating minimums and debt-to-income limits, and few programs systematically recognize expected energy savings as increasing the ability to pay. Many programs are also not available to rental properties, and those that are available usually do not successfully address the split incentives between rental property owners who make the investment and tenants who pay the utility bills. OBF programs face the same barriers in this area as traditional financing programs, unless the repayment is attached to the meter (as opposed to an individual tenant) which could *potentially* make a program more accessible both to renters and individuals with low credit scores but good bill repayment history.

Low Participation Rates

Despite the 150+ loan programs for residential energy efficiency in the United States, only a tiny fraction of the population has been reached. Most of the programs reached less than 0.1% of their “potential” customers in 2007, implying that in many cases their impact is marginal at best. Of course, many people have used traditional funding sources, or can pay for improvements up front, but the number of program participants is surprisingly small. Programs that have higher participation rates tend to have networks of engaged and informed contractors who use the financing program as a sales tool. OBF programs did not have noticeably higher participation rates, but there are still so few OBF programs that this could not be accurately assessed.

Difficulty Assuring That Savings Will Exceed Payments

Assuring that the measures financed will actually have a positive cash flow (i.e., savings are greater than loan payments each month) is critical. While this is especially true for low- and moderate-income people, it is essential that energy efficiency is not an additional burden for this population. Currently, most programs do not offer a rigorous assessment of expected savings or any guarantee for vulnerable populations, and the average loan term of five to seven years is often not long enough to achieve a positive cash flow for many improvements that would yield substantial energy savings. Most programs also do not offer any rigorous measurement and verification for the installed measures, therefore little is known about the actual impact.

Limited Support for Comprehensive Energy Retrofits

While basic weatherization and lighting might save 5% to 15% of energy use, more extensive retrofits might save 20% to 50% and usually will last much longer. However, these measures also often have longer payback periods and require financing with a term of 10 to 20 years to match the savings. Most programs offer terms of five to seven years. Longer financing terms are needed to reach this higher level of savings.

Inability of Programs to Cover Their Costs

Expecting programs to be self-supporting typically results in highly limited applicability and impact. Most of the higher-volume programs reviewed are likely serving participants who have higher incomes and access to other (albeit less attractive) sources of funding. It appears that financing alone might not be enough, especially to reach low- and moderate-income families. Most programs, particularly those with wider participation, offer additional subsidies in the form of free or low-cost “handholding,” cash rebates, or interest rate buy-downs to attract customers. They also provide guarantees to the provider of loan capital.

Additional Issues Particular to Residential On-bill Financing Programs

There are additional concerns that pertain to residential on-bill financing (OBF) programs. First, changing the billing system to allow for on-bill financing appears to be difficult for some utilities. Second, repayment allocation (i.e., who gets paid first) is an issue when customers partially pay their bills. When using a third-party source of capital for the OBF program, the utility usually covers the gas or electric charge first, increasing the risk to the lender. Third, using OBF for improvements that save non-utility fuels, such as heating oil, may be confusing for a customer who has an electricity-only utility bill (this is less of an issue in California where most utilities provide gas and electricity). Finally, the commitment of the utility to the OBF program is critical. OBF is very difficult to maintain if the utility is not completely committed, because the payments have to run through their systems. Utilities’ concerns need to be thoroughly addressed before they are required by regulatory bodies to offer financing programs. It is important to note that initial OBF programs outside of the residential market appear promising.

While most of the programs examined are variations of conventional consumer loans provided by utilities or government agencies, particular attention is given to several innovative options that have the potential to address some of the limitations described above. Two of these add the repayment charges to the utility bill or the property tax bill, respectively:

- **Tariffed Installation Program (TIP)** – TIPs use a utility’s billing system to collect a charge that has been attached to the meter as a special tariff to repay the cost of energy improvements. Because the payment is tied to the meter, not the homeowner, TIPs allow for the current occupant to move, with the next occupant responsible for repayment. Typically, the monthly charge must be less than the expected savings from the efficiency improvements and charged for a term less than the life of the efficiency measures being financed.
- **Clean Energy Municipal Financing (CEMF)** – CEMF uses a special municipal tax to fund energy improvements. The municipality provides funding for the program through the issuance of a bond that is repaid through a line item on the property tax bills of participating property owners. If the property is sold prior to the end of the repayment term of 20 years, the new owner takes over the remaining special tax payments as part of their property’s annual tax bill.

There are also two other mortgage financing mechanisms that address key limitations of many existing energy loan programs:

- **Energy Efficiency Refinancing** – An energy efficiency refinancing program would promote refinancing of homes with new mortgages specifically designed to include major energy improvements. A particular application of this mechanism would be for moderate-income

homeowners who could benefit from restructuring their current higher-interest mortgages and other high interest debt. In these cases, energy savings could allow those with high debt burdens to both consolidate their debt at lower rates and lower their energy bills.

- **Energy Improvement Mortgage (EIM)** – An EIM allows a new home buyer to get additional financing rolled into the mortgage to cover the cost of energy improvements. With higher energy prices and the potential development of time-of-sale energy rating disclosures or efficiency requirements, such a product may merit reconsideration.

Conclusions

Eliminating the first cost of energy investments is an important tool to address the barriers to improving the energy efficiency of existing homes. Once an individual is interested in making energy improvements, financing can make the investment possible and affordable. However, as shown in the cases analyzed for this study, existing financing programs have some important limitations. Some of these issues may be addressed by public funding, using alternative credit qualifications, lengthening the repayment term, allowing the transfer of repayment obligation with tenancy, and/or increasing the effectiveness of outreach. Several conclusions follow from these findings:

- Financing is one of many important tools to overcome barriers to implementing improvements in energy efficiency. It is valuable, but not sufficient on its own.
- Conventional energy efficiency loan programs cannot address much of the need without significant public support.
- New mechanisms are being developed to address key barriers. While these innovations hold great promise, they currently have limited to no experience.

It is also important to note that solutions to some of these limitations may directly conflict with each other. Getting comprehensive energy savings may make it more difficult to assure that financing payments will be less than savings for every project, increasing the risk of not reducing overall costs. Without public support to protect low- and moderate-income families from the uncertainty of actual energy savings, it may make sense to install only the measures that have the quickest paybacks, or – even better for society as a whole – find a way to guarantee savings for vulnerable populations so that more extensive measures can be done. Another possible conflict is between saving the most energy per dollar spent and getting comprehensive savings. Implementing only the measures with the fastest paybacks maximizes savings per dollar spent in the short term. However, if we have bolder energy-saving goals, such as those outlined in California’s *Energy Efficiency Strategic Plan*, it may cost less in the long run to do more extensive work in each home on the initial visit. It is also important to note that few programs do measurement and verification for the installed improvements. As a result, little is known about the actual impact. This information would enable a more rigorous assessment of best practices.

Recommendations for California

- **Make a statewide conventional financing product available in California.** Unlike many other states, most California residents do not have access to a conventional financing product targeted at energy efficiency improvements. California could easily create a simple statewide program similar to that of Pennsylvania’s and offer state funds (with interest) and a reserve fund to keep rates low. Like Pennsylvania, this could be offered through a network of contractors, possibly in partnership with Viewtech Financial Services, which is already operating a loan program in

California, or the California Building Performance Contractors Association⁵ (CBPCA). This will not address the limitations mentioned above, but it will get the ball rolling and encourage more people to invest in energy efficiency.

- **Additional support for the development & implementation of new innovative financing mechanisms.** Three mechanisms are of particular interest:
 - A Clean Energy Municipal Financing program that uses property tax payment history as a proxy for credit and allows repayment responsibility to transfer with property ownership, as is currently being pursued in Berkeley and Palm Desert.
 - An on-bill Tariffed Installation Program that uses utility bill payment history as a proxy for credit and is accessible to rental properties.
 - A mortgage refinancing program that works closely with low- and moderate- income households to make efficiency improvements and reduce their total debt burden.

- **Expand and strengthen California’s network of energy improvement contractors,** and make them a sales force for financing. This has already begun through the California Building Performance Contractors Association (CBPCA), which offers Building Performance Institute⁶ trainings, but more funding is needed to train contractors and crew members, and to help develop the capacity of the existing businesses in this market so that they can serve more customers.

- **Experiment with new messages and new messengers to promote financing.** Financing reduces first cost so that those without access to capital can choose to make energy efficiency improvements. But before people sign up for financing, they must want to make efficiency improvements. There is a lot of room to try creative new ways of informing and engaging people. There is evidence that more direct, grassroots outreach through groups that people already know and trust is important to increase participation. There may also be ways to tap into traditional marketing expertise and create sophisticated campaigns that target key market segments.

- **If statewide time-of-sale energy efficiency requirements are adopted, support the development of new Energy Improvement Mortgage products.** More than loan programs will be needed to meet the state’s targets. Implementing time-of-sale energy performance disclosure and time-of-sale energy requirements are options for increasing the efficiency of California’s residential buildings. Energy Improvement Mortgages may be useful to enable efficiency improvements if these policies are implemented.

All parts of society must be engaged in the effort to reduce energy consumption and protect vulnerable populations from rising energy costs. It is important to remember that this problem will not be solved simply by offering low- or no-interest loans. California is well-positioned to address the energy issues it faces and become a model for the rest of the world; success lies in understanding the potential and limitations of tools such as financing, and figuring out the right set of policies and programs to meet our goals.

⁵ More information about CBPCA available here: www.cbPCA.org

⁶ The Building Performance Institute (BPI) offers nationally-recognized training, certification, accreditation, and quality-assurance programs. BPI is the standard recommended by the EPA’s Home Performance with Energy Star program. More information here: www.bpi.org

I. Introduction

Energy efficiency has a vital role to play in addressing our daily resource needs and creating a vibrant future for our society. At the household level, electricity and fuel prices are rising, squeezing budgets especially for the poorest families. On a macro level, energy efficiency is repeatedly pointed to as the obvious first step in managing our energy supply and addressing climate change. Energy efficiency has also been highlighted as a vital opportunity for job creation in a new “green” economy.

An important arena for the transformation to a more energy efficient economy is in the building sector, which accounts for 30% of non-transportation energy use⁷, 72% of electricity use⁸, and 36% of greenhouse gas (GHG) emissions⁹ in the U.S. This report focuses on existing residential buildings, which account for 30% of non-transportation energy use¹⁰, 32% of electricity use¹¹, and 6% of GHG emissions¹² in California. Many of the most stringent laws that set building standards, such as Title 24 in California, address new buildings. However, improving efficiency in our existing building stock is extremely important both to improve the comfort and affordability of homes, and also to address climate change and the pollution created by energy consumption. Buildings have many-decade lifetimes, and today’s buildings will continue to be a majority of all buildings in 2050. Without a focused effort to reduce energy demand in existing buildings, it may be virtually impossible to meet the necessary GHG reduction targets or state-wide energy efficiency goals.

Despite the potential for reducing energy consumption in the building sector, energy efficiency programs have often met with disappointing results. There are several barriers to improving the energy efficiency of homes. In fact, over the last 30 years there has been a contentious debate over why consumers and businesses forego “cost-effective” energy efficient products and practices, and what role public policy and enabling programs (such as financing programs) should play in influencing these decisions. Researchers have often tried to explain consumer efficiency-related decisions using a Life Cycle Cost (LCC) analysis, which looks at the upfront costs of adoption versus the energy savings discounted over time. Most public policy starts with the premise that regulations should only promote options that result in positive net present value (NPV) for the LCC, usually applying a discount rate of 5% to 8%.¹³ Appliance standards were created using this framework with the intention of removing the least efficient options from the market while keeping the financial burden to a minimum. However, analyses of implicit discount rates (those found by examining the *actual* choices people make) reveal extremely high and widely varying discount rates, often in the range of 25% to 75%.¹⁴

The difference between what is deemed “cost-effective” and what consumers actually choose has been called the “energy efficiency gap,”¹⁵ and much effort has been devoted to closing this gap through incentives and policies to address perceived barriers. In terms of the relevance for designing a program to finance energy efficiency improvements, estimated discount rates are not particularly effective tools for

⁷ EIA 2007: Annual Energy Outlook.

⁸ Buildings Energy Data Book September 2007: 1.1 Buildings Sector Energy Consumption.

⁹ EIA 2006: Emissions of Greenhouse Gases in the United States.

¹⁰ EIA 2005

¹¹ California Public Utilities Commission. *California Long Term Energy Efficiency Strategic Plan* (2008)

¹² California Air Resources Board: 2004 Greenhouse Gas Inventory

¹³ Net present value (NPV) is the initial cost plus today’s value for a series of cash flows (energy savings in this case) in future years. These cash flows are “discounted” back to the present with a discount rate that represents the lost value from getting a payment in future years rather than today. For example \$1.10 received in a year would be worth only \$1 today with a discount rate of 10%. $\text{Net present value} = \text{Initial cost} + [\text{Future value}/(1 + \text{Discount rate})^{\text{Number of years}}]$

¹⁴ Electric Power Research Institute, “Implicit Discount Rates in Residential Customer Choices,” EM-5587, Volume 1, Research Project 2547-1 (February 1988).

¹⁵ Jaffe, Adam B., and Robert N. Stavins, “The Energy-Efficiency Gap: What does it mean?” *Energy Policy* (1994, Volume 22, Number 10): 804-810.

predicting which product or measure a consumer will choose. This has huge implications for policy given that discount rates are the conceptual foundation for most public policy, but more pertinent to this discussion, it emphasizes the need to have other ways of understanding the barriers to consumer demand. There are several “traditional” barriers to explain the energy efficiency gap that are important to consider. These include: a) transaction costs, b) lack of information, c) the uncertainty of the actual energy savings, d) split incentives, and e) the initial capital investment required.

The cost of energy has historically been low on many individual’s list of priorities, with the exception of lower-income households. Energy expenses tend to be small relative to other expenses such as housing, transportation, clothes, food, etc. As a result, energy costs are often not a primary concern (though this has changed with current price increases), and for some households the benefits of energy savings may be outweighed by the **transactions costs**.¹⁶ The cost of getting the information needed to make a decision, or the time and effort required to apply for a loan to cover retrofit expenses, may simply not be perceived as worth the return in energy savings. An example of this for appliances is that, despite the impressive rates of returns that are often available from efficient appliances, it is frequently the case that the relatively small total *amount* of return (versus the *rate* of return) makes the cost of not choosing the “economically optimal” product relatively insignificant.¹⁷ Another transaction cost important to consider is the disruption caused by actually performing the retrofit, which may interfere with a home owner’s other commitments.

Lack of information is an important barrier to consider when designing a financing product. Many customers do not know how to implement energy efficiency measures or understand and have confidence in the benefits of a project. In many cases, a customer needs to do a complicated calculation to understand the financial benefit of a measure, or a client must experience a well-insulated house to understand the value of near-invisible retrofit work. Customers also may not know *how* to get such work done – who to call and what the options are. However, experts have pointed out that lack of information cannot fully explain the “gap” – a significant amount of literature shows that simply providing information is often not enough to change behavior; government standards and incentives would not be needed if lack of information was the only barrier.¹⁸ There is reason to believe that much more underlies consumer decision-making. At a basic level, the *way* information is communicated and *by whom* is extremely important. In one study, community groups outperformed both private subcontractors and utilities in implementing energy efficiency programs when performance was measured by cost, energy savings, and response rate,¹⁹ perhaps because the level of mutual trust and familiarity homeowners had with the community groups. Choosing partners and crafting an appropriate marketing strategy when launching a new energy efficiency product are extremely important.

The next barrier worth noting is the **uncertainty about the actual energy savings that can be expected**. On *average*, a set of measures might produce a predictable level of savings, but savings can never be perfectly predicted for an individual home. Deviation from the expected level of savings might not be an issue for those with higher incomes; sometimes, they may even be higher than estimated. But if expected savings levels are not met for low- and moderate-income households, it is a major problem. Houses are complex systems, and it takes a certain level of expertise and understanding of site-specific situations to make reasonably accurate estimates of energy savings. The cost of a reasonably accurate analysis, while almost always worthwhile if substantial improvements are made, is a major barrier when it needs to be paid by the homeowner at the outset of the process.

¹⁶ International Energy Agency, “Promoting Energy Efficiency Investments,” ISBN 978-92-64-04214-8 (2008).

¹⁷ Sanstad, Alan H, W. Michael Hanemann, and Maximilian Auffhammer, “End-use Energy Efficiency in a “Post-Carbon” California Economy: Policy Issues and Research Frontiers,” Chapter 6 in Economic Growth and Greenhouse Gas Mitigation in California (California Climate Change Center: August 16, 2006).

¹⁸ Lutzenhiser, Loren, “Social and Behavioral Aspects of Energy Use,” *Annual Reviews* 18 (1993): 253.

¹⁹ Stern, Paul C., Elliot Aronson, John M. Darley, Daniel H. Hill, Eric Hirst, Willett Kempton and Thomas J. Wilbanks, “The Effectiveness of Incentives for Residential Energy Conservation,” *Evaluation Review* (April 1985, Volume 10, Number 2).

The fourth barrier is **split incentives**. This is when the decision-maker does not receive many of the benefits of a measure that they invest in. An example is the case of rental property owners who often will not invest in building efficiency upgrades because it is the tenant who pays the electricity or gas bill. This may change, especially in slow rental markets, as tenants who are concerned about rising energy costs show a preference for housing with lower energy bills. There is also the “meta” split-incentive issue where an individual may invest in changes, but some of the benefits actually accrue to future owners of the home or to society as a whole through reduced strain on the energy system and reduced pollution caused by energy generation; in fact, this is a justification for public support of energy efficiency incentives.

The last barrier is the one most directly addressed by financing – the **first cost**. A project may be a great investment for a homeowner, but the individual may not have sufficient cash available to invest in the project. Imagine a contractor finds that improvements can be made in a house that increase the comfort and will have a return on investment of 15%, but cost \$6,000. Upfront costs can cause even individuals with access to capital to decline a project – the cash may not be easy to come by, or there may be other competing demands. Financing alleviates this problem by allowing individuals to spread payments over time as benefits from the projects are realized. There is research that suggests financing does make a difference. Only 29% of those using zero interest financing in an early Pacific Gas & Electric (PG&E) program said they would have made changes *without* the program. The comparable figure in the early Bonneville Power Administration’s program was 45%, and 29% for the Northern States Power loan program.²⁰

Financing can be a powerful part of overcoming the barriers to improving efficiency in homes but, as this report will show, it is not a panacea. In particular, financing will be an important tool for reaching the goals laid out in the California Public Utilities Commission’s *Energy Efficiency Strategic Plan*. There are three goals set out for 2020 that will be especially aided by financing options because they require significant upfront capital investment by home owners:

- Reduce energy use in existing homes by 40%
- Build 100% of new residential homes as net-zero energy homes
- Install low-energy heating and cooling systems in 50% of existing and new homes

Just one example of the need for financing in the California market is a Bay Area contractor who buys down unsecured loans for his customers from the market rate of 12.99% to 7.99% - and approximately 25% of his customers use this financing option.

This study focuses on 18 programs that are representative of various financing options, including some that currently exist, are about to launch, or have been terminated. Background research and interviews were conducted for each program. A particular focus of this study is on residential on-bill financing (OBF) programs, of which there are relatively few currently operating (see Table 3), though interest in the area is growing because of the appeal of repaying an efficiency investment on the same bill as the energy usage charges. This paper is organized into the following sections: II. An overview of the elements that make up a financing program, III. An analysis of the lessons gleaned from the cases studies, and IV. Conclusions. Also note that references are made throughout to financing programs that are described in more detail in Appendix A.

²⁰ Stern 1985.

II. The Elements of Financing

There are many elements that make up a financing program. This section presents a break-down of the elements that define the product offered to customers and create a common language that is used later to describe each program case study. Understanding the elements that make up a program is also important because two programs might both be referred to as “on-bill financing,” but actually function very differently – “on-bill” refers only to the collection mechanism. The table below offers a visual of the program elements discussed in this section.

Table 1: Financing Program Elements

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Underwriting Criteria	Security Interests
Banks	Personal loan (secured or unsecured)	Amortized payment bill	Reduced interest rates	Energy efficiency	Debt to income ratio	Unsecured
Public benefit charge or added to rate base	Mortgage / home equity (secured or real estate)	Lease payment	Stretched underwriting criteria	Renewables	FICO score	UCC fixture filing
Utility general funds	Line of credit (secured or unsecured)	On utility bill	Guarantees & reserves	Other home improvement	Utility bill payment history	Mechanics lien
State / municipal general funds	Lease	On property tax bill	Rebates		Tax payment history	Other lien on real estate
Municipal bonds	Retail installment contract	Performance contract bills	Subsidized transaction costs		Other	Lien on other property (car, boat, etc)
Manufacturers	Special municipal tax or fee levied	Buy kWh or therms	Aggregation			Disconnection for nonpayment
Pension funds	Tariffed installation program		Environmental or carbon credits			
Housing or economic dev finance agency	Performance contract					
Settlement revolving fund	Power purchase agreement					
Other 3rd party						

Sources of Capital

There are many possible sources of capital for a financing program. For most loan programs, capital has been provided by banks or utility general funds, and is often supplemented by utility-collected funds from a public benefit charge or additional expenses are added to the rate base to provide lower than market rates of interest. A public benefit charge is a small fee attached to each utility bill to create a pool of funds to use for a public purpose. Including the additional program expenses (such as the cost of buying down a

loan) in the rate base allows the utility to be reimbursed for expenses after the fact. There are also a few programs that use money from state settlements with energy-related companies that have been put into a revolving fund to support efficiency programs, including loan programs. Other sources include manufacturers who help finance their equipment, leasing companies, municipal bonds, state treasuries and pensions funds, and housing and economic development agencies. Loans originated by many of these sources can also be sold on a secondary market to a third party, such as Fannie Mae.

Financing Mechanisms

Some of the financing mechanisms are fairly standard – a consumer loan can be unsecured or secured to an asset such as a car or the improvement itself; a mortgage or home equity loan is secured by the property; and a secured or unsecured line of credit allows the borrower to draw down funds as needed instead of as a lump sum. The first two are the most common in the existing loan programs in the U.S. A retail installment contract (RIC), used by a few loan programs, is one type of unsecured consumer loan that is often used to purchase new cars.²¹ In this context, RICs allow consumers to pay a contractor for energy improvements on credit using a contract that fixes the finance charge and number of installments. RICs provide extra benefits to borrowers by enabling them to assert a future claim against the lender if there is a problem with the installation.

There are also variations on a traditional mortgage product that are relevant to energy improvements. An Energy Improvement Mortgage (EIM)²² allows a new home buyer to get additional financing rolled into the mortgage to cover the cost of energy improvements. Vermont Energy Investment Corporation (VEIC) conducted a pilot of this mechanism more than a decade ago, but it has otherwise rarely been used, largely due to the already-challenging process of closing a home; the hassle of figuring out the additional details of an EIM is usually prohibitive²³ – though EIMs may become useful if combined with public policy that encourages improvements at the time-of-sale. Another option that avoids the initial home closing is an Energy Efficiency Refinance Program. A refinancing program would promote refinancing to finance comprehensive energy savings improvements to existing homes. A targeted and streamlined energy efficiency refinancing program could be extremely attractive for homeowners who have substantial debt or already have a mortgage, if the rates can be low enough and energy savings high enough to reduce or stabilize monthly costs by consolidating their debt at lower rates and lowering energy bills. The Energy Programs Consortium²⁴ is pursuing pilots of this concept in a few states.

There are also several new options that are being piloted in the U.S. A tariffed installation program (TIP) uses a utility's bill collection system to collect a charge that has been attached to the meter as a special tariff. TIPs provide a mechanism for homeowners to install measures in their property that may outlast their tenure. Because the payment is tied to the meter, not the homeowner, TIPs allow for the current occupant to move, with the next occupant responsible for repayment. Typically, the monthly charge must be less than the expected savings from the efficiency improvements and charged for a period less than the life of the efficiency measure being installed. Failure to pay can result in utility disconnection for most TIP programs. TIPs may offer a mechanism for rented premises where the split incentives between landlords and tenants chronically lead to underinvestment in energy efficiency. With a TIP, the obligation is borne by the meter customer, not necessarily the building owner. The Pay As You Save Program

²¹ U.S. Environmental Protection Agency, "Financing Guidebook for Energy Efficiency Program Sponsors" (December 2007).

²² An EIM, which allows the buyer to borrow more money to invest in efficiency improvements, is different than a Energy Efficiency Mortgage (EEM), which gives an efficient home a more favorable mortgage interest rate.

²³ Faesy, Richard, "Understanding and Overcoming the Energy Mortgage Barrier," ACEEE Summer Study on Energy Efficiency in Buildings (2000).

²⁴ The Energy Programs Consortium is a joint venture of the National Association of State Community Services Programs (NASCSPP) with the mission to foster coordination and cooperation among state and federal agencies in the areas of energy policy and program development. More information: www.energyprograms.org

(PAYS®) is a proscribed TIP design²⁵. Its features include an independent estimate to assure savings, a requirement that the expected payment be no more than 75% of the anticipated savings, and the term of repayments be for 75% or less of the time equal to the life of the measure. PAYS programs require disconnection in the event of nonpayment. The developers of PAYS believe these features are integral to achieving widespread savings and substantial program participation. As a tariff, TIPs require the support of implementing utilities and approval from the utility regulators. Funding for the improvements can come from the issuance of bonds, public funds, utilities or other private sources of capital.

Another option, currently being piloted in California, is to use a special municipal tax to fund improvements, called Clean Energy Municipal Financing (CEMF). The municipality provides funding for the program through the issuance of a special tax bond that is repaid through a special tax line item on the property tax bills of only the property owners who choose to join the financing district. To initiate the financing, the municipality records a Notice of Special Tax Lien against the property. This imposes a lien to secure the obligation to pay special taxes that is paid before a property’s first mortgage if a default occurs. In the event of delinquent special taxes, the municipality has the ability to foreclose on the delinquent property or it may choose to wait for another party initiate foreclosure. There is no up-front cost to the property owner, and if the property is sold prior to the end of the repayment period of 20 years, the new owner takes over the remaining special tax payments as part of their property’s annual tax bill. Interest payments on the project are tax deductible, similar to a home mortgage. The long repayment period and transferability of the payments allows property owners to invest in comprehensive energy savings and renewable projects that pay back over a longer time frame than many existing financing options allow. This concept is being piloted for the first time this fall in Berkeley and is being considered by city officials in Burlington, VT.

There are a few mechanisms that are rarely, if ever, used in the residential market for energy efficiency, but may have potential for innovation in the future. A lease is sometimes used for large equipment, but household equipment is not usually leased, though there is at least one solar company experimenting with a leasing model for residential solar. Power purchase agreements (PPA), where another party owns the improvements (often used with larger solar electric systems) and the building owner purchases the electricity produced or saved, are seldom used on a residential scale due to the high fixed costs of setting up the necessary contracts and the risk to the system owner associated with doing a PPA on a small scale. A few companies are currently investigating this mechanism for the residential market. A performance contract, where an energy service company guarantees a level of savings or agrees to share savings, is commonly used for large-scale efficiency projects. To date, there has been little success making this work on a residential level, but this may change as new players enter the market and as energy prices rise.

To give a sense of how the programs reviewed in this paper compare to traditional financing options, Table 2 shows some financing mechanisms currently available that might be “competitors” to financing programs focused on energy efficiency.²⁶

Table 2: Traditional Financing Options

Financing Mechanism	Eligibility	Interest Rate	Loan Limits
Mortgage refinance or home equity line of credit	Must have equity in home	~7-9%	Usually limited to 80-95% of equity
Personal loan	Must be credit worthy	~12%+	Usually \$1,000 to \$35,000
Credit card	Decent credit history	~14%+ e.g. Lowe's credit card offers 0% for 12 months then 21.99%	Based on credit score and history

²⁵ More information: www.paysamerica.org

²⁶ EPA 2007.

Collection Mechanism – On-Bill Financing

Most of the programs collect payments with a standard monthly loan repayment bill. However, there is growing interest in putting the payment on the utility or property tax bill (i.e. on-bill financing). As shown in the table below, there are currently few on-bill programs for the residential market, though this number will likely grow. Some utilities have had difficulty adding the repayment as a line item to the bill. Maui’s program puts a separate bill in the same envelope and SMUD started sending an entirely separate bill after they switched to a new billing system. See section IV for further discussion on the issues with implementing the on-bill collection mechanism.

Table 3: Residential On-Bill Financing Programs

Sponsoring Entity	Program Name	Location	Type
Active			
Alabama Power	Energy Financing	Alabama	OBF with reduced interest
Dixie Electric Cooperative	Energy Financing	Alabama	OBF with 5% interest
First Electric Cooperative	Home Improvement Loan Program	Arkansas	OBF with 7.5% interest
Manitoba Hydro	Power Smart Residential Loan	Manitoba, Canada	OBF with reduced interest
Hawaiian Electric Company	SolarSaver (Two bills in same envelop)	Hawaii	TIP Pilot for solar water heaters
Midwest Energy	How\$mart	Kansas	On-bill TIP Pilot
United Illuminating	SmartLiving Catalog Program	Connecticut	OBF for \$200/ year of EE products at 0% interest
Canceled			
BC Hydro	Home Improvements Program (HIP) (Canceled)	British Columbia, Canada	OBF with reduced interest rates
New Hampshire Electric Coop	SmartSTART (Canceled for residential customers)	New Hampshire	On-bill TIP
NW Natural Gas	On the Bill Program (Canceled)	Oregon/ Washington	OBF at market rates
Oklahoma Gas & Electric	Heat Pump Loan Program (OBF canceled, now lender sends bill)	Oklahoma	OBF for heat pumps
Sacramento Municipal Utility District (SMUD)	Residential Loan Program (formerly on-bill, now two bills sent)	Sacramento, CA	Reduced interest loan
Proposed / Announced			
Berkeley FIRST	Launching pilot September 2008	Berkeley, CA	CEMF with repayment on property tax bill
Milwaukee Energy Efficiency (ME2)	Set to launch pilot early 2009	Milwaukee, WI	On-bill TIP program
Town of Babylon	Proposed	Long Island, NY	TBA

OBF = On-bill financing

TIP = Tariffed Installation Program

CEMF = Clean Energy Municipal Financing

Enhancements

This category is a catch-all for the ways that programs have “enhanced” their product by making it more appealing or accessible than what is available in the market. Enhancements can include the following:

- **Reduced Interest Rates** – Often programs offer fixed, below-market interest rates, or offer buy downs of a certain percentage; this is usually funded through a public benefit charge or through a lower-interest source of capital that borrowers do not have access to outside of the program. Some programs also give participants tax benefits for interest payments, such as the deductibility of interest payments in the case of Berkeley’s CEMF program.
- **Stretched Underwriting Criteria** – One credit enhancement is for the lenders to include the energy savings on the income side when they are evaluating a borrower’s credit using a debt-to-income ratio.
- **Guarantees and Reserves** – Guaranteeing loans or pre-funding reserves (funds set aside to cover defaults) enable lenders to both offer loans to a wider (more risky) group of borrowers, and also to offer lower interest rates because of security provided by the guarantee.
- **Rebates for Efficiency Measures** – A common way to enhance a loan program is by providing a direct payment for implementing certain efficiency measures to offset some of the project cost.
- **Subsidized Transaction Costs** – Some programs offer free audits or cover the costs of handholding a customer through the process to reduce transaction costs.

There are a few other enhancements that have not been implemented in the cases reviewed, but have potential. One possibility is to aggregate the projects to the extent that a group of projects can get lower rates for products and services. Another idea is to sell the environmental or carbon benefits of the project into a market that values them to lower the project cost. This could be a carbon trading market or an energy efficiency market; markets for “energy saving credits” have been developed recently in a few countries in Europe.²⁷ To get economies of scale, residential projects would need to be aggregated and sold to these markets in substantially larger units than one house at a time.

Eligible Measures

Eligible measures vary from program to program. Most programs have a list of approved efficiency measures. Some programs only finance one measure, such as solar water heaters in Hawaii, while others have an extensive list that includes a wide range of improvements to the building along with new appliances and equipment. Some programs allow some non-energy improvements (e.g., general home repairs, water-saving measures, etc.) to be made along with the energy-saving improvements. A few programs also finance solar electric systems, small-scale wind, and geothermal heat pumps.

Underwriting Criteria

Underwriting is the process of determining whether an applicant should receive financing. The standard measures for evaluation are the applicant’s debt-to-income ratio and FICO²⁸ score, which is a score used by the credit rating industry to represent credit worthiness based on bill payment histories, current debt, and other criteria. Most programs use these standard measures; however, a few use proxies for credit (such as a utility bill or a property tax bill payment history) that potentially widen the eligible pool of borrowers.

²⁷ Vine, E. and J. Hamrin, “Energy savings certificates: A market-based tool for reducing greenhouse gas emissions.” *Energy Policy*, 2008. **36**(1): p. 467-476.

²⁸ FICO scores are commonly used evaluate the credit worthiness of an individual. They are calculated using a method developed by the Fair Isaac Corporation.

Security Interests

Many of the loan programs use unsecured loans, which are not attached to any of the borrower's assets and have higher interest rates. Other programs, especially those with higher loan limits, tend to use some type of lien for security. A lien is a security interest in an item of property to secure the payment of a debt or some other obligation. A lien on the real estate itself is a mortgage. A Universal Commerce Code²⁹ fixture filing is a lien attached the "fixtures" installed that is recorded with the property title and must be paid in the event of the foreclosure or sale of the home. A mechanic's lien, not used in these the programs reviewed, is a security interest in the property title to secure the claim of those who have supplied labor or materials to improve the property. A lien can also be placed on other valuable assets such as a car or boat. In addition to these traditional methods of acquiring a security interest, some programs use the ability to disconnect power for nonpayment as added security.

²⁹ The Universal Commercial Code is a body of recommended laws regarding sales and commercial transaction that are meant to harmonize the laws in various states. Form to create a UCC fixture filing available at: http://www.sos.ca.gov/business/ucc/ra_9_ucc-1.pdf

III. Lessons from the Field

The cases explored for this study represent a wide range of program design and experience. This section uses the lessons from these programs, which are detailed in Appendix A, to identify the limitations of existing programs and distill best practices and new opportunities to make financing programs more effective. This section focuses on five important program limitations: limited applicability for households most in need, low participation rates, difficulty assuring that savings will exceed payments, limited support for comprehensive energy retrofits, and the inability of most programs to cover their costs. It then touches on issues particular to on-bill financing programs, and ends with suggestions for effective program design.

Limited Applicability for Households Most in Need

It is relatively easy to provide a loan program for those who are educated, motivated, and credit-worthy – but these are exactly the people who may be least in need of financing. There has been little success in addressing the financial barriers faced by those most in need of financing, including those with the highest energy cost burdens (energy cost as a percentage of income), low or fixed incomes, and poor credit, or those in rental housing.

Reaching Households with Lower Incomes or Poor Credit

It appears that most existing programs have very limited success in making financing work for low- and moderate-income families, in underwriting criteria, in the repayment term length, and in considering the increased ability to make payments due to the energy savings. This population is often in the greatest need of financing because they lack access to capital. Many programs have credit requirements that include FICO score minimums and debt-to-income limits. Few programs systematically recognize the expected energy savings as increasing the ability to pay. None of the programs were able to provide data on participants' income levels, but a sense of the program participants' credit levels can be seen in the average FICO scores. Efficiency Vermont's program has participants with an average score in the high 700s, and AFC's customers have an average score of 733. To put those in perspective, the median FICO score nationwide is 723³⁰. Approval rates are also an important indicator; many programs reject a significant number of applicants. For example, AFC, NYSERDA's program with Energy Finance Solutions (EFS), and Viewtech reject 35% or more of their respective applicants. In addition, lower income households are more likely to live in rental properties which, as discussed below, have limited access to financing programs.

There are a few programs that make special efforts to increase accessibility for low- and moderate-income customers and those with poor credit histories. For example, Vermont Gas and Efficiency Vermont first direct customers with less than 60% of the area median income (AMI) to Vermont's free low-income weatherization program. Vermont Gas customers above 60% AMI can apply for a loan, which Vermont Gas guarantees. Almost 100% of applicants have been accepted due to this guarantee. NYSERDA assists low-income customers with a direct subsidy; the organization pays for 50% of the project cost, up to \$5,000. This is a significant help with the overall cost, but does not remove the first cost barrier; even a small upfront cost can be a significant deterrent.

³⁰ Fair Isaac Corporation: <http://www.myfico.com/>

Tariffed installation programs (TIPs), such as those offered by Maui Electric Company and Midwest Energy, typically rely only on the customer’s utility bill payment history to determine eligibility, which opens up the program to a wider group. These programs are able to shut off power for non-payment, providing additional security for the loans, and they assume that the customers’ bills will be equal to or less than their bills without the energy savings. However, a customer’s total bill may actually be higher than in the past if energy prices rise faster than the reduction from the energy savings. In this case, the bill will still be lower than what the customer would have paid without the energy improvements. Energy saving measures become more valuable with rising energy prices because the savings allow the customer to avoid paying for increasingly more expensive energy.

Manitoba Hydro also uses bill payment history as a proxy for credit and, though they do **not** shut off power for nonpayment, they attribute their low default rate to the customers’ (false) belief that they could shut off power for nonpayment. Berkeley’s program requires home ownership, but will likely only require a good tax payment history as a credit screen.

It is important to note that additional debt might not be possible or advisable for many low-income households. If low-income households participate in financing, they almost certainly require neutral, if not positive, project cash flow. Typical shorter financing terms (five to seven years) limit them to low-level investments that may not have appreciable impact or address the substantial improvements that they really need. This can also lead to “cream skimming” the most cost-effective measures, and in the process of doing so may create lost opportunities (e.g., it may be prohibitively expensive to come back for the larger more expensive measures later, as compared to bundling them with the short-term, high-return measures on the initial visit). Thus, if relatively short-term conventional financing is to be used for most low- and moderate- income households, it requires significant subsidies to achieve high levels of energy savings. One option that is being explored in Vermont and elsewhere with the support of the Energy Programs Consortium (EPC) is an Energy Efficiency Refinance Program. A refinancing program would make lower-cost mortgages available to homeowners who implement approved efficiency measures as part of the refinancing. This might allow low- and moderate- income households with a heavy debt burden to consolidate their debt at lower rates and at the same time make energy saving improvements to their homes that further reduce their bills. Of course, lower income people are less likely to own a home as seen in Table 4, and this is trend is more pronounced in California, but still 30-50% of people who make under \$50,000 would be eligible for such programs.

Table 4: Owner Occupied Homes by Income

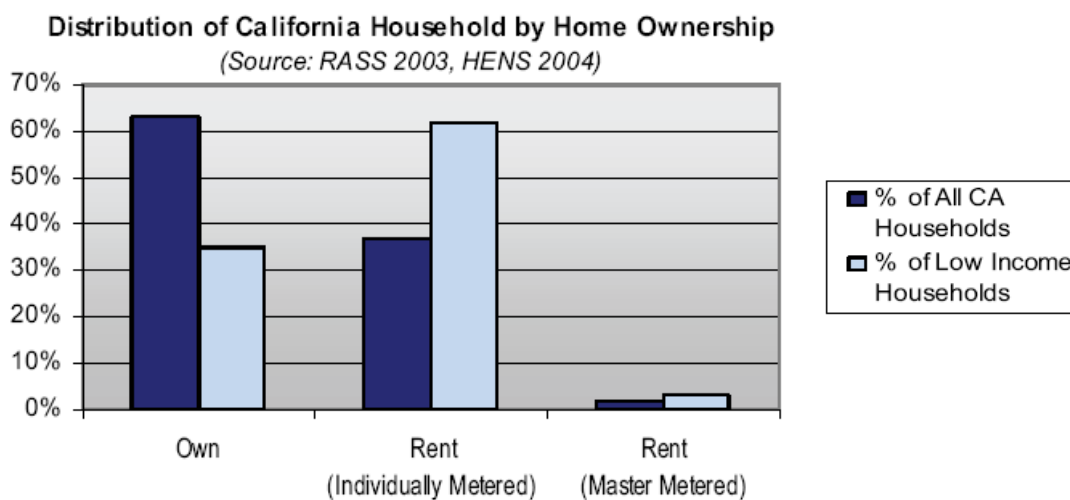
	Percent of Owner Occupied Households by Income		
	United States	California	Difference
Less than \$5,000	34.3%	32.0%	2.3%
\$5,000 to \$9,999	35.2%	26.7%	8.5%
\$10,000 to \$14,999	45.3%	34.6%	10.8%
\$15,000 to \$19,999	49.7%	35.9%	13.8%
\$20,000 to \$24,999	52.9%	39.1%	13.8%
\$25,000 to \$34,999	57.9%	45.3%	12.6%
\$35,000 to \$49,999	65.2%	49.9%	15.3%
\$50,000 to \$74,999	75.2%	61.3%	13.9%
\$75,000 to \$99,999	83.8%	72.0%	11.7%
\$100,000 to \$149,999	88.8%	80.9%	7.9%
\$150,000 or more	92.1%	88.1%	4.0%

Source: New America Foundation’s California Housing Memo
(Based on American Community Survey 2005 Data)

Reaching the Rental Market

The issue of split incentives between rental property owners and tenants still remains a major barrier. No financing program currently addresses this issue satisfactorily, and many programs explicitly exclude rental properties from the program. This issue affects lower-income households disproportionately, because they are more likely to rent as seen in Table 5. Of the programs examined, the Minnesota program is the only one that particularly targets rental properties, but so few use it (21 loans were made in 2007) that it is clear a below-market interest rate does not adequately address the barriers in this sector. Anecdotal evidence suggests that as tenants become more concerned about energy prices, rental property owners will be compelled to make changes to attract and retain tenants; but so far, no growth in demand for energy efficiency financing from rental property owners has been reported by the programs reviewed.

Table 5: Home Ownership vs. Renting by Income Level



(Source: *California Energy Efficiency Strategic Plan*)

There are two options that might have the potential to address the rental market, although neither is proven yet. TIPs may be able to address the split-incentive problem if the tenant pays the utility bill, since this arrangement allows the tenant to pay for improvements over time, while also benefiting from them. There is little evidence of how well this will work because the existing TIP programs are so new. The experience of Midwest Energy since August 2007 offers a glimpse of hope for addressing this market. Of the 47 projects that closed, seven were rental properties. This ratio matches the overall percentage of rental units in the local market. The program manager noted that, while it appears that renters themselves are not motivated to get projects done for a variety of reasons, several rental property owners are excited about the program and are working on projects after tenants leave, and before the new ones move in. Property owners who use the program in this way will need to be closely monitored (which Midwest Energy seems able to do by carefully prescribing what measures are allowed to be funded) so that tenants are not paying for improvements that they will not benefit from. The second option that is currently being discussed by some program managers, but has yet to be formally applied, is a Green Lease.³¹ This is a contractual agreement between the property owner and tenant to make efficiency improvements or add renewables and share the savings in some agreed-upon way. For example, a property owner might make energy-savings improvements if a tenant agrees to a rent increase equal to 50% of the expected savings.

³¹ Williams, Beth E., "Overcoming Barriers to Energy Efficiency for Rental Housing," Massachusetts Institute of Technology Masters Thesis in Urban Studies and Planning (June 2008).

Another significant gap in these programs is how they address the multifamily building market. This gap also disproportionately affects tenants, since low- and moderate-income families are more likely to live in multifamily buildings. Half of the programs reviewed serve multifamily properties, but few programs have significant demand for loans from this sector. NYSERDA's Energy Smart Loan Fund served 29 multifamily properties in 2007 for a total of \$23.2 million in loans. The fund tailors incentives to this sector, which might help, but a total of 29 loans is not substantial. There are several reasons for this low demand. One reason is that many of these buildings are rented, and face the split-incentive problem described above. Another reason is the difficulty of coordinating retrofits in many units at once. However, it should be noted that utility-sponsored multifamily programs and low-income weatherization programs have considerable experience addressing these problems. More research is needed to ascertain how the barriers facing this market might be mitigated.

Low Participation Rates

One fact that cannot be ignored is that, despite the 150+ loan programs for residential energy efficiency in the United States, only a tiny fraction of the population has been reached. Of course, many people have used traditional funding sources, or can pay for improvements up front, but still the number of participants in most programs is surprisingly small. Most of the programs examined reached less than 0.1% of their "potential" customers in 2007, implying that their impact is marginal at best. The pool of potential customers used includes all residential households in the territory covered by the program; e.g. all households in a utility's service territory, or all households in the state for a statewide program. This is a much larger pool than the actual potential customers who ideally would only include those eligible customers who could qualify for the loan and had not participated already. However, the size of this smaller pool is unknown, and even with a pool half of the size used in this report the participation rates would still be low.

The most successful program in terms of participation in 2007 was Manitoba Hydro, which reached 1.9% of its customers (8,100 households). SMUD reached 0.6% of its customers (3,200 households) in 2007, and has reached approximately 26% of its customers (135,900 loans in total) since its inception in 1977 (though some homes may have received more than one loan), a testament to what a program can accomplish over time.³²

It is important to remember that financing only addresses the barrier of first cost, and only for those who qualify. There are still a variety of other barriers. Many people are not motivated enough to deal with the transaction costs of arranging a project and signing up for a loan, even if it is a "good deal." It may not be worth the effort for them. As energy prices rise, this may change somewhat, but transaction costs and lack of information may still dominate the decision making of the majority of people without further intervention.

There are many ways that program participation might be increased. One option being discussed is to implement public policies that require energy use evaluations of all buildings to raise awareness about the potential impact of improvements, or require certain energy upgrades at the time-of-sale. Because energy savings have public benefits, in addition to private benefits, policy intervention may be appropriate. Once certain changes are required, it will be important to have a financing option to enable these investments.

Another option is to offer longer payback periods and transferability of payments to the next homeowner, so that the current residents can feel comfortable that they will only have to pay for improvements that they directly benefit from. Programs should also consider new ways of incentivizing participation that

³² This is a rough estimate: 135,900 loans since 1977 / 520,000 current customers = 26%

grab peoples' attention. For example, how would offering a FREE top-of-the-line ENERGY STAR refrigerator for homes that invest in other energy efficiency improvements impact participation? Or what if energy efficiency was sold to certain market segments as a smart investment to round out an individual's portfolio of investments? There are ideas from the marketing industry that can be applied to market energy efficiency.

Another way to increase participation is by greatly increasing awareness of the program's availability. Experience suggests the most effective outreach is done by well-informed contractors (see below). Another option is to increase marketing campaigns to educate consumers directly about the benefits of efficiency and the opportunity to make improvements with zero up-front costs. One interesting model for increasing outreach is Houston's Power to People program.³³ This program offers free weatherization (so no financing is necessary) to low-income residents, but the outreach techniques may be applicable to programs designs that do use financing. The City of Houston targets a neighborhood and sends a letter to every household; this effort results in an approximate sign-up rate of 10% of the residents. Then the city connects with community leaders, the city council member from the community, church groups, neighborhood associations, and others to get the word out. These community groups organize volunteers to do "block walks," where they go door to door, talking to their neighbors about the program. They follow that with a block party featuring food and music to attract more participants. These techniques are relatively inexpensive because they rely on volunteer support, but they have resulted in **40% to 80% participation rates**, depending on the neighborhood. If a financing program used these techniques and achieved even a fraction of that – say, just 5% participation – that would constitute a breakthrough in participation rates for financing programs.

This is in line with research showing that it is more effective to use direct, personalize information provided by relevant role models, direct contact with consumers, and outreach through local networks.³⁴ Stern et al found that larger incentives may increase participation in loan programs, but marketing and implementation may be even more important than the size of the incentive. In one study, program participation varied tenfold between programs offering identical financial incentives. The more successful programs were operated by trusted organizations and marketed by word of mouth and other aggressive, direct methods.³⁵ The time might be right for community-based efforts such as these; community energy action groups are springing up in towns and cities all over the United States, and they may be a resource for community outreach. Many of these groups have conducted CFL bulb drives and sponsored local policy changes. Promoting the concept of comprehensive home energy savings might be a good next step.

Difficulty Assuring That Savings Will Exceed Payments

Assuring that the measures financed will actually be cost-effective (e.g. positive project cash flow) to the borrower can be critical. This is especially true for low- and moderate-income people. Wealthier participants can afford to pay more if necessary (whether due to choosing pricier improvements or taking on a shorter loan term), but it is essential that energy efficiency is not an additional burden for lower-income people. Project cash flow is assumed to be the payments and savings for the project itself – payments must be less than the value of the avoided energy costs. This does not mean that the utility bill will be less; if energy prices rise rapidly the bill may increase even if the project has positive cash flow. Several variables are particularly important with respect to measuring cost-effectiveness. The first is having accurate estimation tools and assuring that such estimates are made by qualified analysts. Another

³³ Phone interview with Sydney Igleheart, Sr. Communications Specialist with the City of Houston (6/19/2008).

³⁴ Lutzenhiser 1993.

³⁵ Stern 1985.

factor is the term of financing: e.g., allowing a long repayment period, so that the savings are always greater than the payments.

To the extent that customers are counting on savings to pay off a loan, they need to be confident that promised savings will actually occur. Programs must include a quality savings estimate, which in turn requires qualified auditors or contractors using quality calculation methods and diagnostic methods. Many loan programs do little to assure savings beyond setting broad guidelines or prescribed lists of measures for what can qualify for the program. Customers who qualify for loans are largely left to their own judgment about whether or not to invest in the measures proposed by contractors. The moderate- to upper-income participants that dominate most current programs can likely afford to pay a little more each month if needed, but this is a problem for those already on a tight household budget.

Making the program accessible to those who need financing most will require greater assurance of savings. Midwest Energy is a good example of a program attempting to do this. They estimate the savings themselves, use conservative numbers, and require that payments be less than 90% of savings. It is difficult to estimate savings, and takes time to do it well. It should be noted that there is no one calculation method or piece of software that can be relied upon to assure accurate savings estimates. The program manager at Midwest Energy noted that one of the more widely used simulation platforms consistently overestimated savings for their projects, so they switched to another software program that they calibrate for each home using the building's historical energy use data. This is an excellent approach, and illustrates how home energy performance is highly complex and situational. The best results have less to do with the calculation tool being used than site-specific information about the building (which typically include diagnostic testing such as a blower-door test that pressurizes the building and measures the air leakage before and after the energy improvements), historical energy use records, information on how occupants use the building and, perhaps most importantly, the skill and knowledge of the analyst making the inputs to the calculation tool. Yet this level of analysis may not always be possible, so it may be beneficial to figure out new ways to assure reasonable levels of confidence in projected savings or to balance savings and losses over an aggregated pool of homes. One means of increasing the confidence of the building owner that has been successful in commercial buildings is to guarantee savings. So far this has not been cost effective in residential homes, but there is likely potential for development and innovation in this area. It is also important to note that most programs do not offer any rigorous measurement and verification for the installed improvements, therefore little is known about the actual impact. This data would help gauge the need for more exact savings estimates.

Limited Support for Comprehensive Energy Retrofits

Getting comprehensive energy savings financed on a positive cash-flow basis requires longer terms (10-20 years) than are available through most conventional financing programs. Comprehensive energy measures go beyond the fast payback measures such as lighting, appliances, and sealing leaks, and can include measures such as attic and wall insulation, new duct work, overhauling the heating or cooling systems, etc. While basic weatherization and lighting might save 5% to 15% of energy use, more extensive retrofits might save 20% to 50% and usually will last much longer.³⁶ However, these measures also often have longer payback periods and require financing with a longer term to match savings. It should be noted that achieving statewide energy savings or carbon goals may well require high levels of savings. California Public Utilities Commission's goals to reduce energy use in existing homes by 40% and install low-energy heating and cooling systems in 50% of new and existing homes by 2020 will certainly require more comprehensive energy retrofits.

³⁶ Savings vary greatly with climate and the age and condition of the home; these are rough estimates.

Most existing financing programs have loan payment terms of less than 10 years, with the majority in the 5- to 7-year range. The City of Berkeley's proposed program is one of the more innovative in this regard. Eligibility is based simply on home ownership and past payment of taxes, rather than a good credit history, and has a term of 20 years that can be transferred with ownership. Midwest Energy offers a 15-year term and Viewtech offers a 12-year unsecured loan. In general, a TIP requires that payment amounts be some fraction of the estimated savings, a practice that protects the next owner of the meter, but limits the scope of retrofit work. Midwest Energy's program has the lowest average loan amount (approximately \$4,000). This could be because they are conservative in the savings estimates (limiting the level of investment), but there may well be other factors. It should be noted that major weatherization typically has a higher project cost (e.g., Vermont's existing low-income weatherization program averages between \$5,000 and \$6,000). AFC's new mortgage-backed loan product offers a 20-year term and can cover investments both in efficiency and in renewables, such as solar and geothermal. In general, mortgages with 15- or 20-year terms can be used to cover this type of work, but it can be difficult to arrange, or impossible for renters or homeowners with poor credit.

Inability of Programs to Cover Their Costs

Expecting programs to be self-supporting typically results in highly limited applicability and impact, and raises the odds against success. Many of the higher-volume programs reviewed are likely serving participants who have higher incomes and access to other (albeit less attractive) sources of funding. BC Hydro's case is a good example of a program with over 10 years of experience that was not able to make the program pay for itself. SMUD's program is the only one that comes close to covering its costs. After 20 years, they have created a program with the expertise, volume, and contractor network to be able to run the program "at cost" by loaning internal funds at 7.5%.

In general, it appears that financing alone is not enough, especially to reach low- and moderate-income families. Most successful programs offer additional subsidies in the form of free or low-cost "handholding," reserve funds, cash rebates, or interest rate buy-downs to attract customers. Even though the average savings from many projects should be enough to cover financing payments, most customers need additional incentives to encourage them to make the effort to pursue efficiency improvements in their homes. Vermont Gas augments its free audit service with a payment of one-third of the project cost, and then finances the balance at 0-4% interest. Manitoba Hydro pays for a significant portion of the initial cost before financing the balance. Most other programs offer rebates for the most cost-effective measures in addition to the loan, and most offer a below-market interest rate. AFC and Vermont Gas have a reserve fund to cover losses to allow them to charge lower rates and make the program available to more people.

Issues Particular to Residential On-Bill Financing Programs

There are a few additional issues to consider that pertain to residential on-bill financing (OBF) programs:

- **Billing System Limitations** – Changing the billing system to allow for residential OBF appears to be difficult for some utilities. Some of the existing program managers say it was not a problem to add this option; others say it was a major challenge. SMUD switched from offering on-bill financing to offering a separate bill when they began using a new billing system, because it was difficult to add an OBF option to the new billing system.
- **Repayment Allocation** – When customers partially pay their bills, the repayment allocation (i.e., who gets paid first) is important. If a third-party financier is used for the residential OBF

program, the gas or electric charge will usually be paid first, which increases the risk to the lender. In the NW Natural Gas case, this was a deal breaker for the lender, and it effectively ended their program.

- **Non-utility Fuel Savings** – Using residential OBF for improvements that save non-utility fuels, such as heating oil, may be confusing for a customer who has an electricity-only utility bill.
- **Utility Commitment** – Residential OBF is very difficult to maintain if the utility is not completely committed, because the payments have to run through their systems. Many utility employees interviewed for this report expressed concerns about offering OBF to the residential market. These concerns included a fear of defaults, their ability to manage transferable loans, and negative public relations if they had to shut off power for non-payment. PG&E’s market research³⁷ also showed that a major issue was aligning utility support behind the residential OBF programs. From this anecdotal evidence, it is clear that the utilities’ concerns need to be thoroughly addressed before they are required by regulatory bodies to offer residential OBF programs.

It is important to note that initial OBF programs outside of the residential market appear promising.

Increasing Program Effectiveness

While the existing financing programs have many limitations that must be addressed and will likely continue to require public support to be accessible to those who most need financing, the program case studies offer a number of key lessons regarding effective program design.

Strong Contractor Networks

The programs with the highest volume of loans all have strong contractor networks and regular program communication with those contractors. Manitoba Hydro has 1,100 contractors and 200 retailers in their program; AFC has 700 approved contractors in Pennsylvania; Viewtech has 600 contractors in Southern California; SMUD has 180 contractors in the Sacramento region; and NYSERDA has 147 contractors in New York. These contractors constitute a potential sales force for energy improvement projects that use a financing product. Program managers stressed that significant time and effort should be spent to make sure the contractors understand and feel comfortable with the program. After all, they are the ones explaining it to customers and often helping customers fill out loan application forms. Some programs even charge the contractors a fee to join the network, reflecting the value the contractors place on having a financing option to offer. AFC dedicates staff to travel around Pennsylvania offering contractors training in marketing techniques and in the mechanics of the financing product. NYSERDA originally expected that their 100+ lenders would be the information source for customers, but quickly found that more than half of their customers learned about the program from contractors. Trust is an important factor in the success of these programs, and contractors are logically the people that homeowners trust to make improvements to their homes.

For most existing programs, the minimum qualification requirements for participation in the “approved” contractor network are fairly easy to meet. Most require appropriate licenses, insurance, and a minimum threshold of longevity in the business. While joining the list often has a low bar, it also allows the program to cut people from the list if they receive customer complaints, although no program reported having this happen very often. Some programs also require expertise-based certification. For example,

³⁷ Freeman, Sullivan & Co, “On Bill Financing Utility Benchmarking,” power point prepared for Pacific Gas & Electric (May 30, 2008)

both NYSERDA and Efficiency Vermont require that their contractors be certified by the Building Performance Institute (BPI), a diagnostics-based training program endorsed by the U.S. Environmental Protection Agency's Home Performance with ENERGY STAR program. This training improves contractors' skills and offers some assurance of quality to home owners. A growing number of states and utilities are running programs using Home Performance with ENERGY STAR, including BPI training and certification. It is likely that more programs in the future will require this type of contractor training and certification. The California Building Performance Contractors Association is offering this training in California.

Managing Program Costs

Program costs can vary based on the types of services offered, how well the programs are run, and volume of the program. An effort was made to break down the costs to make comparisons among programs, but this turned out to be extremely difficult because of the way budgets and reporting are done for each program. A breakdown of the costs reported by some of the programs is found in Appendix C. Although it is difficult to compare the programs directly, a rough estimate is that programs budget between \$300 and \$1500 per loan to cover non-efficiency measure expenses. Less costly programs tend to offer fewer services or outsource the loan processing to a lender (which still entails costs, but these are not included in the programs' budget).

From discussions with program managers, important indicators of program cost per loan are the ratio of audits to installations, and the ratio of loan underwriting to loan acceptance – the higher conversation rate to installations and loan acceptance the better. One option to reduce these costs is to charge for audits, but allow participants to bundle the audit cost in the financing package. Another way of weeding out those who are not serious about making improvements without charging for an audit, which may be a barrier to participation, is requiring a preliminary loan qualification as part of program intake. A number of contractors using the EFS loan product have found this effective.

Other expenses, such as the costs of complying with consumer lending laws, must also be considered. When a utility or other organization issues loans itself, it must follow all the notification, disclosure, and other legal requirements that come with consumer lending. SMUD's loan program is administered in house, and almost all of its loan program staff are former bank employees who are familiar with lending requirements and practices. The startup costs of hiring the expertise needed to run an in-house program like SMUD's are high. Other programs such as NYSERDA, Efficiency Vermont, Vermont Gas, AFC, and Viewtech are either lenders themselves or work with lenders to process and service the loans.

Streamlined Process

A streamlined application process is important both to the customer and the contractor. Any burden for the customer or a delay in paying the contractor is an important barrier. Programs such as Manitoba, SMUD, AFC, Viewtech, and others offer quick application processing, often with approval over the phone for unsecured loans (loans secured to the home take longer). On the back end, it is important to get the payment to the contractor as soon as possible. In focus groups that the City of Berkeley held with contractors, getting paid quickly was a major priority. Several programs deposit the funds directly into contractors' accounts as soon as customers sign the certificate of completion.

One reason that AFC and Viewtech can offer quick turnarounds is that they use retail installment contracts (often used to sell new cars). Frequently, these can be approved on the spot while the contractor is meeting with the customer. However, this is not the only way to offer a streamlined process. Efficiency Vermont's program with VSECU offers three different options, and the process, from a customer's

perspective, is both simple and customized. The customer talks directly to a bank representative, figures out which option will work best, and then the bank, the contractor, and Efficiency Vermont work together on the project approval and payment process. By comparison, Maui's TIP program requires that the customer get a form notarized, after which it can take more than a month to obtain approval, delaying the project. The program manager in Maui reports that customers have chosen the alternative standard financing program requiring a 35% down payment just to avoid these delays.

There are other ways to streamline the process as well. Vermont Gas Systems (VGS) offers to assign a private contractor to the homes they audit, and approximately 95% of customers choose this option rather than finding a contractor on their own or getting multiple bids. These designated program contractors are chosen through a periodic solicitation conducted by VGS. Midwest Energy's internal auditing team creates a conservation plan that contractors must follow, reducing the need for homeowners to make decisions about what improvements that they should make in an area they know little about. Another interesting case, not covered above, is United Illuminating's online "Smart Living Catalogue." Customers in that utility's territory in Connecticut can buy up to \$200 worth of efficient products each year and repay the cost at 0% interest over 12 months as a line item on their utility bill – all processed online. As market research commissioned by Pacific Gas & Electric indicates, simplicity is vital. But so is consistency, so that customers and contractors know what to expect and can move through the process with ease.³⁸

Third-party Support

The sponsorship or other supportive involvement of third parties (i.e. direct involvement of parties other than the contractor making the sale), often plays a key role by helping participants reduce information barriers and transaction costs, and/or providing some measure of quality assurance. As mentioned above, Vermont Gas performs an initial audit, and then usually assigns a qualified contractor to do the work. Midwest Energy creates a detailed conservation plan for the customer. Efficiency Vermont trains and mentors its contractors, and provides quality checks and customer information. These types of services encourage those who might not feel comfortable doing this work on their own, and increases the quality of the energy improvements. However, it also comes with a higher price tag, due to the staff time required.

Trusted authorities who endorse a program provide another cost-effective way to increase the interest in a program. One example of this is an experiment where a letter announcing an incentive program for home retrofits was sent in three versions to randomly selected households. The letter on the local utility's letterhead with no mention of the county's involvement had a response rate of 6%. The letter on the local utility's letterhead that mentioned the county's involvement had a response rate of 11%. And the letter with the county's letterhead signed by the chairman of the County Board of Commissioners had a response rate of 26%.³⁹ The effect of having a trusted third party involved can be seen in the early enthusiastic support for both the Berkeley and the Cambridge programs, even before they have been launched.

³⁸ Freeman, Sullivan & Co 2008.

³⁹ Stern 1985.

Table 6: Comparison of Program Characteristics

Most of these programs focused on providing additional **subsidies**. Only two programs effectively addressed **low-income** households or households with **poor credit**, only three programs serve the **multifamily market**, and only two programs serve the **rental market**. The programs encouraged many different levels of energy savings, but only one program offers a 20-year term that may encourage **comprehensive energy savings**. Programs with the **highest participation** tend to have a **strong contractor network** and a **streamlined process** for obtaining the financing.

	Additional Subsidies	Serves Low Income/ Poor Credit	Serves Rental Market	Serves Multifamily Market	Encourages Comprehensive EE Savings	Strong Contractor Network	Streamlined Process	Participation >0.2% OR >500 homes
AFC First Financial Corporation	√				~	√	√	√
Cambridge Energy Alliance				~				n/a
City of Berkeley	~	~		~	√		~	n/a
Efficiency Vermont	√				~	~	~	
First Electric Cooperative	√						~	
Manitoba Hydro	√	√		√	~	√	√	√√
Maui Electric Company	√	~	~					
Midwest Energy	√	~	√	~	~			n/a
Minnesota Center for Energy and Environment	√		√	√				
Nebraska Energy Office	√			~	~			√
NYSERDA Energy Smart Loan	√	~		√	~	√		
NYSERDA HPwES Loan	√	~			~	√	√	√
Sacramento Municipal Utility District (SMUD)	√			~	~	√	√	√√
Vermont Gas Systems	√	√			~		√	~
Viewtech Financial Services	~				~	√	√	√

√ = Meets this criteria

~ = Close to meeting this criteria or has potential

Note: These ratings are subjective and do not use strict criteria. They are meant only to give a general sense of program characteristics.

IV. Conclusions

Eliminating the first cost of energy investments is an important tool to address the barriers to improving the energy efficiency of existing homes. Once an individual is interested in making energy improvements, financing can make the investment possible and affordable. However, as shown in the cases analyzed for this study, existing financing programs have some important limitations. These include limited applicability for households most in need, low participation rates, the difficulty of assuring savings, limited support for comprehensive energy retrofits, and the inability of most programs to fully cover their costs. Some of these issues may be addressed by public funding, using alternative credit qualifications, lengthening the repayment term, allowing the transfer of repayment obligation with tenancy, and increasing the effectiveness of outreach. Several conclusions follow from these findings:

- Financing is one of many important tools to overcome barriers to implementing improvements in energy efficiency. It is valuable, but not sufficient on its own.
- Conventional energy efficiency loan programs cannot address much of the need without significant public support.
- New mechanisms are being developed to address key barriers. While these innovations hold great promise, they currently have limited to no experience.

It is also important to note that solutions to some of these limitations may directly conflict with each other. Getting comprehensive energy savings may make it more difficult to assure that financing payments will be less than savings for every project, increasing the risk of not reducing costs for low- and moderate-income families. Without public support to protect low- and moderate-income families from the uncertainty of actual energy savings, it may make sense to install only the measures that have the quickest paybacks, or – even better for society as a whole – find a way to guarantee savings for vulnerable populations so that more extensive measures can be done. Another possible conflict is between saving the most energy per dollar spent and getting comprehensive savings. Implementing only the measures with the fastest paybacks maximizes savings per dollar spent in the short term. However, if we have bolder energy-saving goals, such as those outlined in California's *Energy Efficiency Strategic Plan*, it may cost less in the long run to do more extensive work in each home on the initial visit. For any program, it is extremely important to clarify the goals of the program upfront, and if the goals conflict, identify ways to address the conflict. It is also important to note that few programs do measurement and verification for the installed improvements. As a result, little is known about the actual impact. This information would enable a more rigorous assessment of best practices.

Recommendations for California

- **Make a statewide conventional financing product available in California.** Unlike many other states, most California residents do not have access to a conventional financing product targeted at energy efficiency improvements. California could easily create a simple statewide program similar to that of Pennsylvania's and offer state funds (with interest) and a reserve fund to keep rates low. Like Pennsylvania, this could be offered through a network of contractors, possibly in partnership with Viewtech Financial Services, which is already operating a loan program in California, or the California Building Performance Contractors Association (CBPCA). This will not address many of the the limitations mentioned above, but it will get the ball rolling and encourage more people to invest in energy efficiency.

- **Additional support for the development & implementation of new innovative financing mechanisms.** Three mechanisms are of particular interest:
 - A Clean Energy Municipal Financing program that uses property tax payment history as a proxy for credit and allows repayment responsibility to transfer with property ownership, as is currently being pursued in Berkeley and Palm Desert.
 - An on-bill Tariffed Installation Program that uses utility bill payment history as a proxy for credit and is accessible to rental properties.
 - A mortgage refinancing program that works closely with low- and moderate- income households to make efficiency improvements and reduce their total debt burden.

- **Expand and strengthen California’s network of energy improvement contractors,** and make them a sales force for financing. This has already begun through the California Building Performance Contractors Association (CBPCA), which offers Building Performance Institute⁴⁰ trainings, but more funding is needed to train contractors and crew members, and to help develop the capacity of the existing businesses in this market so that they can serve more customers.

- **Experiment with new messages and new messengers to promote financing.** Financing reduces first cost so that those without access to capital can choose to make energy efficiency improvements. But before people sign up for financing, they must want to make efficiency improvements. There is a lot of room to try creative new ways of informing and engaging people. There is evidence that more direct, grassroots outreach through groups that people already know and trust is important to increase participation. There may also be ways to tap into traditional marketing expertise and create sophisticated campaigns that target key market segments.

- **If statewide time-of-sale energy efficiency requirements are adopted, support the development of new Energy Improvement Mortgage products.** More than loan programs will be needed to meet the state’s targets. Implementing time-of-sale energy performance disclosure and time-of-sale energy requirements are options for increasing the efficiency of California’s residential buildings. Energy Improvement Mortgages may be useful to enable efficiency improvements if these policies are implemented.

All parts of society must be engaged in the effort to reduce energy consumption and protect vulnerable populations from rising energy costs. It is important to remember that this problem will not be solved simply by offering low- or no-interest loans. California is well-positioned to address the energy issues it faces and become a model for the rest of the world; success lies in understanding the potential and limitations of tools such as financing, and figuring out the right set of policies and programs to meet our goals.

⁴⁰ The Building Performance Institute (BPI) offers nationally-recognized training, certification, accreditation, and quality-assurance programs. BPI is the standard recommended by the EPA’s Home Performance with Energy Star program. More information here: www.bpi.org

V. Appendices

Appendix A. Residential Financing Case Studies

There are hundreds of programs to finance energy efficiency around the world; the Database of State Incentives for Renewables & Efficiency (DSIRE⁴¹) funded by the U.S. Department of Energy contains 150 programs for the residential market in the US alone.⁴² The 15 existing and 3 terminated residential financing programs discussed below are intended to represent a range of program types of potential interest and value.⁴³ While typical programs are represented in these case studies, there was special effort made to identify and report on new concepts that may be less known and understood. They were also selected based on the potential value of the lessons they provide, or the promise they offer, for policymakers and program planners currently interested in new or expanded options for residential energy efficiency financing.

Some programs have existed for over 20 years; others are just starting in 2008. In this paper, they are organized roughly by program type. This section starts with several off-bill programs of various types, including two programs that use retail installment contracts (Viewtech, AFC First), then moves to standard on-bill financing programs (Manitoba Hydro, First Electric Cooperative), then features tariffed installation programs (TIPs) that also have the repayment charge with the utility bill (Midwest Energy, Maui Electric Company), and ends with the Clean Energy Municipal Financing being launched this year by the City of Berkeley. Each case has a standard set of program data that accompanies it, and a compiled list of these data follows the existing program narrative. Some program data are estimated based on discussions with program managers. Also, it is important to note that the “percent of customers served in 2007” category assumes that the pool of potential customers includes all residential households in the territory covered by the program; e.g. all households in a utility’s service territory, or all households in the state for a statewide program. This is a much larger pool than the actual potential customers who ideally would only include those eligible customers who could qualify for the loan and had not participated already. However, the size of this smaller pool is unknown, so this larger number was used as a proxy to enable some comparison of programs.

The case study section closes with the discussion of several programs that were terminated. The lessons learned from their failure may be even more instructive than the lessons being gleaned from programs currently operating. The section following the case studies, called Lessons from the Field, explores what can be learned by critically examining the case studies.

Conventional Off-Bill Financing Programs

Sacramento Municipal Utility District

Residential Loan Program, Sacramento, California

The Sacramento Municipal Utility District’s financing program is among the oldest in the country, beginning in 1977, and has issued 135,000 loans over this time. Since 1990, it has issued 78,000 loans for a total of \$443 million in capital loaned. The Sacramento Municipal Utility District (SMUD) uses

⁴¹ More information about DSIRE here: www.dsireusa.org

⁴² See Appendix G.

⁴³ See Appendix A for a list of existing programs and web links.

internal funds to run the program, which mainly serves single-family, owner-occupied homes. SMUD works closely with more than 180 pre-approved contractors, the main salespeople for the program. The contractor walks the customer through the loan application on the spot, and SMUD approves or denies the loan within 24 hours. After the work is completed and the home owner and contractor sign off, SMUD pays the contractor, often via direct deposit, and begins billing the client. Originally SMUD included the charge on the utility bill, but now they send a separate bill for the loan repayment. Once the work is completed, it takes less than a week for SMUD to pay the contractor.

SMUD does all of the underwriting, servicing, and collections. It charges an interest rate of 7.5%, which covers its cost of capital, plus all overhead costs, including program administration and defaults. The program received 4,400 applications in 2007, of which 3,200 (73%) were approved. Its default rate has been quite low due to the security of the fixture filing that they place on the property. In 2007, the default rate was 1.8%, higher than usual because of adverse economic conditions. In 2006, it was 0.3%; the highest annual default rate was 4% in 1996. In 2007, the total budget was approximate \$30 million with \$2 million for administration operating costs and \$28 million for new loans. Of the \$28 million, nearly \$15 million was used for central air-conditioning or heat pump systems and \$11 million for high performance windows. In 2007, the administrative cost per loan was approximately \$245 which includes origination (underwriting), servicing and collections for those loans issued in 2007.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Utility's general revenue funds	Consumer loan	Separate monthly bill from utility	Below market rate interest	EE, solar thermal, solar PV	Utility	Yes, std bank metrics used plus bill pmt history 73% approved	Secured with a fixture filing to the property
Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
1977	Single family owner occupied	Network of 180 contractors	\$8,750 no max	7.5% up to 10 years	3,200 loans \$28 million	0.6% (3,200 loans / 520,000 homes)	1.80%

Minnesota Center for Energy and Environment Rental Energy Loan Fund, Minnesota

The Rental Energy Loan Fund was created in 1990 to encourage rental property owners to make energy improvements to their properties. The loan is offered at 4% for up to 5 years, and is secured by the value of the property. The non-profit Center for Energy and Environment processes the loan, provides guidance, and approves energy saving measures. Even though this program was designed expressly to address barriers to efficiency improvement in the rental housing market and offers a below-market interest rate, it has achieved only limited participation. That is, the number of loans issued every year is small, even after more than a decade of operation. For example, there were only 21 loans in 2007, representing less than 0.1% of total residential customers.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
State revolving loan fund	Mortgage	Separate monthly bill from sponsoring entity	Below market rate interest	Energy efficiency	Sponsoring entity	No set bar, they review DTI and cash flow of property	Secured by lien on home

Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
1990	Single- and multi-family rental units	Info to landlords, contractors	\$8,000 \$10,000 max	4% up to 5 years	21 loans \$164,000	<0.1%	~3-5%

Efficiency Vermont

Home Performance with ENERGY STAR® Loan Program, Vermont

Efficiency Vermont's Home Performance with ENERGY STAR (HPwES) Loan Program has operated for the last three years. To date, approximately 50 loans have been approved, with over 40 more pending. Efficiency Vermont works with several lenders to offer this program (customers choose lenders), but most activity has been with VSECU, the state employees' credit union which now has open membership. The customer works with a contractor to get a quote and scope of work, and then seeks approval from both the lender (usually over the phone) and Efficiency Vermont. If changes need to be made during implementation, Efficiency Vermont approves those changes and the lender adjusts the loan amount. Once the work is complete, the funds are disbursed directly to contractor. Quality inspections are done as part of the general HPwES program, but are not required for each loan.

The lender provides all of the underwriting, origination, and servicing. Efficiency Vermont approves the efficiency measures, and then pays a lump sum equal to the net present value of buying down the loan by 3.5%. Efficiency Vermont's overhead costs are relatively low, an estimated \$250 per loan for the average staff time spent of 4-5 hours per loan. In addition, Efficiency Vermont pays an average of \$670 per loan for the buy down. With VSECU, several different financing options are available: a personal loan, a loan backed by an asset (e.g., a car), or a home equity loan. The interest rate charged to the customer varies according to the loan type and the creditworthiness of the customer, but tends to be in the 2.0% to 6.5% range after the 3.5% buy down from Efficiency Vermont. The term for the subsidized rate is up to 5 years, but it can be combined with market rate interest to extend the term. Thus far, the program has experienced a 100% approval rate and no defaults. The customers applying for these loans tend to have FICO scores, a measure of credit risk used by credit rating agencies, in the high 700s, as do the average clientele of VSECU. One issue mentioned by program staff is that only a few contractors understand and

encourage financing for their customers. The program could support additional loan volume, and addressing this issue will be important to increasing the use of this program.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Lender funds, plus public benefit charge	Consumer loan or mortgage	Separate monthly bill from lender	Interest buy down	Energy efficiency	Lender	Varies based on loan product 100% approved	Some loans are secured with home equity or another asset (e.g. a car)
Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
2006	Single family owner occupied	Sponsor promotes, some contractors promote	\$8,000 \$15,000 max	Buy down 3.5% Final interest varies ~2-6.5% 5 years max	34 loans \$257,000	<0.1% (34 loans / 250,000 homes)	None so far

Vermont Gas Systems Retrofit Loan Program, Chittenden County, Vermont

The Vermont Gas Systems (VGS) program started 15 years ago and provides a high level of support to help customers with higher-than-average gas usage find ways to improve the thermal efficiency of their homes. Administrative, audit, incentive and loan guarantee costs are covered by Vermont Gas with cost recovery through rates, and the loan capital is provided by the Opportunities Credit Union. VGS staff conduct a free audit for customers and recommend specific improvements for eligible customers (those whose gas usage level suggests an opportunity for substantial savings). Customers then have the option of using either a VGS-appointed contractor (about 95% of customers choose this option), or selecting their own contractor. VGS submits the loan application and incentive agreement to the lender for approval.

The lender services and collects on the loan. It also does the underwriting, but almost no one is denied because VGS guarantees the loans. This practice gives lower-income customers access to financing. To date, there has been only one default in the portfolio. Customers generally receive a direct rebate for one third of the project cost, and then can choose to finance the rest at 0% to 4% interest, depending on the term. The 2007 program budget was \$448,000, which included \$100,000 for administration, \$121,000 for audits, and the rest for incentives. Last year, 382 audits were completed, leading to 152 installations (a 40% conversion rate of audits to installations). Of these installations, 54 went through the free, income-qualified weatherization program, 66 customers chose to take loans, and 32 did installations without a loan. The administrative cost per installation was \$658, and the audit costs were \$317 or \$796 per audit that converted to an installation (total installations / total audit costs).

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Lender funds, plus expenses added to rate base	Consumer loan	Separate monthly bill from lender	Below market rate interest; loans guaranteed	Energy efficiency improvements that reduce gas use	Utility	Low bar as loans are guaranteed; ~100% approved	Secured by lien on home; loans guaranteed by VGS
Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
1993	Single- and multi-family with larger than average gas use	VGS staff, contractors	\$4,380, no max	0% for 3 years 2% for 5 years 4% for 7 years	66 loans \$289,000	0.2% (66 loans / 36,000 homes)	~0% (1 in 10 years)

Nebraska Energy Office Dollar and Energy Saving Loan Program, Nebraska

The Nebraska Energy Office (NEO) offers reduced interest rate loans through partner lenders at 600 locations. The program started in 1990 with \$10 million that were provided to the State from a settlement with oil companies that overcharged customers. Since then, the NEO added an additional \$23.4 million to the pool. The interest rate is reduced to half the lender's normal rate because the state purchases 50% of the loan, up to \$7,500, at 0% interest. The resulting blended interest rate is usually under 5%, and the loan can be secured or unsecured, depending on the lender's requirements. The program funds a prescriptive set of energy efficiency measures such as insulation, appliances and home electronics, heating and cooling system upgrades, windows and doors, etc. Measures adopted by the audit must meet a simple payback of 15 years for building improvements, 5 years for replacement appliances or home electronics, and 10 years for all other items.

Since its inception, the program has issued 22,700 residential loans worth \$138 million. In 2007, 784 residential projects were funded with an average of \$9,000 per project. The program funds both single family and multifamily homes; the program does not track those projects separately but almost all are for single family homes. The default rate for the program is extremely low, less than 0.1%. Internal overhead costs also appear to be fairly low as the lenders do much of the administration; two program staff work on the loan program in addition to their other responsibilities.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Lender funds, oil overcharge funds	Consumer loan	Separate monthly bill from lender	Below market rate interest	Energy efficiency, renewables	Lender	Lender does underwriting, Approval rate varies	Varies based on lender's requirements

Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
1990	Single- and multi-family property owners	Contractors, lenders	\$9,000 SF max \$35,000 MF max \$75,000	Under 5% on average	784 loans \$7.1 million	0.1% (784 loans / ~700,000 homes)	<0.01%

New York State Energy Research and Development Authority Energy Smart Loan Fund, New York

The New York Energy Smart Loan Fund program is a part of the New York State Energy Research and Development Authority's (NYSERDA) portfolio of more than 40 energy efficiency and renewable generation programs supported by a public benefits charge on utility bills. Begun in 1998, the Energy Smart Loan Fund works with a network of more than 123 lenders who offer interest rate buy downs of 4% (6.5% for customers of ConEdison) for up to 10 years. The program has a partner who recruits and provides energy efficiency education for lenders, as well as training in how the incentive program works. The program was originally intended for the lenders to do much of the outreach; however, participants most often learned about the Energy Smart Loan Fund through participating Home Performance contractors accredited by the Building Performance Institute (BPI) in NYSEDA's network of 147 contractors. Most loans are given for energy efficiency, although loans are also available for the purchase and installation of photovoltaic and wind turbine systems. In terms of impact by energy efficiency measure, it is estimated that insulation, duct sealing, and weather stripping account for 50% of all energy savings, followed by improvements to windows, skylights, doors, and installation of heating equipment .

For single-family loans, the maximum loan amount is \$20,000 (\$30,000 for customers of ConEdison); loans may be secured or unsecured at the lenders discretion. For existing multifamily housing, there is a limit of \$5,000 per unit, or up to \$2.5 million per borrower, plus an additional limit of \$2.5 million for projects that include advanced meters, coupled with a time-of-use electricity rate structure. To qualify, all multifamily buildings must receive an audit through NYSEERDA's Multifamily Performance Program. In 2007, 340 loans totaling \$3.8 million went to single-family homes, and 29 loans totaling \$23.2 million went to multifamily buildings. Home improvements must be installed by a BPI-accredited contractor. Lenders are required to provide default rate information annually, and they reported only a few defaults in 2007. Overhead is approximately 14% (\$1,540 per loan on average) of the total loan amount and includes the interest rate buy down, processing the loan, and disbursement of proceeds to contractors upon completion of the project.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Lender funds, plus public benefit charge	Consumer loan	Separate monthly bill from lender	Interest buy down, Add \$ for low income	EE, solar thermal, solar PV, wind	Lender	Lender does underwriting, Approval rate varies	Loans over \$7,500 must be secured
Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
1998	Single- and multi-family property owners	Lenders and contractors	SF \$11,000 \$20,000 max MF varies widely	Buy down of 4% term varies	SF 340 loans \$3.8 million MF 29 loans \$23.2 million	<0.1% (369 loans/ ~6 million homes)	<1%

New York State Energy Research and Development Authority Home Performance with ENERGY STAR® Loan Program, New York

NYSEERDA has a Home Performance with ENERGY STAR (HPwES) loan program as an alternative to the Energy Smart Loan Fund. The HPwES is an unsecured loan at 5.99% for a term of 3, 5, 7, or 10 years. The loan program is currently implemented by Energy Finance Solutions (EFS), a national energy efficiency financing organization operated by the Wisconsin Energy Conservation Corporation. EFS makes significant, but not exclusive, use of capital from Fannie Mae.

This program is preferred by some customers over the Energy Smart Loan Fund because it is available statewide (not just with certain lenders) and requires less paper work and time to arrange. Customers can get pre-approval over the phone. After the loan documents are submitted via mail, the HPwES program implementer, currently the Conservation Services Group, Inc., reviews the scope of work; once the work is completed, EFS wires the money directly to the contractors within two business days of receiving the certificate of completion. Customers must have a FICO score higher than 640 to qualify, and approximately 65% of applications submitted to EFS are approved. In 2007, 541 loans were issued for a total of \$4.2 million. The ENERGY STAR loan product offered by EFS has a default rate between 2% and 3%. Overhead is approximately 19% (\$1,482 per loan on average) of the total loan amount and includes the interest rate buy down, processing of the loan, and disbursement of proceeds to contractors upon completion of the project.

If customers choose not to use either of NYSEERDA's loan programs, they are eligible to receive a rebate of up to 10% of their project costs up to \$3,000. Also, for both programs, NYSEERDA offers a 50% subsidy of project costs up to \$5,000 per single family homes (up to \$10,000 for 2-4 family homes) for

financially eligible customers that have incomes less than either 80% of the state or area median income, whichever is greater.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Fannie Mae funds and public benefit charge subsidy	Consumer loan	Separate monthly bill from lender	Below market rate interest, Addl \$ for low income	Energy efficiency	Lender	FICA >640 ~65% approved	Unsecured
Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
2003	Single family owner occupied	Contractors	\$7,800 \$20,000 max	5.99% for 3, 5, 7 or 10 years	541 loans \$4.2 million	<0.1% (541 loans/ ~6 million homes)	~2-3%

Viewtech Financial Services Fannie Mae Loan Program, California

Viewtech Financial Services is one of three lenders nationwide working with utility and state agency sponsors that uses capital from the Fannie Mae Energy Loan program to finance residential energy efficiency improvements, including central heating and cooling systems, water heating systems, replacement windows and doors, insulation, ductwork upgrades, lighting, and solar and other renewable technologies. Viewtech works with more than 600 contractors who have been screened by the League of California Homeowners⁴⁴. The contractor helps the customer fill out the loan application, and Viewtech notifies the contractor of approval or denial. When the work is complete, the customer signs a certificate of completion, and the payment is wired to the contractor in 2 to 3 business days. Viewtech services the loan, and sells the underlying asset to Fannie Mae.

This program started in 1995 and has disbursed approximately 100,000 loans with an average value of \$10,000 and a typical term of 8 to 9 years. The loan is unsecured and uses a retail installment contract (RIC). The current interest rate is 12.49% for top tier credit, which is near the current market rate for this type of loan. In 2007, approximately 3,000 loans were issued, mostly in Southern California, and 60% to 70% of loan applications were approved. After a period of reduced demand (and rates as high as 14% in the last few years), Viewtech reports that demand appears to be growing.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Fannie Mae funds	Consumer loan	Separate monthly bill from lender	Below market rate interest	Energy efficiency	Sponsoring entity	FICA >640 60-70% approved	Unsecured Retail Installment Contract (RIC)
Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
1995	Single family owner occupied	Contractors and utilities advertise	\$10,000 \$20,000 max	12.49% Up to 12 years	3000 loans \$3,000,000	n/a	~2%

⁴⁴ The League of California Homeowners is a non-profit consumer organization that does credit and background checks on home contractors to help home owners find contractors that do good quality work. They do not train contractor in energy efficiency work, nor do they provide information about the knowledge base of the contractor. More information: www.homeowners.org

AFC First Financial Corporation Keystone Home Energy Loan Program, Pennsylvania

AFC First Financial Corporation administers Pennsylvania's residential energy loan programs. There are two loan products offered under the Keystone Home Energy Loan Program (HELP), unsecured and secured. The unsecured loans are issued by AFC and then the underlying assets are purchased by the Pennsylvania Treasury Department. To keep rates low, two state agencies, the Pennsylvania Energy Development Authority and the Department of Community and Economic Development, have eliminated the need for loan insurance by providing a loan loss reserve fund of 5% (\$900,000), reducing the interest rate on the loans by an estimated 1.5% to 2%. The unsecured loan covers smaller energy efficiency investments up to \$10,000 at 8.99% interest. AFC requires 4% interest for contractor training and recruitment, underwriting, origination, loan servicing, and other administrative costs, and the Pennsylvania Treasury currently requires a 5% return. The reserve fund insures these returns to the lenders, enabling the 8.99% rate. In March of 2008, AFC launched a new secured product supported by loan funds from the Pennsylvania Housing Finance Agency. This mortgage-secured loan can cover renewable energy investments, including comprehensive energy efficiency improvements, solar, geothermal, and other technologies. This loan can be up to \$35,000, ranging from 6.375% to 8.875%, for terms of up to 20 years. There are no closing costs for the unsecured loans, and closing costs for secured loans are generally below \$500.

In 2007, AFC issued approximately 1,500 unsecured loans with an average loan size of \$6,000 for a total of \$9 million in financing. The approval rate is approximately 65%, and the average FICO score of the borrowers is 733. In 2007, the second year of the program, the default rate was less than 0.5% and the delinquency rate was less than 1%. Fewer data are available for the secured loan program, since it started in March 2008. However, in the first two months, approximately 50 loans were made, with an average size of \$17,000. The cornerstone of AFC's program is working closely to train contractors to use and promote the financing products. AFC works with 700 approved contractors who help customers through the loan process. Unsecured loans can be processed over the phone or on-line, and both loan types offer same-day approval. Final payments are made directly to the contractors upon satisfactory project completion.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
PA Treasury, Housing Finance Agency & Energy Dev Authority	Retail installment contract (RIC) or mortgage	Separate monthly bill from lender	Below market rate interest	Energy efficiency, solar, wind and geothermal	Sponsoring entity	FICA >640 ~65% approved	Loan loss reserve fund; some loans also secured with mortgage
Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
2005	Single family owner occupied	Contractors	\$6,000 unsec \$10,000 max sec \$35,000 max	unsec 8.99% for 3, 5 or 10 years sec 6.375-8.875% for 10,	~1,500 loans \$9 million	<0.1% (1,500 loans / 4.8 million homes)	<0.5%

Cambridge Energy Alliance Cambridge, Massachusetts

The Cambridge Energy Alliance (CEA) has launched an initiative backed by the City of Cambridge with the goal of retrofitting 50% of Cambridge buildings and reducing the city's emissions by 10% over the next five years. Thus far the program has received an overwhelming response, in the form of residents

signing up for audits via an online request form, to public announcements, news articles, and a feature on public television (PBS). The program targets all building types, and is designed to make energy improvements through a number of selected energy service companies (ESCOs). For the residential market, homeowners can use a free audit, paid for by state public benefit charge funds. All the work is specified and implemented by the ESCO that CEA has selected for the residential market. This program is just starting up, so information at this point reflects plans, expectations and early experience.

CEA directs customers who need help with financing to two loan options: (1) They have negotiated a rate of 9.75% for an unsecured personal loan with East Cambridge Savings Bank. The maximum loan amount is \$25,000 for a term of up to 10 years for energy efficiency, solar thermal, or solar PV. The approval rate for these loans is projected to be approximately 80%. (2) Customers with less than 80% of the area median income can apply for a loan from Citizens Bank at a program-subsidized interest rate of 1-3%. This option is expected to have an approval rate of about 30%.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Lender funds	Consumer loan	Separate monthly bill from lender	Negotiated reduced rate	EE, solar thermal, solar PV	Lender	Varies, lender does underwriting 30-79% approved	Unsecured

Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
2008	All sectors	Public announcements, articles, etc	max \$25,000	9.75% for ECSCB 1-3% for Citizens' if <80% AMI <10 years	n/a	n/a	n/a

On-Bill Financing Programs

Manitoba Hydro

Power Smart Residential Loan, Manitoba, Canada

Manitoba Hydro has the highest annual loan volume of any of the programs reviewed. Since 2001, they have disbursed 41,000 loans, and in 2007 their volume was 8,100 loans with an average value of \$4,800. Approximately 2% of their customer base participated in this program in 2007 – the highest of any program reviewed. This is particularly surprising because Manitoba Hydro has some of the lowest average residential tariffs in the world (5-6 cents/ kWh), which makes efficiency improvements less attractive. They offer unsecured loans at 6.5% for a term of up to 5 years. Customers can work with a contractor or do the improvements themselves as long as the measures meet the required standards. Eligible measures include adding insulation, installing ventilation, sealing air leaks, replacing windows and doors, lighting, electrical service and wiring, upgrading the efficiency of the existing heating system including the installation of geothermal and air-source heat pump, and domestic water heaters. Of the \$167 million in loans disbursed since March 2001, 59% has funded energy efficient window and door upgrades, 35% has funded heating system upgrades, and 6% has funded a combination of upgrades to insulation, ventilation, and air sealing. Part of the reason for the low percentage of this latter category is that a large portion of these costs are covered with rebates, and only the balance is financed. Manitoba Hydro is able to offer generous rebates as part of its efficiency programs that are supported, in part, from income it receives from selling its relatively low-cost hydro power to utilities in the U.S.

This program has a fast turnaround time for loan approvals: typically, the same business day for most approvals and within seconds using a web-based system for their network of contractors and retailers, which includes approximately 1,100 contractors and 200 retailers. After the work is approved by the client, Manitoba Hydro pays the contractor within 20 business days. To assess credit worthiness, Manitoba Hydro uses bill payment history and/or a credit review. Their approval rate is high – 94% of applications are approved. The default rate over the program life is 0.2%, and in 2007 it was less than 0.2%. Loan repayments are added as a line item to the utility bill. Overdue payments are subject to an interest charge of 1.25% per month until paid. When a customer falls into arrears on their energy account greater than 90 days, they are subject to disconnection of services. A sample loan agreement form from Manitoba Hydro is provided in Appendix D.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Utility's general revenue funds	Consumer loan	On utility bill	Below market rate interest	Energy efficiency	Utility	No set bar, review credit and bill payment history 94% approved	Unsecured
Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
2001	Single family owner occupied	Contractors, suppliers, utility	\$4,800 \$7,500 max	6.5% up to 5 years	8,100 loans \$39 million	<1.9% (8,100 loans / 420,000 homes)	<0.2%

First Electric Cooperative Home Improvement Loan Program, Arkansas

The First Electric Cooperative (FEC) has offered various forms of on-bill financing since the mid-1990s. Among FEC's services are free energy audits to its members, and financing for those who want to do larger projects through a contractor on FEC's approved list. The only requirement for participation is the purchase of a qualified heat pump; in addition, FEC will fund other efficiency improvements with the loan. Once the work is complete, the utility issues a check that the customer signs over to the contractor, and the utility adds a line item to the customer's bill for loan repayment activity.

FEC does all the underwriting and loan servicing itself. Staff talk to all interested customers, and provide guidance about the process to all who appear to be good candidates. The loan source is a national fund available to electric cooperatives. The rate for up to \$15,000 is 7.5% over 5 years, and is secured by a fixture filing and a mortgage for larger sums. FEC essentially breaks even on the loan. In 2007, FEC issued only seven loans that averaged \$11,000 for a total of \$76,900. Because the loan volume is low, this activity has a minimal impact on staff time. Program staff were unsure why the demand was so low, and speculated that customers might be obtaining financing elsewhere, such as through the equipment manufacturers.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
National electric coop funds	Consumer loan or mortgage	On utility bill	Below market rate interest	Heat pump required, other EE allowed	Utility	No set bar, review credit and bill payment history ~100% approved	Fixture filing, plus loans over \$2,500 secured with mortgage
Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
2000	Single family owner occupied	Through utility	\$11,000 \$15,000 max	7.5% up to 5 years	7 loans \$76,900	<0.1% (7 loans / 65,000 homes)	<1%

Midwest Energy How\$martSM, Kansas

In August 2007, Midwest Energy launched a tariffed installation program (TIP) for all residential customers, including owners of multifamily and rental units. Midwest Energy worked with the Energy Efficiency Institute⁴⁵, developer of the Pay As You Save Program (PAYS®) model, to set up the program. This required approval of the new tariff from the regulatory commission, which took six months. The tariff was strongly opposed by the Consumer Advocate due to concerns about disconnection for non-payment and the prospect of Midwest Energy claiming reimbursement for bad debt. In contrast, the regulatory commission is reported to have been enthusiastic about the program. At the time of the launch, Midwest Energy already had a well-trained internal auditing team that had completed audits for free or nominal fees depending on the level of detail. The new program, How\$martSM, builds on that established expertise. Midwest Energy provides free audits for customers who enroll in How\$martSM; recommends specific improvements, such as insulation levels and new equipment sizing; and generates an estimated savings level. The customer then selects a contractor to perform the work as specified by Midwest Energy. Once the customer signs off on the completed work, Midwest Energy pays the contractor directly and adds the loan repayment charge to the customer's bill. The How\$martSM charges must be less than

⁴⁵ More information: www.eeivt.com

90% of the estimated monthly savings. Midwest Energy does not guarantee these savings, but they do stand behind their recommended improvements and have committed to fix any problems that result from errors on their part. They currently do some “spot checks” after the work is complete, and are developing a more thorough evaluation process.

In less than a year and with very little marketing, the pilot program has seen a strong response for a small utility with approximately 40,000 residential customers. As of July 2008, 47 projects have been completed, with about 120 more in the pipeline. Program staff report that area contractors are now booking many months out to complete projects. Each project uses two sources of capital: (1) half of the amount has 0% financing from the state-wide program funds by the Kansas Housing Resources Corporation (KHRC), and (2) the other half is from internal funds from Midwest Energy. Taken together, the blended interest rate is 4%. They also add a one-time 5% fee (about \$200) to the loan to cover some of their auditing expenses.

To qualify, customers are required only to be current on their utility bills; they do not undergo a formal credit check. Midwest Energy will disconnect power for nonpayment if necessary; they believe that this gives them enough security to make the program widely available. One interesting aspect of this program is that it appears to be of special interest to rental property owners. Of the 47 completed projects, 7 of these are for rental units, which is similar to the overall mix of rental vs. owner-occupied units in the market. Program staff observe that property owners are starting to do projects during the intervals between renters’ occupancy, whereas the renters themselves, for any number of reasons, do not seem to be interested in initiating the improvements. Another interesting note is that their average loan amount is the lowest of all the case studies. Midwest Energy is conservative with their saving estimates to avoid the chance of overstating savings and this, combined with the savings requirement of the program, limits the scope of improvements. A sample program brochure from Midwest Energy is provided in Appendix F.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Utility's general revenue funds and state housing fund	Tariffed installation program	On utility bill	Below market rate interest	Energy efficiency	Utility	Good utility bill payment history	Disconnection for nonpayment

Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
2007	Single- and multi-family rented or owned	Contractor and utility	\$4,000 no max	4% interest 15 years	47 loans closed \$188,000 (since Aug 2007)	n/a	None so far, started last year

Maui Electric Company SolarSaver Pilot, Maui, Hawaii

Hawaiian utilities started a three-year tariffed installation pilot program for solar water heaters in 2007. Maui Electric Company’s pilot program plans for 50 solar water heater (SWH) installations each year for the three years of the pilot. Customers work with their contractors to apply for the loan, and Maui Electric Company (MECO) attaches the repayment responsibility to the utility meter. This program is available to single or multifamily homes, and to both owner-occupied and rental properties. Renters need approval from the building owner before proceeding with a project. The program offers 0% financing over an average term of 8 years in addition to the standard \$1,000 rebate for solar water heaters. Honeywell is the contractor that processes the applications and manages the program. Currently, the annual administrative

cost budgeted is \$65,000. With a maximum of 50 installations per year for the pilot, this is \$1,300 in administrative overhead per water heater.

MECO staff said that the program began slowly, but seems to be picking up. Currently, 16 projects have been approved. They also note that one barrier for customers is the time it takes to attach the payment responsibility to the meter. Customers must get a form notarized, and then it can take up to two months to obtain approval by the Bureau of Conveyances. According to others working on tariffed installation programs, this wait seems excessively long. It has not been the case with the Midwest Energy program, for example. Due to the wait, some customers have chosen MECO's other solar water heater program that requires 35% down and use a standard unsecured loan. MECO plans to evaluate the program at the end of the pilot phase and decide whether to continue it. A sample program brochure from MECO is provided in Appendix E.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Public benefit charge	Tariffed installation program	Separate bill within the utility bill envelop	Zero percent interest	Solar hot water	Contractor	No set bar, review credit and bill payment history	Disconnection for nonpayment

Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
2007	Single- and multi-family rented or owned	Contractor and utility	\$5,000 no max	0% 8 year term ave	16 loans \$80,000	<0.1% (16 loans/ ~40,000 homes)	None so far, started last year

Clean Energy Municipal Financing

City of Berkeley

Berkeley FIRST, Berkeley, CA

The Berkeley Financing Initiative for Renewable and Sustainable Technology (FIRST) is currently under development, with a pilot launch for solar PV planned for Fall 2008. Berkeley FIRST is an innovative program that allows residential and commercial property owners to install energy efficiency measures, solar thermal, and solar PV, and pay for the cost over a 20 year period through a special tax, collected as a line item on the property tax bill. Only the residents who have had work done on their property are responsible for paying the special tax. If the property is sold prior to the end of the repayment period, the new owner takes over the remaining special tax payments as part of the property's annual tax bill. The long repayment period and transferability of the payments allow property owners to invest in comprehensive energy savings and renewable projects that pay back over a longer period than many existing financing options allow. This strategy should also have wider applicability because it does not anticipate considering general applicant creditworthiness as a qualification, but rather will use the record of paying property taxes as a proxy for credit.

The City is planning to provide funding for the program through the issuance of a municipal bond. The interest for participants is expected to be in the range of 5% to 7%, and the interest portion of the payments will be tax deductible. To initiate the financing, the City will record a Notice of Special Tax Lien against the property. This imposes a lien to secure the obligation to pay special taxes and takes priority over a property's first mortgage. In the event of delinquent special taxes, the City has the ability

to foreclose on the delinquent property, or it may choose to wait for the county to initiate foreclosure. Berkeley FIRST is expected to be a major component of Berkeley’s voter-approved Measure G, which sets an 80% greenhouse gas reduction target by 2050.

Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Municipal bond	Special tax levied	On property tax bill	Interest payments are tax deductible	EE, solar thermal, solar PV	tba	Must own property and be current on property tax pmts	Secured by lien on home

Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
September 2008	Residential and commercial property owners	tba	tba	5-7% (tba) 20 years	n/a	n/a	n/a

Table 7: Program Design Summary

Capital came from a variety of sources including lender funds, internal utility funds, and public benefits charges. The most common **financing mechanism** was an unsecured consumer loan, though mortgage-backed loans, TIPs, and other mechanisms were also used. Most programs used a separate monthly bill as the **collection mechanism**, with on-bill financing used in a few cases. Most programs had significant **enhancements** such as zero or reduced interest rates. **Eligible measures** were often limited to energy efficiency, with other technologies such as solar PV allowed in a few cases. The lender or the utility most often **processed the application**. **Credit requirements** varied widely, with several programs reporting FICO score requirements over 640 and a ~30% application denial rate. Many programs did not require **security interests**, though some programs used liens or the threat of disconnection to add security to the loan.

Sponsoring Entity	Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
AFC First Financial Corporation	PA Treasury, Housing Finance Agency & Energy Dev Authority	Retail installment contract (RIC) or mortgage	Separate monthly bill from lender	Below market rate interest	Energy efficiency, solar, wind and geothermal	Sponsoring entity	FICA >640 ~65% approved	Loan loss reserve fund; some loans also secured with mortgage
Cambridge Energy Alliance	Lender funds	Consumer loan	Separate monthly bill from lender	Negotiated reduced rate	EE, solar thermal, solar PV	Lender	Varies, lender does underwriting 30-79% approved	Unsecured
City of Berkeley	Municipal bond	Special tax levied	On property tax bill	Interest payments are tax deductible	EE, solar thermal, solar PV	tba	Must own property and be current on property tax pmts	Secured by lien on home
Efficiency Vermont	Lender funds, plus public benefit charge	Consumer loan or mortgage	Separate monthly bill from lender	Interest buy down	Energy efficiency	Lender	Varies based on loan product 100% approved	Some loans are secured with home equity or another asset (e.g. a car)
First Electric Cooperative	National electric coop funds	Consumer loan or mortgage	On utility bill	Below market rate interest	Heat pump required, other EE allowed	Utility	No set bar, review credit and bill payment history ~100% approved	Fixture filing, plus loans over \$2,500 secured with mortgage
Manitoba Hydro	Utility's general revenue funds	Consumer loan	On utility bill	Below market rate interest	Energy efficiency	Utility	No set bar, review credit and bill payment history 94% approved	Unsecured

Sponsoring Entity	Sources of Capital	Financing Mechanism	Collection Mechanism	Enhancements	Eligible Measures	Who processes application?	Credit Requirements	Security Interests
Maui Electric Company	Public benefit charge	Tariffed installation program	Separate bill within the utility bill envelop	Zero percent interest	Solar hot water	Contractor	No set bar, review credit and bill payment history	Disconnection for nonpayment
Midwest Energy	Utility's general revenue funds and state housing fund	Tariffed installation program	On utility bill	Below market rate interest	Energy efficiency	Utility	Good utility bill payment history	Disconnection for nonpayment
MN Center for Energy and Environment	State revolving loan fund	Mortgage	Separate monthly bill from sponsoring entity	Below market rate interest	Energy efficiency	Sponsoring entity	No set bar, they review DTI and cash flow of property	Secured by lien on home
Nebraska Energy Office	Lender funds, oil overcharge funds	Consumer loan	Separate monthly bill from lender	Below market rate interest	Energy efficiency, renewables	Lender	Lender does underwriting, Approval rate varies	Varies based on lender's requirements
NYSERDA's Energy Smart Loan Fund	Lender funds, plus public benefit charge	Consumer loan	Separate monthly bill from lender	Interest buy down, Addl \$ for low income	EE, solar thermal, solar PV, wind	Lender	Lender does underwriting, Approval rate varies	Loans over \$7,500 must be secured
NYSERDA's HPwES Loan Program	Fannie Mae funds and public benefit charge subsidy	Consumer loan	Separate monthly bill from lender	Below market rate interest, Addl \$ for low income	Energy efficiency	Lender	FICA >640 ~65% approved	Unsecured
Sacramento Municipal Utility District (SMUD)	Utility's general revenue funds	Consumer loan	Separate monthly bill from utility	Below market rate interest	EE, solar thermal, solar PV	Utility	Yes, std bank metrics used plus bill pmt history 73% approved	Secured with a fixture filing to the property
Vermont Gas Systems	Lender funds, plus expenses added to rate base	Consumer loan	Separate monthly bill from lender	Below market rate interest; loans guaranteed	Energy efficiency improvements that reduce gas use	Utility	Low bar as loans are guaranteed; ~100% approved	Secured by lien on home; loans guaranteed by VGS
Viewtech Financial Services	Fannie Mae funds	Consumer loan	Separate monthly bill from lender	Below market rate interest	Energy efficiency	Sponsoring entity	FICA >640 60-70% approved	Unsecured Retail Installment Contract (RIC)

Table 8: Program Results Summary

The **target market** for almost all programs is single family owner occupied homes, with a few programs open to multifamily and rental properties. **Marketing channels** are mostly through contractors and direct marketing from utilities. **Loan amounts** are typically in the \$4,000 to \$10,000 range. **Interest rates** vary from 0% to 12%, with most programs offering 4% to 8% interest rates. **Terms** tend to be for 5-8 years, with a few programs offering longer terms. The **number of loans issued** in 2007 varies widely, but most programs serve less than 0.1% of the customer base. Annual **default rates** range from near 0% to around 3%.

Sponsoring Entity	Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
AFC First Financial Corporation	2005	Single family owner occupied	Contractors	\$6,000 unsec \$10,000 max sec \$35,000 max	unsec 8.99% for 3, 5 or 10 years sec 6.375- 8.875% for 10,	~1,500 loans \$9 million	<0.1% (1,500 loans / 4.8 million homes)	<0.5%
Cambridge Energy Alliance	2008	All sectors	Public announcements, articles, etc	max \$25,000	9.75% for ECSB 1-3% for Citizens' if <80% AMI <10 years	n/a	n/a	n/a
City of Berkeley	September 2008	Residential and commercial property owners	tba	tba	5-7% (tba) 20 years	n/a	n/a	n/a
Efficiency Vermont	2006	Single family owner occupied	Sponsor promotes, some contractors promote	\$8,000 \$15,000 max	Buy down 3.5% Final interest varies ~2-6.5% 5 years max	34 loans \$257,000	<0.1% (34 loans / 250,000 homes)	None so far
First Electric Cooperative	2000	Single family owner occupied	Through utility	\$11,000 \$15,000 max	7.5% up to 5 years	7 loans \$76,900	<0.1% (7 loans / 65,000 homes)	<1%
Manitoba Hydro	2001	Single family owner occupied	Contractors, suppliers, utility	\$4,800 \$7,500 max	6.5% up to 5 years	8,100 loans \$39 million	<1.9% (8,100 loans / 420,000 homes)	<0.2%

Sponsoring Entity	Program Start Date	Target Market	Marketing Channels	Average Loan Amount	Interest Rate & Term	Financing Issued in 2007	% Customers Served in 2007	Default Rate in 2007
Maui Electric Company	2007	Single- and multi-family rented or owned	Contractor and utility	\$5,000 no max	0% 8 year term ave	16 loans \$80,000	<0.1% (16 loans/ ~40,000 homes)	None so far, started last year
Midwest Energy	2007	Single- and multi-family rented or owned	Contractor and utility	\$4,000 no max	4% interest 15 years	47 loans closed \$188,000 (since Aug 2007)	n/a	None so far, started last year
MN Center for Energy and Environment	1990	Single- and multi-family rental units	Info to landlords, contractors	\$8,000 \$10,000 max	4% up to 5 years	21 loans \$164,000	<0.1%	~3-5%
Nebraska Energy Office	1990	Single- and multi-family property owners	Contractors, lenders	\$9,000 SF max \$35,000 MF max \$75,000	Under 5% on average	784 loans \$7.1 million	0.1% (784 loans / ~700,000 homes)	<0.01%
NYSERDA's Energy Smart Loan Fund	1998	Single- and multi-family property owners	Lenders and contractors	SF \$11,000 \$20,000 max MF varies widely	Buy down of 4% term varies	SF 340 loans \$3.8 million MF 29 loans \$23.2 million	<0.1% (369 loans/ ~6 million homes)	<1%
NYSERDA's HPwES Loan Program	2003	Single family owner occupied	Contractors	\$7,800 \$20,000 max	5.99% for 3, 5, 7 or 10 years	541 loans \$4.2 million	<0.1% (541 loans/ ~6 million homes)	~2-3%
Sacramento Municipal Utility District (SMUD)	1977	Single family owner occupied	Network of 180 contractors	\$8,750 no max	7.5% up to 10 years	3,200 loans \$28 million	0.6% (3,200 loans / 520,000 homes)	1.80%
Vermont Gas Systems	1993	Single- and multi-family with larger than average gas use	VGS staff, contractors	\$4,380, no max	0% for 3 years 2% for 5 years 4% for 7 years	66 loans \$289,000	0.18% (66 loans / 36,000 homes)	~0% (1 in 10 years)
Viewtech Financial Services	1995	Single family owner occupied	Contractors and utilities advertise	\$10,000 \$20,000 max	12.49% Up to 12 years	3000 loans \$3,000,000	n/a	~2%

Terminated Programs

Several promising energy efficiency financing programs were discontinued or drastically altered, for various instructive reasons. This section examines four canceled programs that offered on-bill financing to residential customers. These cases highlight some of the limitations of current financing designs, and suggest important considerations in designing successful new programs.

BC Hydro's Home Improvements Program

BC Hydro, a utility in British Columbia serving 1.5 million households, ran the Home Improvements Program (HIP) from 1990 until 2002. The program provided a free audit, a \$1,000 rebate for energy efficiency improvements, and a below-market interest rate for on-bill financing for the balance. More than 26,000 customers (approximately 1.7% of households in BC Hydro territory) participated in this program over 11 years. The audits recommended retrofits that involved draft-proofing, insulation, ventilation, and thermostats. Some improvements that were not cost effective in terms of energy savings, such as windows and doors, were also allowed. Program managers said that they used the lure of financing windows to get customers to do other measures.

The combination of free audits, rebates, and financing led to an extremely expensive program for the amount of energy saved. As with other DSM expenditures, BC Hydro funded the program through conventional rate-base cost recovery, but this program was judged to not compete favorably with the savings from other demand side management programs. Program evaluators estimated that the total resource cost (TRC) of the program was 29.34 cents / kWh, which included the costs for improving aesthetics and home comfort. The non-energy benefits were not included in the benefits side of the calculation. BC Hydro's summary of the program's costs and benefits are presented in Appendix G, including this explanation of the program's closure:

As the program evolved, customer loans varied from interest-free, low-interest and market-based. Contractor service fees to BC Hydro were also adjusted. In the late 1990s, HIP changed the eligibility criteria to include homes with all types of space heating fuel and made a strong attempt to create a full cost-recovery initiative. When this failed to materialize, the program was closed.

In addition to judging the financing program to be an inefficient use of funds, one evaluator also said that he did not think that financing was needed for the residential market. He believed that customers had many financing options already, and pointed to BC Hydro's customer surveys that never ranked financing as a top barrier to making efficiency improvements.

California Energy Efficiency Loan Fund

In 2004, KEMA Consulting launched the California Energy Efficiency Loan Fund (CEELF) in the five-county San Francisco Bay Area. The program began as a result of KEMA's application to the CPUC to initiate the program as a third-party provider for the Pacific Gas and Electric (PG&E) Company using public benefit charge funds. After an initial rejection and then months of negotiations over the program specifications, a pilot project was approved to operate in October 2004, and the project ran through December 2005. The CEELF targeted small commercial and industrial businesses (not residential customers) that averaged less than 100 kW of annual maximum electricity demand, including retail, small office, service establishments, and warehouses.

The CEELF was intended to be a program that provided a one-stop source of information to help small business identify and implement energy efficiency measures. KEMA would guide clients through the audit process, using their on-staff engineers to perform the audit, and then provide a loan through their participating lenders or direct them to other programs. The incentive offered, based on the NYSERDA program, was a 4% reduction in the standard interest rate at a participating bank for a loan of up to \$200,000. KEMA staff recruited and trained 75 officers from 11 lending institutions. These loan officers were the link to potential clients, and KEMA staff provided them with brochures and other information to share with clients. KEMA staff in the Oakland office relied on KEMA staff in the Massachusetts office, who were experienced with the NYSERDA loan program, to find participating banks and craft the marketing messages. At the end of the program's pilot phase, only three audits were done, no loans had been processed, and no referral payments had been made.

This case has been included, despite being designed for business customers, because it exposes some important weaknesses experienced by a program in California. According to KEMA Consulting staff, there were several issues that inhibited success of the program that are relevant to the design of residential programs, including:

- **Timeframe was too short:** By the time the program was finally done with negotiations and approved, KEMA Consulting staff had 13 months to implement the plan which had been based on a timeline of 24 months. In retrospect, 24 months may have been insufficient given the slow decision making time frames for investments made by small businesses.
- **Conflicts with “double dipping”:** In many cases, clients would have to choose between instant rebates and the subsidized loan (unlike the NYSERDA program that allowed access to both incentives for one project), and historically customers have chosen rebates over loans when they cannot select both.
- **Limited incentives for the loan officers:** The loan subsidy created an extra step for the loan officers and did not give the officers any significant benefit.

The CAEELF program was evaluated to assess the performance of the program.⁴⁶ In addition to some of the challenges expressed above by the program staff, the program evaluators also attributed the program failure to:

- **False assumptions about the willingness/appropriateness of lenders to market the loans:** In the NYSERDA loan fund program a majority of borrowers are referred by the Energy Smart program and contractors, not by lenders. The CEELF program should have been promoted more widely, especially by contractors.
- **Insufficient understanding of the market potential for this program:** The NYSERDA program had only six loans in its first year and 29 in its second year with a population target audience more than three times the size of the Bay Area. The CEELF program was too ambitious, and the pilot too short to see significant results.

Implementation matters – it is unlikely that simply making a program available will be enough. It is vital to have a variety of trusted channels with appropriate incentives for outreach. Marketing the program through loan officers was not sufficient for success. Additionally, a long-term commitment may be vital for the success of the program. Even the NYSERDA program was slow to gain traction because it

⁴⁶ Research Into Action, "Final Evaluation Report: KEMA's 2004-2005 California Energy Efficiency Loan Fund," (October 2006).

required building relationships with those connecting directly with customers (such as ESCOs and contractors) and growing the general awareness of the opportunity among customers and lenders.

New Hampshire Electric Cooperative's SmartSTART

The New Hampshire Electric Cooperative (NHEC) launched a tariffed installation program (TIP) in 2002, originally a Pay As You Save Program (PAYSA®) pilot, for both commercial and residential customers. The commercial program still exists today, although with very low participation rates; the residential program was canceled in 2003. The initial program offered residential customers the opportunity to buy compact fluorescent lightbulbs (CFLs) at a local hardware store, with the cost deducted from their utility bills. Approximately 200 people signed up for this program. It was canceled for two reasons: (1) the administrative costs of doing the requisite paper work, and (2) the decrease in the cost of CFLs, making them more affordable to customers.

NHEC also offered a TIP for residential weatherization improvements. The criterion for participation was that monthly payments for the improvements could be no more than two-thirds of the estimated savings, over three-quarters of the expected project life. NHEC funded the program internally; the interest rates varied, but were generally close to 7%. Only about 10 residential customers, none of them renters, signed up before the program was canceled due to low participation rates and NHEC's concerns about the program's costs and risks. A few reasons have been offered by the utility for the low participation. One is that customers often had to choose between rebates and financing and, as other research has also shown, people typically prefer rebates when given the choice.⁴⁷ Another issue was meeting the savings criterion. NHEC was concerned about the transfer of the loan between customers, and decided to limit the loan term to 5 years. Given that the payments could not be more than two-thirds of the estimated savings, very few weatherization measures fit into this timeframe – limiting project scope and overall savings. In the end, no projects ever changed hands, so NHEC never had to deal with the repayment obligation transferring between customers.

NHEC staff also expressed concern about customers' responses if their bills did not go down. Two scenarios in particular were mentioned. If electricity rates were to rise, the actual bill might increase, even though customers would be paying less than they would otherwise. Also, the NHEC bill is for electricity only and many of the weatherization savings are in heating fuel. So the customer's electric bill could actually increase (while their fuel bill would go down). NHEC staff worried that customers might not recognize these distinctions and complain if their bills did not go down as advertised. These concerns are not unfounded, and they present an important consideration in designing and marketing an on-bill financing program.

NW Natural's On-bill Financing

NW Natural's on-bill financing program, which ran from 2000 to 2002, ended for very different reasons than those previously mentioned. The Portland, Oregon utility worked with a third party, Questar Energy Services, to offer customers an unsecured loan at 13% to 16% interest with a 5-year payback for improvements and equipment that reduce natural gas consumption. The program manager said the high interest rates did not seem to be a barrier for customers; they were able to provide loans to 2,200 customers in just two years, which was approximately 0.4% of their customer base. Questar managed and funded the entire program, and NW Natural just added the repayment fee to the customer's bill. Questar would approve borrowers (about 70% were approved) and notify NW Natural of the loan amount and payment schedule.

⁴⁷ Stern 1985.

The program ended when Questar decided to get out of the lending business, and sold this portion of the business to another lender. One of the reasons for the sale was the default rate of 3.7%, which, according to the program manager at NW Natural, was too high for Questar. NW Natural was willing to continue the program, but the new lender discontinued the service, largely due to the program's repayment priority order. That is, if a customer paid only a part of the bill, the lender was fourth in line to get paid, after the gas charge and other taxes and fees were paid. The new lender was not comfortable with this arrangement, so it discontinued the program.

Appendix B. Links to Programs

- **AFC First Financial Corporation**, Keystone Home Energy Loan Program – www.keystonehelp.com
- **Cambridge Energy Alliance**, Residential Loan Program – www.cambridgeenergyalliance.org
- **City of Berkeley**, Berkeley FIRST – rael.berkeley.edu/berkeleyfirst
- **City of Houston**, Power to People – www.houstonpowertopeople.com
- **Efficiency Vermont**, Home Performance with Energy Star Loan Program – www.encyvermont.org/pages/Residential
- **First Electric Cooperative**, Home Improvement Loan Program – www.firstelectric.coop/content.cfm?id=2023
- **Manitoba Hydro**, Power Smart Residential Loan Program – www.hydro.mb.ca/your_home/home_comfort/index.shtml
- **Maui Electric Company**, SolarSaver – www.heco.com/portal/site/heco/menuitem.508576f78baa14340b4c0610c510b1ca/?vgnextoid=f94c5e658e0fc010VgnVCM1000008119fea9RCRD&vgnextfmt=default
- **Midwest Energy**, How\$mart – <http://www.mwenergy.com/howsmart.html>
- **Minnesota Center for Energy and Environment**, Rental Energy Loan Fund – www.mncee.org/programs_residential/rental_rehab_financing/index.php
- **Nebraska Energy Office**, Dollar and Energy Saving Loan Program – www.neo.ne.gov/loan
- **New York State Energy Research and Development Authority**, Energy \$mart Loan Fund – www.getenergysmart.org/SingleFamilyHomes/ExistingBuilding/HomeOwner/Financing.aspx#
- **New York State Energy Research and Development Authority**, Home Performance with Energy Star Loan Program – www.getenergysmart.org/SingleFamilyHomes/ExistingBuilding/HomeOwner/Financing.aspx#
- **Sacramento Municipal Utility District**, Residential Loan Program – www.smud.org/rebates/images-rebates/finance_factsheet.pdf
- **United Illuminating**, SmartLiving Catalog Program – www.efi.org/smartliving/
- **Vermont Gas Systems**, Retrofit Loan Program – www.vermontgas.com/efficiency_programs/res_programs.html
- **Viewtech Financial Services**, Fannie Mae Loan Program – www.energyloans.org/

Appendix C. Program Costs

Program costs vary based on the types of services offered, how well the programs are run, and age and volume of the program. An effort was made to break down the costs to make comparisons between programs. This turned out to be extremely difficult because of the way budgets and reporting are reported for each program. Many of the programs integrate their loan services into a portfolio of other services, and do not break out the administrative costs for financing. Others pay contractors to do part of the work, and do other parts internally. Below is the cost information for programs that were able to share these data.

Sacramento Municipal Utility District (SMUD)

In 2007, SMUD's loan program budget was \$30 million. Of this, \$28 million was given out in loans, and \$2 million (6.7%) of that paid for overhead, which covers origination (underwriting), servicing, and collections. Because SMUD has had a program for many years, they have an outstanding loan portfolio in which they must service, bill and collect until paid in full. In 2007, they funded 3,183 new loans, the outstanding number of loans in the active portfolio was 8,784, and the outstanding number of charged-off loans in the inactive portfolio was 4,004 (collected over the many previous years of the program). The program staff divided each operating segment of the administrative budget by the appropriate basis and summed each of the respective costs per loan together to get \$245 per loan for the new loans issued in 2007. Of course, these loans will continue to have servicing costs in future years until they are repaid.

Maui Electric Company

Currently, the annual administrative cost budgeted is \$65,000. With a maximum of 50 solar water heater installations per year for the pilot, this is \$1,300 in administrative overhead per water heater. This \$1,300 covers the cost of Honeywell, the contractor that processes the applications and manages the program, and also covers some of MECO's program staff time.

Vermont Gas Services

Vermont Gas provides a high level of service, including a free audit and guidance for the customer throughout the process. The 2007 program budget was \$448,000, which included \$100,000 for administration, \$121,000 for audits, and the rest for incentives. VGS spends approximately \$650 per installation for general administrative costs, plus another \$300 for the audit. It is also interesting to look at the costs of the audit *per installation* (i.e., audits that led to retrofits). In 2007, 40% of the Vermont Gas audits resulted in installations, for an audit cost of almost \$800 per installation (\$ spent on audits that led to an installation).

NYSERDA's Energy Smart Loan Fund & HPwES Loan Program

NYSERDA has 1.5 staff assigned to work on the loan funds. They estimate that for the Energy Smart Loan Fund overhead is approximately 14% of the total loan amount (\$1,540 per loan on average), which includes the interest rate buy down, administrative costs, and disbursement of proceeds to contractors upon completion of the project. The lender is responsible for processing and underwriting the loan. They estimate that the HPwES Loan Program overhead is 19% of the total loan amount (\$1,482 per loan on average) and includes processing of the loan and disbursement of proceeds to contractors upon completion of the project, provided by EFS, plus it also include the interest rate buy down.

AFC First Financial Corporation

AFC First charges 4% interest on each loan to cover its costs (about \$240 per year per loan). This includes underwriting, origination, loan servicing, contractor training and recruitment, and other administrative costs.

Efficiency Vermont

Efficiency Vermont spends 4-5 hours of staff time, about \$250 per loan, to do loan processing and evaluation of the efficiency measures. In addition, Efficiency Vermont pays approximately \$670 per loan for the write-down. This does not include the time Efficiency Vermont spends to train and mentor the HPwES contractors. The lender does the underwriting, origination, and servicing.

Appendix D. Manitoba Hydro's Loan Agreement

PF1962/f Rev 05 12
CHC 01-34-87

PART I



POWER SMART* RESIDENTIAL LOAN AGREEMENT

Agreement no. _____

(hereinafter called the "Owner"),

OF THE FIRST PART

- and -

MANITOBA HYDRO,

OF THE SECOND PART

CONTRACTOR INFORMATION:

District	Location of Building where work to be undertaken (hereinafter called the "Building")				
Primary Contractor/Retailer name	Primary Contractor/Retailer mailing address	CITY/TOWN	PROVINCE	POSTAL CODE	Telephone no.
Description of work:					

BUILDING DESCRIPTION:

Type of Building (check one only):

- single detached
 side-by-side
 duplex (upper and lower units)
 tri-plex/four-plex
 row house/town house
 mobile home on permanent foundation

Size of Building _____ square feet Construction year of Building _____

No. of stories: one one and a half two three

Fuel used (check principal method only): electric wood gas oil

other, please specify: _____

SUMMARY OF COSTS:

Fill in the costs below when PART II of the Loan Agreement has been completed.

Total material cost \$ _____

Total labour cost \$ _____

Total cost of the work \$ _____

TOTAL COST TO BE FINANCED \$ _____
(not including finance charges)

FINANCING AGREEMENT:

The Owner and Manitoba Hydro agree as follows:

- Manitoba Hydro will advance to the Primary Contractor or Retailer named above the Total Cost to be Financed, in the amount of \$ _____, upon receipt of the Completion Certificate signed by the Owner.
- The Owner will repay said amount to Manitoba Hydro plus financing charges of \$ _____ by _____ equal consecutive monthly payments of \$ _____, calculated at the true annual rate of _____% per annum on the declining monthly balance.

TOTAL AMOUNT TO BE REPAYED BY OWNER, INCLUDING FINANCIAL CHARGES: \$ _____

- The Terms and Conditions set forth on the reverse of this Agreement form part of this Agreement.
- The Owner represents as follows:

CREDIT INFORMATION:

Electricity account no.	Previous acct. no. (if applicable)	Natural Gas account no.	Previous acct. no. (if applicable)
Present mailing address (house no., street, box no., etc.)		How long at this address?	Previous mailing address (if less than 5 years at present address)
Owner's employer or business	Business address	Position held	How long? Annual income (\$)
Joint owner's employer or business	Business address	Position held	How long? Annual income (\$)
OTHER LOANS AND OBLIGATIONS OF OWNERS	ADDRESS OF LENDER		AMOUNT OWING (\$) MONTHLY PAYMENTS (\$)
1st mortgage			PIT
2nd mortgage			PIT
Others			
Title to building in the name of	Name of fire insurance company	Amount of insurance (\$)	
Credit approval no.			

- For the purpose of processing an application for credit pursuant to the Personal Investigations Act, the Owner hereby authorizes Manitoba Hydro to investigate the Owner's credit record and to make such other enquiries as are considered necessary.
- The Owner has read and accepts the Terms and Conditions on the reverse side of this Agreement identified as the Power Smart Residential Loan Terms and Conditions.

DATED _____, 20____

Witness _____

Owner _____

Witness _____

Owner
MANITOBA HYDRO

Per: _____
Authorized Signing Officer

POWER SMART RESIDENTIAL LOAN TERMS AND CONDITIONS

1. All Owners of the Building must sign this Agreement. The word Owner where used in this Agreement is deemed to refer to all Owners.
2. The Owner promises and covenants as follows:
 - (a) that the Owner is the owner of the Building in which the renovation work is taking place;
 - (b) that the Owner has entered into a contract with the Primary Contractor in good faith, to perform the Work

OR

the Owner has entered into a contract with the Retailer in good faith to purchase and receive materials to perform the Work:

 - (c) that all information contained in this Agreement is complete and accurate;
 - (d) that the Owner undertaking his/her own renovation will complete the work within 6 months of signing this Agreement.
3. Owners of condominium units and Condominium Corporations billed at the residential rate are also eligible, subject to meeting all of the terms and conditions applicable to homeowners.
4. Power Smart Residential Loans are limited to an accumulated loan up to a maximum amount of \$7,500 per residence. Owners with more than one residence shall be subject to further credit investigation by Manitoba Hydro, and Manitoba Hydro reserves the right to limit the number of Power Smart Residential Loans granted to any Owner in its sole and unfettered discretion.
5. For contractor performed renovations, the work must be completed within 6 months of the date of the Loan Agreement. If the work is not completed within 6 months of the date of the Loan Agreement, or a Completion Certificate and any other applicable forms are not received within 30 days of the completion of the Work and/or receipt of renovations materials, Manitoba Hydro may terminate the Power Smart Residential Loan Agreement upon delivery of written notice to the Owner and shall have no further obligation to pay the contractor/retailer invoice.
6. **The selection of materials, the selection of contractors, renovation work performed by the Owner and the supervision of the contractors' work is the responsibility of the Owner.**
7. The Owner is responsible for obtaining any required building, electrical and/or gas permits or ensure the primary contractor has done so. The Owner shall further be responsible to ensure that renovation work meets applicable requirements of the Manitoba Building Code and applicable bylaws, and is acceptable to inspection authorities.
8. The Power Smart Residential Loan does not constitute an endorsement, approval, or warranty by Manitoba Hydro or its employees of any goods, products, or materials furnished or rendered in connection with the renovation work.
9. Manitoba Hydro has the right to inspect/visit the Building at any reasonable time from the date of the Agreement until 24 months after installation or completion of the Work.
10. If the Owner (a) sells or otherwise disposes of the Building, (b) discontinues as a Manitoba Hydro energy customer, or (c) makes default in payment of any installment when due, all remaining unpaid installments will immediately become due and payable on demand. Overdue payments shall bear interest at the true annual rate of 16.08% per annum or 1.25% month until paid.
11. Statements showing the installment and/or installments due, may at Manitoba Hydro's option, be included with the monthly bill for energy supplied by Manitoba Hydro to the Owner, or otherwise delivered to the Owner, but the failure to include or deliver such a statement will not release the Owner from the obligation to pay the monthly installments as they fall due.
12. The Owner acknowledges and agrees that any amounts received by Manitoba Hydro from the Owner will be applied first against any outstanding arrears of principal or interest under this Agreement, and applied second against any outstanding charges for energy supplied to the Owner.
13. Following the expiry of the initial 6 months of this Agreement, additional payments may be made at any time during the remaining term of this Agreement. Finance charges will be reduced accordingly. The Owner may repay the entire outstanding balance at any time during the initial six months of this Agreement by paying an additional \$20.00 administration fee.
14. Manitoba Hydro may, in its sole and unfettered discretion, terminate the Power Smart Residential Loan program or change its terms, at any time and without notice. Power Smart Residential Loan agreements existing prior to the termination of the Power Smart Residential Loan program shall remain in full force and effect and shall not be affected by termination of the Power Smart Residential Loan program by Manitoba Hydro.
15. **The Owner agrees that Manitoba Hydro has the right to claim any emission reduction (greenhouse gas) credits that may result from the installation of any energy efficient products or equipment by the Owner or his/her contractors under the Power Smart Residential Loan Program.**
16. This Agreement is binding on the Owner and Manitoba Hydro, their and each of their heirs, executors, administrators, and successors, and the obligations of the Owner cannot be assigned by the Owner without the prior written consent of Manitoba Hydro.
17. The Owner acknowledges receipt of a duplicate copy of this Agreement including full and complete particulars of the cost of financing.
18. Time will be deemed to be material and of the essence in this Agreement.

PART II

POWER SMART RESIDENTIAL LOAN AGREEMENT

RETROFIT COST QUOTATION (to be supplied by Primary Contractor OR Retailer listed on Part I; cost should include ALL applicable taxes).

INSULATION MEASURES

LOCATION: Attic, Basement, Crawl space, Walls	R VALUE OF EXISTING INSULATION (see chart below)	R VALUE OF INSULATION TO BE ADDED	TOTAL R VALUE	MATERIALS TO BE PURCHASED (type, no. of bags or no. of rigid panels, and other related materials)	MATERIAL COST (\$)	LABOUR COST (\$)	TOTAL COST (\$)
_____ sq. ft.							
_____ sq. ft.							
TOTAL (\$)							

AIR SEALING MEASURES

LOCATION	MATERIALS	MATERIAL COST (\$)	LABOUR COST (\$)	TOTAL COST (\$)
TOTAL (\$)				

VENTILATION MEASURES

LOCATION	TYPE/MODEL	CFM DELIVERY	MATERIAL COST (\$)	LABOUR COST (\$)	TOTAL COST (\$)
Bathroom exhaust fan					
Kitchen exhaust fan					
TOTAL (\$)					

EXISTING AND REPLACEMENT WINDOWS (list each window with a different construction)

Existing Window:				Replacement Window:							Costs		
Fixed or Operable	FRAME: Wood, Vinyl, Alum., Fiberglass	No. of Panels	Size (in.) W x H	Fixed or Operable	FRAME: Wood, Vinyl, Alum., Fiberglass	No. of Panels	Size (in.) W x H	SPACER: Alum., SWIGGLE, Super Spacer	No. of Low-e Coatings	GAS FILL: Air, Argon	MATERIAL (\$)	LABOUR (\$)	TOTAL (\$)
NOTE: Retailer or Contractor must fill in the above completely. For performance compliance windows, submit the simulation results form from the simulator with the Loan Agreement.											TOTAL (\$)		

REPLACEMENT DOORS

Description of replacement door	No. of doors	R value	Material cost (\$)	Labour cost (\$)	Total cost (\$)

ELECTRICAL & NATURAL GAS EQUIPMENT (heating/heat pump systems, hot water heaters)

Make	Model	Size or capacity	Material cost (\$)	Labour cost (\$)	Total cost (\$)
Total cost of all material (\$)		Total cost of labour (\$)		Total cost to be financed (not including finance charges) (\$)	
Signed by (Contractor/Retailer Representative)			Name of Contractor/Retailer representative (please print)		

PART III

POWER SMART RESIDENTIAL LOAN
COMPLETION CERTIFICATE

NOTE: The meaning of the Terms herein are the same as those in the Agreement.

1. The Retailer certifies that the following Owner has purchased the materials required to perform the renovation in accordance with the Agreement

OR

- The Primary Contractor certifies that the material has been installed at the premises of the following Owner in accordance with the terms of the Agreement.

Owner's name		Owner's telephone no.	
Owner's address	CITY/TOWN	PROVINCE	POSTAL CODE
Address of premises where material delivered and/or installed		CITY/TOWN	POSTAL CODE

2. The Primary Contractor/Retailer also warrants and certifies that:
- the Owner has not been given or promised a cash payment, nor has the Owner been guaranteed any cash bonus or commission of future transactions as an inducement to consummate this transaction;
 - the work or material has been satisfactorily completed or delivered;
 - this Certificate was signed by the Owner after such completion or delivery;
 - the Owner will be provided with a copy of the Certificate of Completion forthwith.
3. The Primary Contractor/Retailer is required to complete PART IV, if an adjustment to the Agreement of the total price of the quoted work is less than the original quotation submitted.

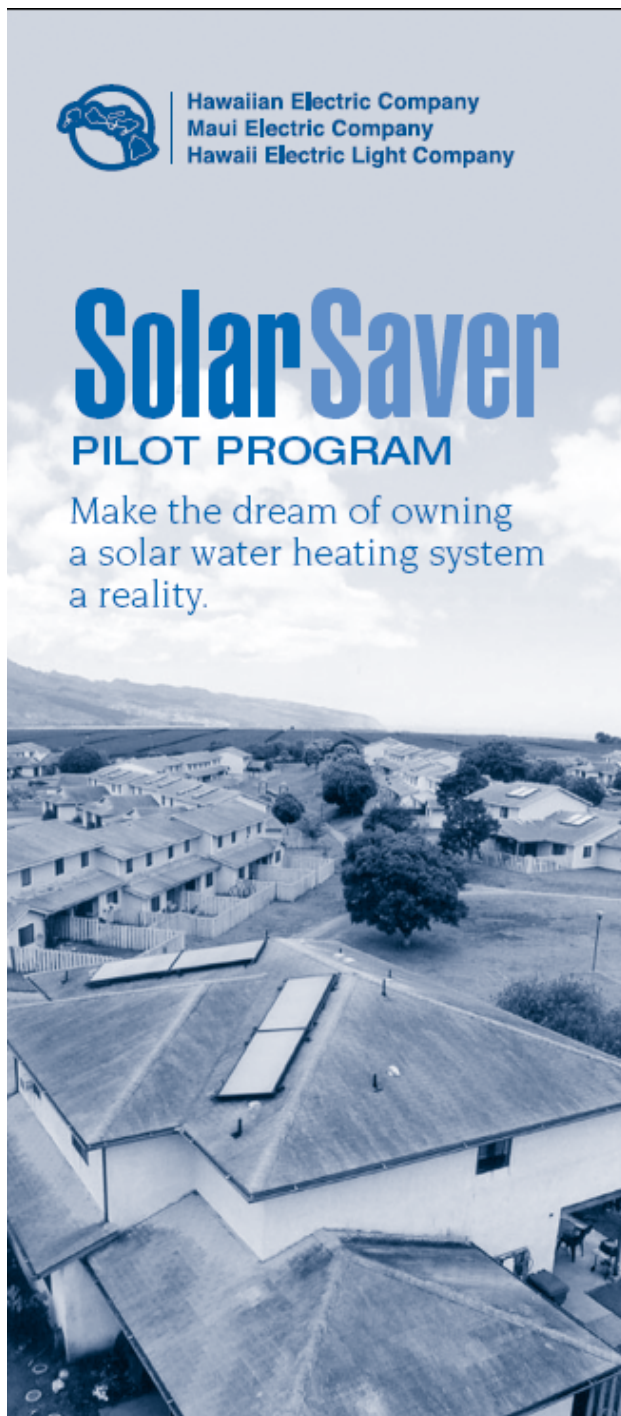
Signed by (Contractor/Retailer)	yy mm dd
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DIRECTION TO PAY (to be prepared only upon completion of contractor work OR upon purchase of materials from retailer for Owner performed renovation)

The Owner hereby agrees that the work or materials have been satisfactorily completed or delivered and directs Manitoba Hydro to pay the Primary Contractor or Retailer named below the total sum of \$_____ pursuant to the Agreement.

Primary Contractor/Retailer trade name			Telephone no.		
Address of Contractor/Retailer	CITY/TOWN	PROVINCE	POSTAL CODE	Electrical Permit no.	Gas Permit no.
Signed by (Owner)	yy	mm	dd		
Signed by (Owner)	yy	mm	dd		

Appendix E. Maui Electric Company's SolarSaver Brochure

The image shows a vertical brochure for the SolarSaver Pilot Program. At the top left is a logo consisting of a stylized map of the Hawaiian Islands. To the right of the logo, the text reads: "Hawaiian Electric Company", "Maui Electric Company", and "Hawaii Electric Light Company". Below this, the title "SolarSaver" is written in a large, bold, blue font, with "PILOT PROGRAM" in a smaller, blue font underneath. A sub-headline in blue text says: "Make the dream of owning a solar water heating system a reality." The background of the brochure is a photograph of a residential neighborhood with houses and mountains in the distance. A solar water heating system is visible on the roof of a house in the foreground.

Hawaiian Electric Company
Maui Electric Company
Hawaii Electric Light Company

SolarSaver

PILOT PROGRAM

Make the dream of owning a solar water heating system a reality.

Dreaming of using solar power to heat your water, but can't afford the cost?

Here's how to make your dream come true...

- **SolarSaver** is a special new and innovative pilot program approved by the State of Hawaii Public Utilities Commission.
- There are no upfront costs to the customer. After installing a solar water heating (SWH) system, you'll use less electricity to heat your water. This lowers your monthly electric bills. The money saved is used each month to payback for your new solar water heating system for up to 12 years.
- Electric companies on Oahu, Island of Hawaii and Maui County offer this program to qualifying residential customers with year-round electric resistance hot water heaters (including property renters and landlords).
- Participation in this three year pilot program is limited and participants are accepted on a first-come, first-served basis. Participation is in conjunction with the utilities' Residential Efficient Water Heating (REWH) Program.
- Most SWH system repair costs are paid by the utility under this pilot program.*

* Most repairs are covered by warranty insurance purchased by the utility. Some restrictions may apply.

How Do I Participate?

7 Easy Steps

1. To find a Participating Solar Contractor enrolled in the **SolarSaver Pilot Program** on Oahu call 94-POWER (947-6937); and the Island of Hawaii call (1-808) 94-POWER (947-6937); Maui customers can call toll free 1-888-MECO SUN (1-888-632-6786) .
2. Get a quote on a SWH system for your home.
3. Complete and sign the one-page **SolarSaver Pilot Program (SSP)** application form and the solar rebate co-payment application form. Then let your contractor submit the documents with your SWH system quote.
4. You will be notified if your application is approved or denied (paying your electric bill on time is a requirement).
5. If accepted into the program, sign the pilot program paperwork agreeing to participate and pay the monthly SSP Fee (in addition to your regular monthly electric bill).
6. Get your new SWH system installed.
7. Pay the SSP fee along with your regular monthly electric bill.

Frequently Asked Questions

■ Can I get a system if I don't own the house I live in?

Yes, the SSP is open to any year-round residential customer with an electric resistor hot water heater, including renters. In addition to the regular SSP Agreements you'll need to sign, the property owner or landlord must also sign a special Renter Authorization Form.

■ How much money per month can I save by installing solar?

Estimates are based on an average family size of 4 people where savings can range from \$30 - \$50 per month depending on hot water usage levels.

■ What is the Solar Saver Fee and is there any interest paid?

The **SolarSaver Fee** is a set fee paid every month by participants to the utility. This pilot program is designed to use the savings from installing solar to help repay the cost of the system without interest over time (up to 144 months or 12-years).

■ How does the repayment work?

After your system is installed, you'll begin receiving a monthly **SolarSaver Fee** billing which comes with your regular electric service bill. You can pay each of these amounts individually — or pay them together (sorry, automated bill pay does not apply to SSP accounts).

■ What happens if I move out or sell my house?

The new occupant will assume the **SolarSaver Fee** since they will now be benefiting from the lower monthly electric bills like you did. You will not be required to pay off the remaining **SolarSaver Fees** after you move but paying off any remaining fees or accelerating payments is always an option.

■ If I have more questions about the SolarSaver Pilot Program, who do I talk to?

For Oahu call 94-POWER (947-6937) and the Island of Hawaii, call (1-808) 94-POWER (947-6937); Maui customers can call toll-free 1-888-MECO SUN (1-888-632-6786).

Appendix F. Midwest Energy How\$mart Brochure

IMPROVE YOUR HOME'S ENERGY EFFICIENCY WITH . . . How\$martSM

- WHAT IS How\$martSM?**
 How\$martSM is a program that provides money for energy efficiency improvements such as insulation, sealing and heating and cooling systems. Customers will repay the funds through energy savings on their monthly utility bill. The monthly surcharge will be less than the amount of savings.
- HOW IS THE ENERGY SAVINGS DETERMINED?**

A Midwest Energy Specialist will perform an audit to identify potential savings opportunities. The repayment surcharge will be no more than 90% of the projected savings. If there is a change in owner or tenant, the surcharge remains with the improved property.

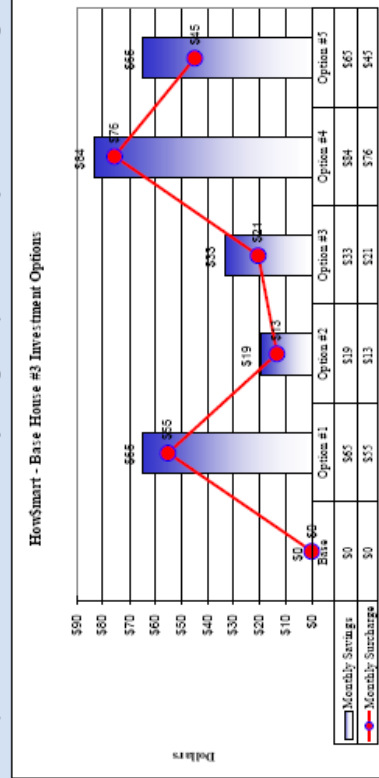
- WHO CAN USE THIS PROGRAM?**

The program is available to Midwest Energy electric and/or gas customers in good standing. It is particularly attractive to landlords and tenants to improve energy efficiency and lower utility bills with no up front investment.

FOR MORE INFORMATION ON
 MIDWEST ENERGY SERVICES:
www.mwenergy.com/energyservices.html

Midwest Energy is the first utility in the nation to voluntarily adopt a program like How\$martSM. How\$martSM provides money for energy efficiency improvements such as insulation, sealing and heating and cooling systems to customers who will repay the funds through energy savings on their monthly utility bill.

Example of Insulated Base House Monthly Savings compared to Monthly How\$mart Surcharge.



2400 sq ft, R-7 Attic, 0 Wall Insulation, High Air Leakage, 64% Furnace, 6 SEER A/C
 Option 1: New 92% Furnace/14 SEER AC at \$5,500 Option 2: R-38 Attic Insulation at \$1,320
 Option 3: R-38 Attic, Air Sealing at \$2,070 Option 4: All Measures at \$7,570
 Option 5: Option #1 with \$1,000 down payment from Owner

Program Summary

Program Name Home Improvements Program (HIP)

Target Market

Residential customers living in single family and townhouse dwellings that had electricity as the primary space heating fuel.

Objectives

- To improve the energy efficiency of existing electrically heated homes.

Technology

HIP was based on the "House as a System" approach and recommended retrofits that involved draftproofing, insulation, ventilation, thermostats, windows and doors.

Program Description

HIP provided free home energy audits in a defined service territory for eligible homes and a combination of grants and loans to implement the recommendations from the audit.

Retrofits carried out under HIP were performed by HIP registered contractors and quality control was provided by HIP Field Technical Support Representatives. Contractors paid a service fee to BC Hydro as a contribution to field manager costs, lead generation, marketing, advertising and other program costs.

Program History

Launched in November 1990, HIP proved to be a comprehensive residential retrofit program over the years. When introduced to the market, the program was available to single family and townhouse dwellings with electricity as the primary space heating fuel. In addition to low-interest financing, BC Hydro provided a grant of up to \$1,000 to conduct retrofits.

As the program evolved, customer loans varied from interest-free, low-interest and market-based. Contractor service fees to BC Hydro were also adjusted. In the late 1990s, HIP changed the eligibility criteria to include homes with all types of space heating fuel and made a strong attempt to create a full cost-recovery initiative. When this failed to materialize, the program was closed.

Table 1: Key Program Dates

Program Launch	November 1990
Program Completion	March 2002

Customer Benefits

- Reduced energy costs
- Improved comfort of home
- Enhanced resale value
- Better indoor air quality
- Extended building life and reduced maintenance
- BC Hydro's guarantee on the quality of retrofit projects

Program Summary

Program Statistics*

Table 2: Program Results

Energy Savings (GWh)	49
Number of Participants	26,076

Table 3: Program Costs (\$000s)

Utility Cost	26,701.0
Customer Cost**	53,014.4
Total Resource Cost	67,509.5

Table 4: Utility Cost Breakdown (\$000s)

Labour	2,737.0
Incentives	7,744.8
Advertising	960.9
Contractors	5,093.5
Evaluation	326.9
Research, Admin. & Overhead	9,837.9

Table 5: Unit Costs and Benefit/Cost Ratios

	Unit Cost (cents/kWh)	Benefit/Cost Ratio
Utility Cost	11.60	0.36
Total Resource Cost ¹	29.34	0.15

¹ The Total Resource Cost used full customer costs of the renovation, which includes the costs for improving aesthetics and home comfort. These non-energy benefits were not included in the benefits side of the calculation, thereby overstating the costs.

Evaluation Publications

Clarke, Darlene, Kenneth Tiedemann, Diane Jean (Fielding) and Dennis J. Nelson. January 1994. *Home Improvements Program Evaluation*, BC Hydro.

Ference Weicker & Company. November 1995. *Process Evaluation of the Power Smart Home Improvement Program*, Ference Weiker & Company/ BC Hydro.

Hewitt, David and Jeff Pratt. June 1993. *Home Improvements Program Process Evaluation*, Pacific Energy Associates/ BC Hydro.

* All program statistics cover the period up to March 2001.

** Customer costs are before incentives.

Appendix H. Residential Loan Programs Listed on DSIRE

Accessed: 6/19/08 (www.dsireusa.org)

Alabama

- [Alabama Power - Heat Pump and Weatherization Financing](#)
- [Cherokee Electric Cooperative - Residential Energy Efficiency Loans](#)
- [City of Florence Utilities - Heat Pump Retrofit Loan Program](#)
- [Cullman Electric Cooperative - Energy Conservation and Heat Pump Loan Program](#)
- [Cullman Power Board - Heat Pump Loan Program](#)
- [Dixie Electric Cooperative - Energy Resources Conservation \(ERC\) Loan Program](#)
- [Joe Wheeler Electric Membership Corporation - Residential Heat Pump Loan Program](#)
- [Sand Mountain Electric Cooperative - Heat Pump Loan Program](#)
- [Sheffield Utilities - Heat Pump Loan Program](#)
- [South Alabama Electric Cooperative - Energy Resource Conservation \(ERC\) Loan Program](#)

Alaska

- [Association Loan Program](#)
- [Energy Efficiency Interest Rate Reduction Program](#)
- [Small Building Material Loan](#)

Arizona

- [Sulphur Springs Valley EC - Member Loan Program](#)

Arkansas

- [First Electric Cooperative - Home Improvement Loans](#)
- [North Arkansas Electric Cooperative, Inc - Energy Resource Conservation \(ERC\) Loans](#)
- [Ozarks Electric Cooperative - Energy Resource Conservation \(ERC\) Loans](#)
- [Petit Jean Electric Cooperative - Energy Resource Conservation \(ERC\) Loan Program](#)
- [South Central Arkansas Electric Cooperative - Energy Resource Conservation Loan](#)

California

- [IID Energy - Residential Energy Efficiency Loan Program](#)
- [Roseville Electric - Residential HVAC Financing Program](#)
- [Santa Monica - Solar Santa Monica](#)
- [SMUD - Residential Energy Efficiency Loan Program](#)
- [SMUD - Residential Solar Loan Program](#)

Colorado

- [Aspen - Solar Power Pioneer Loan Program](#)
- [Colorado Springs Utilities - HomeVantage Home Improvement Financing](#)
- [Delta-Montrose Electric Association - Residential Co-Z Energy Loan Program](#)
- [Fort Collins Utilities - ZILCH \(Zero Interest Loans for Conservation Help\) Program](#)
- [Gunnison County Electric - Renewable Energy Resource Loan](#)

Connecticut

- [CHIF - Energy Conservation Loan](#)
- [DPUC - Low-Interest Loans for Customer-Side Distributed Resources](#)

Florida

- [City of Tallahassee Utilities - Efficiency and Solar Water-Heating Loans](#)
- [Clay Electric Cooperative, Inc - Energy Conservation Loans](#)
- [Gainesville Regional Utilities- Low-Interest Energy Efficiency Loan Program](#)
- [Orlando Utilities Commission - Residential Insulation Loan Program](#)
- [Orlando Utilities Commission - Residential Solar Loan Program](#)

Georgia

- [Amicalola EMC - Energy Resource Conservation \(ERC\) Loan](#)
 - [Blue Ridge Mountain Electric Membership Corporation - Heat Pump Financing Program](#)
 - [Carroll EMC - Residential Energy Efficiency Loans](#)
 - [Coweta-Fayette EMC - Energy Advantage Loan Program](#)
 - [Habersham EMC - Energy Efficient Loan Program](#)
 - [Hart EMC - EC Home Improvement Loan Program](#)
 - [North Georgia EMC - Energy Right Heat Pump Loan Program](#)
 - [Satilla REMC - Home Improvement Loan Program](#)
 - [Walton EMC - Prime Power Loan Program](#)
- Hawaii
- [Honolulu - Solar Roofs Initiative Loan Program](#)
 - [KIUC - Solar Water Heating Loan Program](#)
 - [Maui County - Solar Roofs Initiative Loan Program](#)
- Idaho
- [Idaho Falls Power - Zero Interest Loan Programs](#)
 - [Low-Interest Energy Loan Programs](#)
- Iowa
- [Alliant Energy - Low Interest Energy Efficiency Financing](#)
 - [Alternate Energy Revolving Loan Program](#)
 - [MidAmerican Energy - Energy Advantage Financing Program](#)
- Kansas
- [Kansas Energy Efficiency Program \(KEEP\)](#)
- Kentucky
- [Paducah Power System - Residential Energy Efficiency Loan Program](#)
 - [Pennyrile RECC - Commercial Energy Efficiency Loan Program](#)
 - [Pennyrile RECC - Heat Pump Loan Program](#)
 - [Salt River Electric - Comfort Loan](#)
 - [Solar Water Heater Loan Program](#)
 - [South Kentucky RECC - Energy Efficiency Loan Program](#)
 - [Warren RECC - Heat Pump Loan Program](#)
- Louisiana
- [Home Energy Loan Program](#)
- Maine
- [Home Energy Loan Program \(HELP\)](#)
- Maryland
- [SMECO - Energy Star Home Program](#)
- Massachusetts
- [Berkshire Gas - Residential Energy Efficiency Loan Program](#)
 - [Holyoke Gas & Electric - Commercial Energy Efficiency Loan Program](#)
 - [Holyoke Gas & Electric - Residential Energy Efficiency Loan Program](#)
 - [MassSAVE - Statewide HEAT Loan Program](#)
- Minnesota
- [Dakota Electric Association - Residential Energy Conservation Loan Program](#)
 - [Home Energy Loan Program](#)
 - [MHFA Rental Rehabilitation Loan Program](#)
 - [Minnesota Valley Electric Cooperative - Energy Resource Conservation Loan Program](#)
 - [NEC Minnesota Energy Loan Program](#)
 - [Otter Tail Power Company - Dollar Smart Energy Efficiency Financing Program](#)
 - [Rental Energy Loan Fund](#)
- Mississippi
- [Energy Investment Loan Program](#)

- [Mississippi Power - Hassle-Free Home Improvement Loan Program](#)
 - [Tallahatchie Valley Electric Power Association - Heat Pump Loan Program](#)
 - [Tupelo Water and Light - Residential Heat Pump Loan Program](#)
- Missouri
- [Columbia Water & Light - Super Saver Loans](#)
 - [Laclede Gas - Loan Programs for Energy Efficiency](#)
- Montana
- [Alternative Energy Revolving Loan Program](#)
- Nebraska
- [Dollar and Energy Savings Loans](#)
- New Hampshire
- [New Hampshire Electric Co-Op - SmartSTART Energy Efficiency Loan Program](#)
- New Jersey
- [Home Performance with Energy Star Loan Program](#)
 - [South Jersey Gas - Residential Loan Program](#)
 - [Sustainable Development Loan Fund](#)
- New York
- [NYSERDA - Energy Smart Loan Fund](#)
 - [NYSERDA - Home Performance with Energy Star - Loan Program](#)
- North Carolina
- [Blue Ridge Mountain EMC - Energy Right Heat Pump Loan Program](#)
 - [Brunswick EMC - Residential Energy Efficiency Loan Program](#)
 - [Carteret-Craven Electric Cooperative - Energy Conservation Loan Program](#)
 - [Lumbee River EMC - Weatherization Loan Program](#)
 - [Piedmont EMC - Conservation Loan Program](#)
 - [Progress Energy Carolinas - Energy Efficiency Financing Program](#)
 - [South River EMC - EC Home Improvement Loan Program](#)
 - [Tideland EMC - Weatherization Loan](#)
 - [Union Power Cooperative - Energy Efficient Heat Pump Loan Program](#)
- North Dakota
- [Cass County Electric Cooperative - Energy Efficiency Loan Program](#)
 - [Northern Plains EC - ERC Loan Program](#)
- Oregon
- [Ashland Electric Utility - Bright Way to Heat Water Loan](#)
 - [Ashland Electric Utility - Residential Energy Efficiency Loan Program](#)
 - [Avista Utilities - Weatherization Rebates & Financing Program](#)
 - [Central Electric Cooperative - Residential Energy Efficiency Loan Programs](#)
 - [Central Electric Cooperative - Solar Water Heater Loan](#)
 - [Columbia River PUD - Heat Pump Financing Program](#)
 - [Columbia River PUD - Water Heater Financing Program](#)
 - [Douglas Electric Cooperative - Residential Energy Efficiency Loans](#)
 - [EPUD - Residential Energy Efficiency Loan Programs](#)
 - [EPUD - Solar Water Heater Loan](#)
 - [EWEB - Bright Way to Heat Water Loan](#)
 - [EWEB - Residential Energy Efficiency Loan Programs](#)
 - [Lane Electric Cooperative - Home Energy Loan Program](#)
 - [Salem Electric - Solar Water Heater Loan](#)
 - [Small-Scale Energy Loan Program](#)
 - [Springfield Utility Board - Heat Pump Loan Program](#)
- Pennsylvania

- [Adams Electric Cooperative - Energy Resource Conservation \(ERC\) and Supplemental Loan Program](#)
- [Keystone Home Energy Loan Program](#)
- [Sustainable Development Fund Financing Program \(PECO Territory\)](#)

Rhode Island

- [National Grid \(Narragansett\) - Energy Wise Program](#)

South Carolina

- [Aiken Electric Cooperative - EC Home Improvement Loan Program](#)
- [Berkeley Electric Cooperative - Energy Advance Loan Program](#)
- [Blue Ridge Electric Cooperative - Heat Pump Loan Program](#)
- [Palmetto Electric Cooperative - EC Home Improvement Loan](#)
- [Pee Dee Electric Cooperative - Energy Efficient Home Improvement Loan Program](#)
- [Renewable Energy Revolving Loan Program](#)
- [Santee Cooper - Good Cents Energy Efficiency Loan Program](#)
- [Santee Cooper - Renewable Energy Resource Loans](#)
- [Santee Electric Cooperative - EC Home Improvement Loan Program](#)

South Dakota

- [Otter Tail Power Company - Dollar Smart Financing Program](#)
- [Southeastern Electric - Electric Equipment Loan Program](#)

Tennessee

- [Athens Utility Board - Energy Right Heat Pump Loan Program](#)
- [Bristol Tennessee Electric Service - Energy Savings Loan Program](#)
- [Clarksville Department of Electricity - Energy Efficient Heat Pump Loan Program](#)
- [Clinton Utilities Board - Energy Efficient Heat Pump Loan Program](#)
- [Cookeville Electric Department - Energy Right Heat Pump Loan Program](#)
- [Cumberland EMC - Energy Right Heat Pump Loan Program](#)
- [Gibson Electric Membership Corporation - Heat Pump Loan Program](#)
- [Gibson Electric Membership Corporation - Water Heater Loan Program](#)
- [Holston Electric Cooperative - Energy Right Heat Pump Financing Program](#)
- [Jackson Energy Authority - Energy Efficient HVAC Loan Program](#)
- [Johnson City Power Board - Residential Heat Pump Loan Program](#)
- [Knoxville Utilities Board - Energy Right Heat Pump Loan Program](#)
- [LaFollette Utilities Board - Energy Right Heat Pump Loan Program](#)
- [Lenoir City Utilities Board - Residential Energy Right Heat Pump Loan Program](#)
- [Middle Tennessee EMC - Residential Heat Pump Loan Program](#)
- [Milan Public Utilities - Energy Right Heat Pump Loan Program](#)
- [Murfreesboro Electric Department - Energy Right Heat Pump Loan Program](#)
- [Sequachee Valley Electric Cooperative - Energy Right Heat Pump Loan Program](#)
- [Sevier County Electric System - Energy Right Heat Pump Loan Program](#)
- [Southwest Tennessee EMC - Energy Right Heat Pump Loan Program](#)
- [Springfield Electric Department - Energy Right Heat Pump Loan Program](#)
- [Upper Cumberland EMC - Heat Pump Loan Program](#)
- [Volunteer Energy Cooperative - Energy Right Heat Pump Loan Program](#)
- [Winchester Utilities - Energy Right Heat Pump Loan Program](#)

Texas

- [Austin Energy - Residential Energy Efficiency Loan Program](#)
- [Bryan Texas Utilities - Appliance Loan Program](#)
- [Bryan Texas Utilities - HVAC Loan Program](#)
- [Bryan Texas Utilities - Low-Interest Insulation Loan Program](#)
- [Guadalupe Valley Electric Cooperative - Conservation Plan 7 Loan Program](#)

Vermont

- [Clean Energy Development Fund \(CEMF\) Loan Program](#)
 - [Vermont Gas - Residential Energy Efficiency Loan Program](#)
- Virginia
- [Northern Virginia Electric Cooperative - Residential Energy Efficiency Finance Program](#)
 - [Southside Electric Cooperative - EC Home Improvement Loan Program](#)
 - [Virginia Natural Gas - Low Interest Sun Trust Loan](#)
- Washington
- [Clallam County PUD - Residential Solar & Efficiency Loan Program](#)
 - [Clark Public Utilities - Heat Pump Loan Program](#)
 - [Clark Public Utilities - Solar Energy Equipment Loan](#)
 - [Clark Public Utilities - Weatherization Loan Program](#)
 - [Franklin County PUD - Energy Efficiency Loan Program](#)
 - [Franklin County PUD - Solar Energy System Loan](#)
 - [Grays Harbor PUD - Residential Energy Efficiency Loan Program](#)
 - [Grays Harbor PUD - Solar Water Heater Loan](#)
 - [Klickitat PUD - Loan Program](#)
 - [Okanogan PUD - Conservation Loan Program](#)
 - [Pacific County PUD - Solar Water Heater Loan](#)
 - [Richland Energy Services - Residential Energy Conservation Loan Program](#)
 - [Snohomish County PUD No 1 - Conservation Loan Program](#)
 - [Tacoma Power - Single Family Weatherization Loan Program](#)
- Wisconsin
- [Focus on Energy - Energy Star Mortgages](#)
- Federal
- [Energy Efficient Mortgage](#)