

Left to Our Own Devices

Financing Efficiency For Small Businesses And Low-Income Families

December 2009

AUTHORS

Steven J. Moss, M.Cubed
Jamie Fine, PhD, Environmental Defense Fund

RESEARCH SUPPORT PROVIDED BY:

Kristina Feldman, San Francisco Community Power
Kerry Fleisher, San Francisco Community Power
Ryohei Hinokuma, San Francisco Community Power
Nicole Hudley, San Francisco Community Power
John Motsinger, Environmental Defense Fund



Table of Contents

Executive Summary	3
I. Introduction	8
Access to Capital a Barrier for Families and Small Businesses	10
Existing Financing Programs Have Low Penetration Rates	12
II. Currently Available Programs	15
On-Bill Financing	15
Energy Financing Districts (Property Tax Assessment)	17
Energy Efficiency Local Improvement District	19
Energy Efficiency Mortgages	20
Micro-loans	21
III. New Ownership Models	24
Leases and Power Purchase Agreements	24
IV. Unlocking New Financing Sources	25
Monetizing Bill Subsidies	25
Monetizing Emission Reductions: Climate for Community	31
Carbon Market Funding Mechanisms	33
V. Conclusion	36

Executive Summary

Environmental Defense Fund (EDF) retained M.Cubed¹ and San Francisco Community Power (SF Power)² to identify and evaluate the sufficiency of available financing options³ to help low-income populations, particularly communities that have been historically overburdened by air pollution (i.e., “environmental justice communities”), invest in resource-saving measures, such as energy efficiency and water conservation. This report focuses on the availability of funds for capital investments in the range of \$5,000 or \$10,000 that pay back quickly through avoided utility bills or reductions in other expenditures. Alternatives to existing financial mechanisms - loans and subsidies – and new funding streams, notably emerging carbon markets, offer the potential to link community micro-financing needs with investors seeking emissions reductions and other societal benefits.

Key report findings are as follows:

- *Existing financing mechanisms are inadequate for small businesses and low-income households that need capital to pay for efficiency investments.* Several new strategies could prompt increased efficiency investments directed towards our most vulnerable energy users.
- *Inadequate access to micro-financing is one of several interlinking factors that impede adoption of energy-saving and other conservation measures by low-income households and small businesses.* Increasing access to capital can inspire investments that lower energy-related expenditures, but available financing mechanisms have limited potential for low-income households and small businesses, as detailed in Table ES-1.
- *Access to financing is not a fully sufficient remedy for tenants or small businesses.* Many low-income homes and small businesses are located in environmental justice communities, are challenged by information gaps and split incentives, lack capital to invest, and thus require comprehensive solutions. For the majority of renters and small businesses not generally aware of efficiency and conservation opportunities, financing needs to be embedded into an integrated approach to providing resource-saving goods and services. Such an approach would link high-quality vendors, financiers and marketers, comprehensive packaging of available subsidies and interventions, easy-to-understand information, and guaranteed performance outcomes.

¹ M.Cubed, www.mcubed-econ.com/MCubed/Home.html, is a consulting firm specializing in resource economics and public policy analysis.

² SF Power, www.sfpower.org, is a nonprofit that pilots innovative programs to help small business and low income families better manage their resource use.

³ In this paper, the term "financing" means obtaining loans to pay for efficiency investments. "Credit" or "access to capital" similarly refers to loans from financial institutions, government agencies or third parties.

- *Multiple approaches, as well as enhanced profit opportunities, are needed to address lenders' reluctance to provide financing to modest-sized energy management projects.* High administrative costs and low profit potential deters traditional lenders from developing financing programs for small loans. Micro-financing institutions are an exception, but they tend to focus on income generating investments rather than operating cost reductions. To address this barrier, nonprofits specializing in financial literacy need to incorporate utility and resource saving opportunities into their programs, and policy makers need to look for diverse ways to expand micro-financing options, as well as to increase lenders' profitability. For example, on-bill financing, in which loans are attached to utility bills and meters, revolving loans tied to appliance purchases, and nonprofit-supported programs can help improve market penetration of proven efficiency investment opportunities.

- *A variety of financing approaches can solidify emerging efficiency markets by inspiring consumer confidence.* Individuals and small businesses make appliance or lighting purchase decisions based on convenience and capital cost attributes (e.g., price, refrigerator door configuration, lighting fixture aesthetics and illumination properties). Buyers consider long-term operating costs secondarily to acquisition costs, and may distrust that promised savings will materialize. Methods need to be developed to increase confidence that investments will deliver the savings indicated by consumer information programs, such as the U.S. Department of Energy's Energy Star labels. This can be done through regulatory pre-certification, manufacturer warranties, service provider guarantees (e.g., the provider takes on part or all of the risk of a poor outcome), or through the financing mechanisms themselves. For example, some municipal energy financing districts provide a list of qualifying energy efficiency projects as a way to ensure minimum payback streams. Program integrity can be continually improved through randomly sampled post-installation audits.

- *Financing periods matched to equipment performance may be too long for the preferences of businesses and renters; mechanisms are needed to bridge these temporal gaps.* Investments that are not recouped within a few years can be unattractive to businesses and renters, who weigh near-term considerations heavily. Yet, efficiency investment payback periods can be lengthy. For example, refrigerator investments are best evaluated against the appliance's expected thirteen-year lifetime; photovoltaic panels payback reliably for 30 years and longer. Financial structures that can accommodate extended loan repayment periods include on-bill utility financing and property tax assessments, the later of which are repaid by whoever owns the property during the loan period. On-bill financing may be reliably attached to the utility meter, so that

payments are made by whoever is benefitting from the investment during the repayment period.

- *Additional efficiency subsidies and money flows can increase the attractiveness of financing packages, both from the buyer and seller side.* Mechanisms that reduce the cost of energy saving measures, create additional third-party profit opportunities, or direct revenue streams to purchasers are important elements for low-income families and small business. For example, financing can be effectively packaged into direct public sector or utility subsidy programs, or can be attached to vendor and third-party equipment and service sales.
- *Public policies could be adopted to allow low-income families and small businesses to access revenue generated through climate policies, while directing these funds to efficiency investments.* For example, third parties could be allowed to sell aggregated bundles of emission savings obtained from multiple small sources on emerging carbon markets, thereby providing an additional revenue stream for energy efficiency investments. Monetizing carbon reductions undertaken by small businesses and low-income families could serve as a financing leverage and catalyst when linked with other resources, inspiring third parties to implement efficiency programs. Results from a pilot study conducted by SF Power indicate that if carbon value is accounted for then refrigerators using 648 kilowatt-hours a year can be cost-effective to retire. Likewise, the already positive net value of cost-effectively replacing the up to 28,000 inefficient refrigerators located at non-public low-income housing in the City and County of San Francisco increases by \$400,000 with the addition of the carbon value, an added value of approximately \$15 per refrigerator.⁴
- *Existing utility bill subsidies could be beneficially unlocked to enable recipients to redirect the support payments to finance reductions in their energy use.* For example, under the California Alternative Rates for Energy (CARE) program low income families are provided with a 20 percent reduction on their electricity and natural gas utility bills. The state's two largest investor-owned utilities, Pacific Gas and Electric Company and Southern California Edison Company, spent almost \$600 million on CARE electricity subsidies in 2009. Under the subsidies households are rewarded for using more energy, a perverse incentive that increases air pollution and greenhouse gas emissions. The subsidies could be redirected (i.e., monetized) to enable low-income families to use them to finance energy saving measures, thereby lowering utility expenditures, reducing associated emissions, and increasing comforts associated with effective heating, cooling and ventilation systems.

⁴Based on the assumption that greenhouse gas emission allowances are valued at \$20 per ton in a regulatory compliance cap and trade program.

- *Innovative financing mechanisms should be actively explored by policy makers.* For example, new ownership models, in which third-parties own energy-using equipment, such as residential refrigerators in tenant-occupied homes, could be employed to overcome split incentive barriers. Likewise, an energy maintenance organization approach could be employed to manage resource use by families and small businesses. Under such an approach residential and commercial electricity users could pay monthly fees to an energy service provider in exchange for their active management of energy-using devices.

TABLE ES-1

How Available and Potential Financing Options Address Access Barriers

Mechanism	Description	Financier	Experience	Limitations for low-income households and small businesses
Utility financing	Rate payer funded subsidies	Ratepayers/Utility	Extensive	Insufficient penetration rates even after decades of experience
Traditional Loans	Loan repayments on regular schedule	Banks, Retail stores	Extensive	Split incentives; Lenders don't seek small loans or low-income customers due to credit risk and transactions costs
On-bill financing	Loan repayment via utility bills	Utility or energy services company	Limited but expanding	Billing system incompatibilities, consumer skepticism, needs associated education services
Energy Financing District	Loan repayment via property tax assessment	Local government	Limited but expanding	High transactions costs so not used for smaller interventions
Energy Efficiency Local Improvement District	Loan repayment associated with property, not tenant	Local government	Very limited	Requires majority approval by owners within district
Public loan fund based on municipal bonds	Traditional loan repayment but with better terms	Local government or private entity	Very limited	Similar access and transactions costs issues as traditional loans
Energy Efficiency Mortgages	Traditional loan repayment	Banks; mortgage brokers	Very limited	Only at time of sale; difficult in tough housing market; administrative and verification hurdles
Micro-loans	Low-interest loans for small businesses with limited access to credit to expand commercial operations	Development banks, federal or state government funds distributed by local lenders	Extensive in other countries	Not used typically to reduce operating costs
Third-Party	Private service	Energy Services	Limited to larger	Transaction costs must

Mechanism	Description	Financier	Experience	Limitations for low-income households and small businesses
Investments	providers earn a share of avoided energy bills	or Management Companies	commercial interests	be overcome for small commercial and residential customers; consumer demand must grow to attract investors.
Leases and Power Purchase Agreements	Investments repaid via power contracts or leases	Utilities, On-site power companies	Extensive for large investments	Faces similar challenges as third-party investments for smaller energy users
Bill subsidy monetization	Rather than power rate discounts, use value for capital investments	Utilities	Limited	Requires education for customer to recognize beneficial tradeoff
Carbon market crediting	Aggregating emissions reductions for carbon market crediting	Community benefits organizations or local governments	Very limited, but examples from voluntary and regulatory GHG offsets programs and "white tag" efficiency programs	Transactions costs high for individual monitoring and verification
Carbon policy revenue returns	Climate policy revenues used for micro-financing	Regulators in association with utilities or banks	Limited, but similar example in Alaska's Permanent Fund	Revenues would likely be disbursed via traditional lending programs

Although various innovative financing approaches – such as on-bill and property tax financing – are gaining traction among policy makers and consumers, most have yet to be implemented at large scales. These basic building blocks to increase access to financing for energy-saving investments by low-income families and small businesses will be most effective if delivered as comprehensive packages that include marketing, financing, subsidies, and installation assistance. A variety of approaches that are as diverse as our businesses and residents will be needed to achieve ambitious energy saving and greenhouse gas emission reduction goals in our most vulnerable communities.

While this study identifies the limitations of current and potential of relatively new mechanisms for efficiency investment micro-financing, it does not provide a gap analysis. Such a study would compare the magnitude of existing and anticipated financial resources with the investment need in low-income homes and small businesses.

I. Introduction

There is a widely known gap between cost-effective behavior, consumption patterns and actual marketplace conditions.⁵ For example, energy users rely on a large number of appliances, electronic equipment, and lighting that, if replaced by efficient models, would reduce their utility bills sufficiently to pay for new equipment within reasonable time periods.⁶ In addition to saving money, proper retirement and replacement of inefficient equipment acts to avoid polluting air and greenhouse gas emissions, and can spur green job creation.⁷

This “engineering gap” (or “efficiency gap”) is particularly the case for low-income households and small businesses, which tend to depend on older, inefficient equipment.⁸ This gap is present even after years of utility- and government-sponsored interventions to encourage the retirement of inefficient equipment. For example, through recent field work San Francisco Community Power (SF Power) found that up to one-fifth of refrigerators located in non-public, low-income San Francisco households could be cost-effectively replaced (i.e., induce positive net present value), resulting in utility bill reductions and lower polluting air and greenhouse gas emissions.⁹

The persistent engineering gap is due to a number of factors, including:

- (1) *Lack of capital.* The persistence of old equipment and appliances is partially due to a lack of capital to purchase replacement models. For example, a new efficient commercial refrigerator may cost a few thousand dollars; an energy efficient residential appliance could demand upwards of \$600 or more. A given efficiency purchase may pay-off quickly in terms of reduced operating expenditures, but the individual or business may have insufficient cash to make the investment.

⁵Generally, see <http://enduse.lbl.gov/Projects/EfficiencyGap.html>, and for example reports, see Golove, William and Joseph Eto. 1996. *Market Barriers to Energy Efficiency: A Critical Reappraisal of the Rationale for Public Policies to Promote Energy-Efficiency*. Berkeley, CA: Lawrence Berkeley National Laboratory. Report No. LBL-38059. March; Sanstad, Alan H. and Richard B. Howarth. 1994. “‘Normal’ Markets, Market Imperfections, and Energy Efficiency.” *Energy Policy* 22(10): 811-818.

⁶This phenomenon is distinct from consumers purchasing appliances and equipment that have higher operating costs because they prefer the features associated with those items. That is, the apt comparison is between technologies that provide essentially the same service, with similar qualities and attributes, but demanding different amounts of energy or water.

⁷ If done at a large scale lowering this barrier would also reduce greenhouse gas emission allowance prices under California’s Assembly Bill 32’s cap and trade program.

⁸For example, Californians who earn more than \$100,000 annually are 6 percent more likely to own two year old refrigerators, 1.5 percent more likely to own two to seven year old refrigerators, and 4 percent less likely to own eight to 10 years old refrigerators compared with Californians who make less than \$25,000 a year. See KEMA, Inc., *RASS Reports. California Statewide Residential Appliance Saturation Study*. websafe.kemainc.com/RASSWEB/DesktopDefault.aspx.

⁹ Environmental Defense Fund and San Francisco Community Power, *Aggregation of Emission Reductions Would Provide Economic Benefits to Vulnerable Communities and Ongoing Incentives to Address Hard-to-Reach Sources of Greenhouse Gases*, Summer, 2009.

- Compounding this problem, small businesses often have short time horizons, and avoid investing in new capital equipment – even when it will lower their operating costs – because of concerns that they won't be in business long enough to reap the rewards (i.e., they have very high discount rates).¹⁰
- (2) *Split incentives.* In cases where the equipment owner is different than the party responsible for paying the energy bill, there is little incentive to change out equipment as a means to lower utility expenditures. For example, the renter pays the utility bill, but the property owner owns the appliances (e.g., refrigerator; lighting); or, in the case of small retailers, a beverage distributor owns the refrigerated display case, while the retailer pays the associated electricity bill.
- (3) *Transaction costs.* Efficiency purveyors prefer investing in marketing efforts that provide the highest returns. Implementing many measures at many small sources is presumed to provide less "bang for the buck" than measures aimed at larger power users because the cost of each individual transaction may be noticeable. As a result, families and small businesses tend to be left to their own devices to navigate often complex efficiency-related investments.
- (4) *Knowledge gaps.* Inefficient behaviors and equipment are also the result of information gaps. For example, small businesses may not be attuned to avoiding peak electricity prices, and families may not recognize that plugged-in appliances continue to use electricity even when they're turned off.^{11,12} In general, utility rebate programs require customers to seek out the information themselves or read it as part of a bill insert. Even if a customer inquires further, the application process can be tedious and hard to navigate, preventing low-income households and small businesses from taking advantage of opportunities that will save them money and improve the environment.
- (5) *Conservation ethic.* To many consumers proper environmental and economic behavior is to use things as long as possible. For this population replacing equipment - particularly appliances and lighting – even if it will result in lower operating costs is contrary to the ideals of living sustainably.¹³

¹⁰ This can be true even for businesses that have been operating for more than a decade.

¹¹ M. Cubed, San Francisco Community Power, and Energy and Environmental Economics, *Distributed Energy Resource Implementation: Testing Effective Load Management at the Feeder Level, Draft Interim Report*, published by the California Energy Commission, Winter, 2007.

¹² A report by Lawrence Berkeley National Laboratory indicates that in 2006 low-power mode energy use in California accounted for 13% of residential electricity use, or 982 kWh/yr per home. Meier, A., et al., *Low Power Mode Energy Consumption in California Homes*, 2008, California Energy Commission, Public Interest Energy Research Program, Report No. CEC-500-2008-035: Sacramento, Calif.

¹³ This issue merits greater attention, both from behavioral and empirical (e.g., life cycle analyses) perspectives.

As reflected in California's Assembly Bill (AB) 32 and other environmental legislation, decision makers are increasingly concerned that low-income families tend to live in areas that have above-average environmental hazards, and that this population, along with small businesses, will be least able to pay the higher resource prices likely to result from policies adopted to address global climate change.¹⁴ This, in turn, has prompted a search for ways to reduce barriers to the adoption of efficient technologies by vulnerable populations, as a means to reduce operating expenditures as well as polluting air and greenhouse gas emissions.¹⁵

This paper critically evaluates potential ways to address a lack of capital and split incentive challenges facing small businesses and low-income households. In particular, we examine the following mechanisms:

- Utility financing,
- Traditional loans, supplemented with public sector backing,
- On-bill financing,
- Monetizing existing energy bill subsidies,
- Monetizing greenhouse gas reductions by enabling small emission sources to be aggregated together and placed on emerging greenhouse gas emissions markets,
- Accessing revenues generated from greenhouse gas emissions control policies.

Access to Capital is a Barrier for Low Income Families and Small Businesses

Although it's common sense that a lack of money is likely to be a barrier to purchasing new (energy efficient) appliances and equipment, the importance of this barrier falls along a continuum of hurdles. At one end are families and businesses that don't qualify for credit, including predominately low-income households, as well as cash-strapped and self-employed small businesses which don't have access to a credit line. For this population access to capital is among a number of potential challenges.

At the other end of the spectrum are credit-worthy families and businesses who can generally obtain financing from the marketplace. However, even for this population financing terms can be onerous, and necessary loan sizes for small business energy efficiency investments may be too small to garner financial institutions' interest. For example, the American's Recovery Capital program, administered by the Small Business Administration (SBA) and created in May, 2009, has access to \$255 million, enough funds to make approximately 10,000 loans of up to \$35,000 each. Yet as of mid-August

¹⁴ Carbon dioxide reduction policies are likely to be regressive, meaning the costs will disproportionately affect lower-income households, who spend a larger portion of their income on energy. Dallas Burtraw, Richard Sweeney and Margaret Wells, "Crafting a Fair and Equitable Climate Policy: A Closer Look at the Options," *Resources*, Fall 2008.

¹⁵ See for example, Steven Moss, *Getting the Job Done Right: Employment Growth and California's Global Warming Solutions Act*, published by Environmental Defense Fund, Winter, 2008

only 1,127 loans, totaling \$36.8 million, had been extended.¹⁶ Many of the SBA loans are considerably larger than what would generally be considered catering to small businesses.¹⁷ The slow pace of lending is likely due to the modest profits opportunity for banks and stringent underwriting standards. Low profit potential reduces incentive for banks to staff-up and administer the SBA loan program quickly. Underwriting standards that require as much work as larger loans mean that high transaction costs will compromise the already small profit potential.¹⁸

Banks are not the only source of micro-financing for efficiency investments, especially during the current economic downturn. Appliance retailers are offering attractive credit options to those who qualify. For example,

- *Best Buy*: Appliances costing more than \$499 can be financed at 0 percent interest for 18 months; no interest for 90 days on all purchases; no interest for 6 months on purchases totaling at least \$299.
- *Sears*: For appliances costing more than \$399, purchasers can request a 0 percent interest rate for 12 months. Sears also offers a buyer protection program, where if the purchaser spends more than \$399 on an appliance, and after 30 days loses their job, Sears will waive monthly payments for up to one year.
- *Wal-Mart*: Zero percent on new appliances costing more than \$250 for 12 months.

Attractive financing terms tend to coincide with poor economic conditions (i.e., periods when consumers have even less capacity to make significant purchases, and fewer qualifying for credit), with consumer interest rates rising during periods in which potential buyers may be more able to afford a purchase. For example, in 2007, when consumer demand was high, revolving credit was offered at 7.4, compared to the 2.3 rate charged in 2008 after financial markets almost collapsed.¹⁹

During more typical economic periods, when credit isn't provided at low rates, access to financing appears to induce more businesses and families to invest in energy saving measures. For example, less than one-third of those who relied on zero interest financing as part of Northern States Power and Pacific Gas and Electric Company (PG&E) energy efficiency loan programs and less than half (45 percent) of those

¹⁶Robb Mandelbaum, "A Trickle of Aid for the Little Guy," *The New York Times*, August 13, 2009.

¹⁷For example, Service West Inc. received a \$10.5 million SBA loan, under a program that offers financing of up to \$4 million for projects designed to reduce energy consumption by at least 10 percent or which will generate renewable energy or fuels, to purchase a 132,0000-square-foot commercial office building in San Leandro. Lindsay Riddell, "Expanded SBA program helps East Bay Business" *San Francisco Business Times*, August 13, 2009

¹⁸ SBA pays banks two percentage points over the prime rate. After a one year deferral, the borrower repays the loan over five years. SBA repays the lender in case of default. Ibid.

¹⁹ *Federal Reserve Statistical Release*, May 2009.

participating in a similar Bonneville Power Administration program, said they would have made the efficiency investments without financing.²⁰

Financing programs need to be tailored to meet the needs of the populations of interest. It's relatively easy to provide a loan program for those who are educated, motivated, and credit-worthy; but those are the people and businesses with the least need for loans to finance efficiency investments. It's more challenging to address the challenges faced by those most in need of financing, including families and small businesses with the highest energy cost burdens as a percentage of income, who rely on low or fixed incomes, have poor credit, and/or rent.

Existing Energy Financing Programs Have Low Penetration Rates

There are more than 150 loan programs oriented towards financing residential and small businesses energy efficiency investments on offer in the United States, most of which are managed by utilities.²¹ However, utility and government-sponsored energy efficiency financing programs haven't significantly penetrated the overall market, though programs that have been offered over extended time periods with attractive terms have achieved notable success. In 2007, most of the available utility programs reached less than one-tenth of one percent (0.1 percent) of their potential customers. Manitoba Hydro, the most successful program in terms of 2007 participation, provided financing to 1.9 percent of its customers.²² Sacramento Municipal Utility District (SMUD) reached 0.6 percent of its ratepayers in 2007²³, though it has served approximately 26 percent of its customers – 135,900 loans in total – since the program launch in 1977.²⁴

Utility loan programs' lackluster performance appears to be the result of a number of factors, including the modest interest rate discounts sometimes offered by the programs; requirements that the loan be secured (e.g., property lien);²⁵ high monthly payments; and a lack of confidence that the associated utility bill reductions will be equal to or more than monthly repayment requirements. However, default rates for utility programs tend to be low, less than two-tenths of a percent (0.2 percent), in part due to the threat that utility service could be discontinued if payments aren't rendered.

²⁰ Stern 1985.

²¹ These data omit the potential impact of financing options offered by appliance and equipment vendors.

²² 8,100 households.

²³ 3,200 households.

²⁴ This penetration level, over a twenty year period, is testament to what a program can accomplish over time. Some homes may have received more than one loan. Merrian Fuller, *Enabling Investments in Energy Efficiency, A Study of Energy Efficiency Programs that Reduce First-Cost Barriers in the Residential Sector*, published by the California Institute for Energy and Environment, September 15, 2008.

²⁵ Cascadia Consulting Group, Inc., Seattle Green Building Task Force, October 7, 2008.

Examples of currently available utility loan programs include the following:

- Tacoma Power provides zero-interest loans to residential and multi-family customers to finance insulation and infiltration reduction measures. Approximately 75 of Tacoma's electricity-heated pre-1988 homes have been retrofitted under this program.
- Snohomish Public Utility District provides 2.9 percent interest loans for residential customers to finance pre-selected energy efficient home improvement projects. The minimum loan is \$1,000, with up to 10 year repayment terms.
- SMUD's residential loan program launched in 1977. Since then it has issued 135,000 loans, with an average loan size of \$8,750. SMUD relies on internal funds to support the program, and charges a 7.5 percent interest rate, which covers the cost of capital and overhead.
- The City of Chicago offers a commercial sector low-interest loan program targeting a different industry each year. The starting interest rate is 3 percent, which is waived if the business purchases green power.

The City and County of San Francisco, under its Revolving Loan Fund, offers loans in amounts that range from \$5,000 to \$25,000 to small businesses, with interest rates ranging from 4 to 6 percent. Although this program isn't oriented towards efficiency investments – and has not yet provided loans for that purpose – financing could be obtained for that type of investment.

Beyond providing capital, the most successful loan programs offer technical assistance and “hand-holding” to drive energy efficiency upgrades. Educating contractors and vendors that provide energy efficiency services about financing options is also important, so that these networks can market the program as a sales tool for their own products. And successful financing initiatives need to be simple to access, and require modest upfront cash outlays. For example:

- Participation rates tend to be higher when access to financing is created in collaboration with networks of engaged and informed contractors who use the financing program as a sales tool.²⁶
- Subsidies for low-income families and small businesses, in the form of case management, cash rebates, and/or interest rate buy-downs, may be needed in addition to financing access to achieve significant penetration.

²⁶ In this respect nimble financing managers could take advantage of opportunities as they emerge. For example, the attractive financing terms currently offered by appliance vendors could be seized on as part of utility energy efficiency marketing campaigns.

- Assuring that the financed measures will have a positive cash flow in terms of lowered utility bills can be critical. Most currently-available programs don't offer rigorous assessments of expected savings, nor guarantee that savings will materialize. As a result, little is known about their actual impact, and potential purchasers may not have full confidence that promised outcomes will be achieved. These barriers need to be addressed to ensure fully effective financing programs.²⁷
- For some purchases the average loan term of five to seven years may be insufficiently long to achieve positive cash flow. For example, while plug load management, and residential appliance, lighting and equipment replacement, might be implemented for several hundred dollars, and reduce energy use by upwards of 20 percent, more extensive and expensive retrofits might cut energy bills by as much as 50 percent, and have longer lifetimes. However, these latter measures – along with small scale distributed generation, such as photovoltaics – often have longer payment periods, requiring financing with a term of 10 to 20 years to match the savings. Available financing programs need to match these different time horizons to successfully serve distinct niche markets.

Efficiency financing could also be offered by a host of other non-utility and non-governmental parties. For example, vendors could – and sometimes do – provide financing for equipment purchases. However, only large retailers have the capacity to maintain financing programs due to requirements for underwriting, data tracking, reporting, and capital. Energy service companies make investments to better manage facility load in exchange for a percentage of the resulting bill savings, but they focus on large commercial or industrial customers and do not offer services to small businesses or to low income residents. Social venture funds provide low-cost financing to socially-attractive organizations and investments, but again these financing entities tend to focus on larger loans, and to date have not invested in energy efficiency.

Financing alone won't provide a complete solution to inducing families and small enterprises to adopt cost-effective energy management measures. However, eliminating or reducing the first cost of energy investments can help lower the barriers to improving efficiency in existing homes and businesses.

²⁷ See Lori Higa, "Energy Efficient Products: Hype or Headache," http://www.neighborhoodnewswire.net/index.php?option=com_content&view=article&id=61:lori-higa-&catid=35:energy&Itemid=54

II. Currently Available Programs

On-Bill Financing

Offered by several utilities already and soon to be available from several more, on-bill financing enables businesses and residents to borrow funds for energy efficiency upgrades. This approach associates the loan directly to the resulting stream of bill savings through the utility bill. On-bill financing makes repayment more convenient for borrowers, lowers default rates, and provides for a transparent data stream of costs and bill savings. However, there are a number of challenges to effective implementation of this financing method, as well as successful program penetration, as follows.

- *Meter versus customer.* The loan amount can be associated with the meter, and be paid back by whichever customer is responsible for the utility bill during a given period, or be attached to an individual customer, and paid back in full when they depart the premises. Under a Tariffed Installation Program (TIP), such as Pay as You Save (PAYS), the loan follows the meter. Associating the loan with the meter can provide for longer pay-back periods in households or business in which turnover is notable. Meter-based financing programs enable the utility to shut off electrical service as a sanction, thereby lowering default risks. However, a meter-based approach creates the risk that the energy-saving device, if portable (e.g., refrigerator), could be removed from the site if the tenant moves before the loan has been fully repaid. Meter-based financing also forces new tenants to pay back loans that they may not have explicitly agreed to taking (e.g., based on the previous tenant's actions), though if implemented correctly they will benefit in terms of lower ongoing utility bills.
- *Pre-certified investments.* Loans could be restricted to investments which have been pre-approved to obtain specified bill savings over pre-determined time periods. For example, to ensure savings, PAYS includes an independent estimate of the efficacy of the measure to be implemented and a requirement that the expected payment be no more than 75 percent of the anticipated savings, and the term of the repayment be 75 percent or less that the life of the measure.
- *Interest rate.* Rates could be set at the market, or subsidized through the issuance of bonds or other public funds, by utility ratepayers, or by private capital sources.
- *Nonpayment issues.* A number of issues are associated with nonpayment. For example, if the loans are being financed through a third-party lender, who gets paid first is a concern in cases where customers partially pay their bills; usually the third-party lender is second to the utility, increasing their risk. Although PAYS programs require disconnection in the event of nonpayment, taking such an action

can be made more complex if the customer pays their energy bill but not the loan. For NW Natural Gas, this issue effectively ended their program.²⁸

- *Loan amounts.* Minimum and maximum loan amounts need to be set, with trade-offs between transaction costs associated with many small loans and equity issues associated with comprehensive access.
- *Utility billing system capability.* Significant administrative costs are associated with establishing suitable billing systems.
- *Payment recipient.* The utility could reimburse their customer for measure expenses, or pay the contractor who provides the equipment or services. These different approaches, in turn, could trigger different warranty responsibilities (e.g., if the utility pays the contractor it may be responsible for contractor performance).

Table 1 displays example on-bill financing programs currently or previously on offer.

TABLE 1
Residential On-Bill Financing²⁹

Sponsoring Entity	Program Name	Location	Type
<i>Active</i>			
Alabama Power	On-bill Financing	Alabama	Reduced interest
Dixie Electric Cooperative	On-bill Financing	Alabama	5% interest
First Electric Cooperative	Home Improvement Loan Program	Arkansas	7.5% interest
Manitoba Hydro	Power Smart Residential Loan	Manitoba, Canada	Reduced interest
Hawaiian Electric Company	SolarSaver (two bills in the same envelope)	Hawaii	TIP pilot for solar hot water heaters
Midwest Energy	HowSmart On-bill Financing pilot	Kansas	Pays contractor directly. Loan charges must be less than 90 percent of estimated monthly savings.
National Grid ³⁰	On-bill Financing	New England	0 percent interest.
San Diego Gas and Electric Company	On-bill loans to commercial customers.	San Diego	0 percent interest. Minimum loan is \$5,000; maximum of \$50,000. Defaults can trigger meter shut-offs.

²⁸ Cascadia Consulting Group, Inc., Seattle Green Building Task Force, October 7, 2008.

²⁹ Milwaukee Energy Efficiency is developing a pay-as-you-save type financing program for businesses and residents.

³⁰ The utility has found that borrowers that require loans higher than \$5,000 are more likely to rely on on-bill financing, and that OBF lowers default rates and increases close rates (i.e., the ratio of projects signed to proposals offered).

Sponsoring Entity	Program Name	Location	Type
United Illuminating	SmartLiving Catalog Program	Connecticut	\$200 year of EE products at 0 percent interest
<i>Canceled</i>			
BC Hydro	Home Improvements Program	British Columbia, Canada	Reduced interest rates
New Hampshire Electric Coop	Smart START, residential	New Hampshire	On-bill TIP
NW Natural Gas	On the Bill Program	Oregon/Washington	Market rates
Oklahoma Gas and Electric	Heat Pump Loan Program	Oklahoma	Heat pumps
SMUD	On-bill financing for residential loans	Sacramento	Cancelled due to billing system incompatibility.

On-bill financing programs have been available in several states for a number of years, and will become even more ubiquitous over the next decade as additional utilities adopt the approach. However, their limited track record suggests that utilities need to increase their comfort level with this financing method, and nest it more effectively in an integrated service approach with the necessary billing system upgrades a non-trivial issue for many utilities.

Energy Financing Districts (Property Tax Assessment)

Providing loans for photovoltaic (PV) installations and efficiency investments through property tax assessments, while available in several states for some time, has recently gained in popularity. Under clean energy municipal financing programs, efficiency upgrades and PV are paid back through special property tax assessments, with repayment terms attached to the building. This financing approach increases the incentive for property owners to make long-term investments, and enables them to capture the value of their investment when the building is sold.³¹ The approach is similar to how some municipalities fund undergrounding of electric distribution lines. Since complex utility bill systems do not have to be changed, and fewer third parties are involved, property tax assessment is administratively simpler than on-bill financing, with the important caveat that securing bond financing can be challenging, particularly in the current environment.

Under a clean energy municipal financing program the responsible public agency records a special tax lien against the subject property. This imposes a lien to secure an obligation to pay taxes, which takes precedence over the property's first mortgage if a default occurs. There is no upfront cost to the property owner. Interest payments on the project are tax deductible, similar to a home mortgage. Because retrofit payments are tacked onto property taxes, if there's a default there's virtually no risk that the city wouldn't receive its investment back.

³¹ The lien cost is essentially capitalized into building value, which could act to reduce sale prices.

At least, fourteen states have passed or are considering enabling legislation to allow special municipal districts to undertake clean energy municipal financing.³² The concept has been picked up at the Federal level by developing clean energy and climate policy. Examples of city programs include the following:

- Babylon, New York launched its program, which focuses on energy efficiency measures, such as sealing-up building leaks and replacing inefficient water heaters, in 2008. Under the initiative homeowners are expected to reduce their energy bills by an average of \$900 a year, or about 25 percent, with annual payments over eight years less than these savings, on average. Roughly 150 projects have been funded, with 80 percent complete. In contrast, 114 homes in Long Island participated in a three-year incentive program sponsored by the local utility which provided a 10 percent subsidy to homeowners for retrofits.
- Berkeley, California pioneered the concept in 2009 as applied to PV by enrolling upwards of 60 homes in a pilot initiative.³³ Under the Berkeley pilot, eligibility was based on home ownership and past payment of taxes, rather than good credit, with a financing term of 20 years that can be transferred with ownership. Due to its small scale and cutting-edge nature, access to the credit market was limited. As a result, financing was made available only for projects that could be completed in 270 days, and the interest rate was higher than other sources, such as home equity loans, particularly from credit unions. As a result, some property owners who made reservations to participate in the program dropped out, and, because of the time limitations, no new participants could be added.³⁴
- Boulder, Colorado has 360 homes, and Sonoma County, 184 houses, slated for energy efficiency retrofits and renewables under their financing programs.³⁵ Under Boulder's program, which was launched in April of this year, the county will issue bonds, with potential borrowers screened by their property tax payment history. Maximum loans are set at \$50,000, with a 6.68 percent initial interest rate.³⁶
- The City and County of San Francisco (CCSF) is launching a residential property tax financing program for energy efficiency, renewable energy and water conservation investments, with a citywide Mello-Roos Special Tax District serving as the financing mechanism. Under the program loan amounts will range

³² Annie Jia, "States and Cities Helping Buyers Pay for Energy-saving Improvements," *ClimateWire*, July 6, 2009. To learn about the program being developed in Texas, the Property Assessed Clean Energy Program, go to <http://lonestar.sierraclub.org/Conservation/energy/energy1pace.asp>.

³³ Palm Springs has launched a similar program.

³⁴ Merrian C. Fuller, Cathy Kunkel, and Daniel Kammen, *Guide to Energy Efficiency & Renewable Energy Financing Districts*, September 2009.

³⁵ Jia, op.cit,

³⁶ Fuller, et.al. op.cit.

from \$5,000 to \$50,000, with eligibility based on property value, rather than individual credit.

Clean energy municipal financing was included in climate and energy legislation sponsored by U.S. Representatives Henry Waxman and Edward Markey that passed the U.S. House of Representatives earlier this year. The policy would allow the federal government to back bonds issued by local governments to support energy retrofit projects, which could reduce interest rates significantly. Under a national lien system, if a building goes into foreclosure, money owed to the municipality would be first in line to be repaid.

Energy Efficiency Local Improvement District

Similar to property tax assessments, under an energy efficiency local improvement district (LID) revenue bonds are issued to enable the district to provide low interest, and potentially tax-exempt, financing for efficiency upgrades. This approach is generally more applicable to higher cost measures, such as PV, though could also be used for geographically-aggregated interventions. Likewise, under an LID split incentives typically continue to persist.

An LID requires that a set proportion (e.g., 60 percent) of the affected property owners with a designated district approve the assessments. While the municipality backs the LID assessment through revenue bonds, the bonds do not count towards its debt capacity. LID bonds are repaid through assessments that are made on each property within the district. A guaranty fund is generally also created as a backstop for payment defaults by individual property owners. In the event that this fund isn't sufficient, the municipality could levy taxes to cover debt service payments.

If an LID is created using the traditional model, in which fees are assessed on all parcels in the district, equity concerns, particularly for low-income property owners, could be raised if funds from all owners are used to pay for improvements to select buildings. If, on the other hand, the LID is created using a voluntary opt-in approach, equity issues are less likely to be prompted.

No jurisdictions have yet established an LID for efficiency or renewable investments. However, several municipalities are actively examining the concept. For example:

- Boulder County, Colorado is issuing bonds to provide financing options for renewable energy and energy efficiency improvements through a Clean Energy Options Local Improvement District. The LID would be available to both residential and commercial property owners.
- Oregon has drafted a legislative concept to allow local jurisdictions, and possibly the state, to establish energy efficiency investment districts. Assessment bonds, in

which the repayment stream is collected from the benefiting entity, would be issued.

- The cities of Berkeley and San Francisco have submitted requests for official rulings from the U.S. Internal Revenue Service (IRS) about whether local financing for energy efficiency improvements would overlap with the IRS's Investment Tax Credit offerings. Both cities expect the IRS to rule that there is no conflict.

A variation on an LID would be for the public or private sectors to establish a revolving loan fund. For example, under typical (e.g., pre-2008) market conditions municipal revenue and general obligation bonds carry interest rates of roughly five or six percent, with terms of 25 to 30 years. Establishing a jurisdiction-wide revolving loan fund, backed by revenue or general obligation bonds, provides for a simpler and less expensive way to access capital than LID financing. However, to cover debt services taxes may have to be raised citywide, effecting taxpayers who don't directly benefit. Several cities, including San Francisco, have financed a portion of their conservation efforts through bond sales.³⁷

Energy Efficiency Mortgages

Energy efficiency mortgages (EEM) provide property owners with additional funds, at the time of sale or as part of refinancing, for energy efficiency improvements at discounted interest rates. This approach provides an incentive for landlords to invest in energy saving measures, since they benefit by doing so through lower mortgage rates. However, while energy efficient mortgages have been available for years, they have not attracted significant interest. For example, Countrywide Home Loans offered an EEM, but it wasn't widely used, principally because realtors and lenders were unaware of the product. With focus on closing sales rather than identifying the best financial offering for their clients, realtors and lenders don't take the extra time to complete a Home Energy Rating System to determine the necessary upgrades to qualify for an EEM.

Based on historical experience, to be successful EEMs would need to be widely available, have an interest rate discount of at least an eighth of a point below market rate, and provide sufficient incentives to prompt realtors, lenders, and other third parties to offer them enthusiastically. In addition, administrative hurdles would need to be lowered. For example, lenders would need some expedited means to verify energy efficiency upgrades were made, or the associated promised performance obtained.³⁸

³⁷ Citibank and Bank of America have also established preferential loans for energy efficient homes, that provide for higher mortgages by adding future utility bill savings to their qualifying incomes, and to pay for any efficiency improvements over the lifetime of the mortgage. To compensate consumers for the time and cost of third-party certification, the two banks take up to \$1,000 off of closing costs. Farrell and Remes, *op.cit.*

³⁸ This could be tied into government requirements that efficiency upgrades be conducted as part of property sales, as is mandated in Berkeley and San Francisco.

Similar to EEMs, an Energy Efficiency Refinance Program would harness refinancing to pay for comprehensive energy saving improvements in existing homes. A targeted and streamlined energy efficiency refinancing program could be attractive for homeowners who have substantial debt or already have a mortgage, if the rates are sufficiently low and energy savings sufficiently high to reduce or stabilize monthly costs by consolidating debt at lower rates and reduced energy bills. The Energy Programs Consortium is pursuing pilots of this concept in a few states.³⁹

Micro-loans

Bangladeshi economist Muhammad Yunus, who founded the Grameen Bank, launched the microcredit movement almost forty years ago in response to the scarcity of small capital amounts for extremely low-income would-be entrepreneurs in the developing world.⁴⁰ Over time microcredit approaches have evolved to focus on peer-to-peer platforms, in which communities screen loan applicants in lieu of lengthy application and documentation processes.⁴¹

Microloan programs emerged in the United States roughly two decades ago, based on the peer-to-peer platforms pioneered by the international microfinance movement.⁴² Microloan programs are typically offered by nonprofit organizations or financial institutions supported by federal government agencies, most predominately the United States Small Business Administration (SBA), and the Community Development Financial Institution (CDFI) Fund.⁴³ Micro-lending programs tend to focus on entrepreneurs who have the least credit access. For example, ACCION USA, the largest nonprofit micro-lender, caters to women, immigrant, and minority business owners, with a current or active client population that is 61 percent Hispanic/Latino, 27 percent African-American, and 40 percent female. One hundred million dollars in microloans were provided to 13,000 clients by 250 micro-lenders in 2007.⁴⁴ SBA's micro-loan programs include the following:

³⁹ www.energyprograms.org

⁴⁰ Helms, Brigit (2006). *Access for All: Building Inclusive Financial Systems*. Washington, D.C.: The World Bank. ISBN 0821363603

⁴¹ Ibid, pages 35 to 57.

⁴² Microenterprise Works (Fall 2000) "Business Capital for Microentrepreneurs: Providing Loans," *Microenterprise Fact Sheet Series*, Issue 3

⁴³ SBA operates similar programs for small businesses, including the 7(a) Regular, the 504 Regular, Disaster Recovery, SBIC Debentures and SBIC Participating Securities. According to the SBA *Agency Financial Report of 2008*, the portion of the outstanding principal guaranteed as of September 30, 2008, was \$61.7 billion. The number of approved loans for the same year is 93,541 and the total recovery amount was \$567,868,917. According to the Association for Enterprise Opportunity, a lobbying organization for microenterprises, the program was appropriated \$41,000,000 for FY 2009.⁴³

⁴⁴ Associated Press. February 18, 2009, *Recession ups US demand for microloans*. <http://www.msnbc.msn.com/id/29258701/>

- The *Microloan Direct Program* guarantees microloans from an average of \$8,000 to \$13,000, with interest rates between eight percent and thirteen percent.⁴⁵ Microloan terms are for a maximum of six years, varying according to intended use and intermediary requirements, such as collateral. Enterprises applying for microloan financing are required to do business-related training and planning.⁴⁶ Planning involves preparing a loan request package, including a statement of purpose, business plan or excerpts from the plan, and financial statements.⁴⁷ Examples of California nonprofit intermediaries that don't solely focus on immigrant communities include California Resources and Training, Oakland Business Development Corporation, and Opportunity Fund Northern California.
- Almost 70,000 7(a) loans were approved in 2008. Under this program, the business applies to a lender – most American banks participate – who decides if they'll make the loan internally or, if the application has some weaknesses, request that SBA share from 50 to 75 percent of the loan. 7(a) loans tend to go to credit-worthy enterprises; they must meet SBA size standards, not already have the internal resources to garner credit, be able to demonstrate repayment, have reasonable owner equity to invest; and rely on alternative resources first, including personal assets.⁴⁸ Loans for working capital purposes mature in between seven and 10 years, and cannot exceed 2.5 percent over the prime interest rate. For machinery and equipment, terms range from 10 to 25 years; for real property purposes, it's up to 25 years. The borrower must also pay a guaranty fee: two percent on loans \$150,000 or less, three percent for loans between \$150,001 and \$700,000, and three and a half percent for loans over \$700,000. Some fees may be reduced due to the recovery package.⁴⁹

The Community Development Financial Institution (CDFI) Fund, a U.S. Treasury Department program with \$107 million in appropriations, provides equity investments, loans, deposits, or grants to financial institutions serving low-income and minority populations.⁵⁰ The Financial Assistance Awards, which can be for up to \$2 million, must be matched with funds of the same type from non-federal sources. Awardees may use the proceeds for financing capital, loan loss reserves, capital reserves, or operations.⁵¹ Local

⁴⁵Ibid.

⁴⁶ Small Business Administration. Microloans. Retrieved September 18, 2009

[http://www.sba.gov/services/financial assistance/sbaloantopics/microloans/index.html](http://www.sba.gov/services/financial%20assistance/sbaloantopics/microloans/index.html)

⁴⁷ Small Business Administration. *Finance Primer: A Guide to SBA Loan Guaranty Programs*. Retrieved September 18, 2009. <http://app1.sba.gov/training/sbafp/>

⁴⁸ Small Business Administration. Table 3 Number of Approved Loans by Program.

⁴⁹ U.S. Small Business Administration. *Recovery Act: Frequently Asked Questions*..

⁵⁰ Association for Enterprise Opportunity. AEO Policy Priorities Fiscal Year 2010 Appropriations Funding Levels. Retrieved September 18, 2009 <http://www.microenterpriseworks.org/index.asp?bid=4101>

⁵¹ Community Development Financial Institutions Fund. Community Development Financial Institutions Program. Retrieved September 18, 2009 http://www.cdfifund.gov/what_we_do/programs_id.asp?programID=

awardees include the Northern California Community Loan Fund (NCCLF) and Pacific Community Ventures.

NCCLF provides capital to small businesses and nonprofits – including affordable housing associations, music and theater groups, and legal advocates – which contribute to economic growth in economically depressed regions. NCCLF loans range from \$10,000 to \$1 million, and mature for periods of sixty days to five years. Interest rates range from seven percent to 10 percent, and amortization schedules are adjustable.⁵² NCCLF receives only four percent of its funding from government sources, with the remainder coming from banking institutions, religious organizations, and other donors.

Although microloans are typically used to spark or expand enterprises, rather than reduce operating costs through such investments as increased efficiency, several programs have recently emerged that focus on environmental improvements. For example:

- The Bay Area Green Loan available to businesses and nonprofits located in California's Alameda, Contra Costa, San Francisco, or Solano counties is designed for businesses able to demonstrate a positive impact towards the environment. Loans range from \$10,000 to \$50,000 with five year terms. Fixed interest rates range from 8 to 11 percent. Green certification is preferred. Awardees may use proceeds for such items as furniture and fixtures, inventory, machinery and equipment, supplies and materials, and working capital. There's a \$50 application fee, and closing fees of between three and five percent of the loan amount. Owners must contribute at least 30 percent, and provide a personal guaranty, business assets, or comparable security-to-loan value for collateral.⁵³
- The StopWaste.Org Revolving Loan Fund (RLF) is for small to medium-size businesses and nonprofit organizations engaged in source reduction and recycling activities which benefit and reduce waste from California's Alameda County landfills. The enterprise can be located in California's Contra Costa, San Francisco, San Mateo, or Santa Clara counties. Loans range from \$10,000 to \$287,000, with a fixed interest rate ranging between five and 10 percent, and loan terms of seven, 10, or 20 years, depending on loan use. Borrowers must contribute a minimum of five percent of the loan, and provide a personal guaranty, business assets, or comparable security-to-loan value for collateral.
- SBA Special Purpose (7a) Loans, Pollution Control, must be for the planning, design, or installation of a pollution control facility.⁵⁴

⁵² Northern California Community Loan Fund. Lending. Retrieved September 18, 2009.
<http://www.ncclf.org/lending/>

⁵³ Oakland Business Development Corp. Bay Area Green Loan. Retrieved September 18, 2009.
<http://www.obdc.com/loans/bay-area-green-loan/>

⁵⁴ Small Business Administration. Pollution Control. Retrieved September 18, 2009.
<http://www.sba.gov/services/financialassistance/sbaloantopics/SpecialPurposeLoans/pollution/index.html>

III. New Ownership Models

Third-party ownership of energy-using equipment, as well as energy efficiency investments, can be available to large commercial and industrial customers through energy service companies (ESCOs) that provide energy supplies and/or equipment under long-term, generally fixed, contracts. Often, the ESCO ties its compensation to energy bill savings. Although ESCOs are generally not an option for residential or small commercial customers, third party ownership of energy-reliant equipment installed at small businesses and in institutional settings does occur. For example, soft drink vending machines are typically owned by third parties, as are refrigerator display cases for beverages in small corner markets and liquor stores. In these latter cases split incentives need to be overcome to encourage adoption of efficient equipment.

Third-party ownership of energy-using equipment tied with efficiency incentives could be greatly expanded as a means to aggregate equipment purchases, and potentially gain access to carbon credit markets and other programs. For example, landlords don't necessarily want to own the appliances in their rental units. With the proper incentive structures third-parties could be induced to provide necessary appliances, while actively managing their associated energy use.

A variation on the third-party ownership ESCO model would be to establish "energy maintenance organizations" (EMOs) responsible for managing the energy use of its members. EMOs could be established on a geographic basis, as a means to develop distributed energy resources – small scale photovoltaic installations, wind, storage, load shifting (e.g., through demand response programs), and efficiency, among other assets – to cost-effectively manage energy supply and demand. Similar to health maintenance organizations, EMO participants would pay set fees in exchange for the provision of energy-using appliances, the power to run them, and the associated appliance maintenance.

Leases and Power Purchase Agreements (PPA)

Lease arrangements enable households and businesses to avoid paying the upfront capital costs and, in some cases, the operating costs associated with energy-related purchases. This model is rather well developed for small, distributed power generation. For example, under PV lease arrangements the customer pays nothing upfront, and isn't responsible for equipment maintenance. Instead, the customer essentially purchases the service being provided: electricity, as well as potential information flows through web monitoring. Under PPAs the customer pays for the power a rooftop PV system generates, but not for the equipment or maintenance. If the system fails, the customer isn't responsible for payments. Payments are stable over the length of the PPA. However, it's not clear whether PPAs provide for the best possible financial benefits for consumers as compared with more traditional lease arrangements.

Commercial building leases can also be structured so as to address split incentives to invest in energy management measures. For example, under an “expenses stop arrangement,” if an operator/landlord increases a building’s efficiency related to a pre-established baseline use and expenditure estimate provided in the lease, the landlord retains the savings. However, this approach doesn’t account for how tenants’ behavior, and equipment mix, impacts energy consumption. To address this element, landlords need to incentivize lessees to meet target reductions, through, for example, the sharing of costs and benefits.

IV. Unlocking New Financing Sources

In addition to expanding access to credit, means to increase low-income families’ and small businesses’ capacity to repay loans could play an important part in financing initiatives. There are many ways to redirect existing or emerging revenue streams into efficiency investments. For example, investment funds could be obtained by refocusing utility bill low income subsidy programs, or by providing small businesses and low income families with access to emerging carbon markets or associated revenues. In addition, several possible revenue streams directed towards vulnerable communities are being considered as part of state and federal policy discussions related to global climate change.

Monetizing Bill Subsidies for Efficiency Investments

Government energy assistance programs provide energy bill discounts for low-income families. For example, the California Alternative Rates for Energy (CARE) program provides low-income households with a 20 percent discount on their utility bill. In 2008 the two investor-owned utilities, Pacific Gas and Electric Company and Southern California Edison Company, spent almost \$600 million on the program.⁵⁵

Although the programs’ goal of assisting low-income families is laudable, it can have the pernicious impact of subsidizing inefficient and environmentally damaging practices because low-income families tend to rely on older, inefficient appliances that use excessive amounts of electricity, natural gas, or heating oil. Subsidizing these families’ bills essentially subsidizes the use of inefficient appliances, and the polluting air and greenhouse gas emissions associated with the generating resources necessary to meet this demand. Put differently, these subsidies mute price signals that will inspire efficiency investments. Since polluting power plants tend to be disproportionately located in low-income communities, the subsidies can have a second unintended impact of reinforcing the poor environmental conditions where subsidy recipients live.

⁵⁵ The federal Low Income Home Energy Assistance Program provides a similar subsidy. Southern California Edison’s expenditures include natural gas. However, the utility only has a few thousand natural gas customers compared to almost five million electric customers.

The CARE program was created to help reduce financial burdens on low-income households.⁵⁶ Program eligibility is determined by household income, as shown in Table 2. For both CARE and non-CARE customers, energy bills are calculated based on five different tier rates, which are set proportionally to an administratively-determined baseline consumption.

TABLE 2
Eligibility for the CARE Program

Number of Persons in Household	Annual Income
1 or 2	\$30,500
3	\$35,800
4	\$43,200
5	\$50,600
6	\$58,000
For each additional person, add	\$7,400

Table 3 and Figure 1 show that there are 10 baseline territories in California, with allowable baseline consumption varying seasonally and regionally. San Francisco is included in territory Q, with a baseline allowance of 8.2 kWh/day multiplied by the number of billing days for each billing cycle in summer months (i.e., May to October), and 12.6 kWh/day multiplied by the number of billing days for each billing cycle in winter (i.e., November to May). During each billing cycle, consumption that is under the baseline is charged at a Tier 1 rate, as shown in Table 4. Once use exceeds the baseline, the additional consumption is charged at higher rates: Tier 2 for use between 101 to 130 percent of the baseline; Tier 3 for use between 131 to 200 percent of the baseline; Tier 4 for the use between 201 to 300 percent of the baseline; and Tier 5 for use more than 300 percent of the baseline.

⁵⁶ California Public Utility Commission, *Pacific Gas & Electric Company*. http://www.cpuc.ca.gov/PUC/energy/Electric+Rates/Baseline/pge_baseline.htm (Accessed on August 15, 2009), 2009, 2009; Pacific Gas and Electric Company, *SCHEDULE E-1—RESIDENTIAL SERVICE*. 2008; PG&E, *Electric Rates*. <http://www.pge.com/tariffs/electric.shtml#RESELEC> (Accessed on August 15, 2009), 2009; PG&E, *CARE Program Maximum Household Income*. <http://www.pge.com/myhome/customerservice/financialassistance/care/eligibility/> Accessed on September 8, 2009.

TABLE 3

Allowable Baseline Consumption - (kWh/day)

Baseline Territory	Summer Baseline (May to October)	Winter Baseline (November to April)
P	15.9	12.7
Q	8.2	12.6
R	17.6	12.1
S	15.9	12.5
T	8.2	9.8
V	8.8	10.5
W	18.9	11.3
X	11.9	12.6
Y	11.5	12.9
Z	8.5	11.1

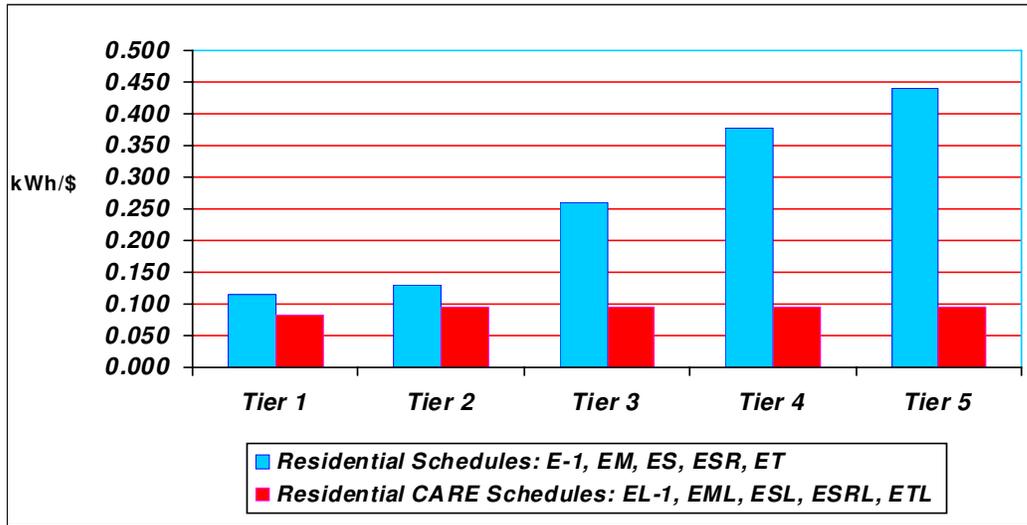
FIGURE 1

California Baseline Territories



As indicated in Figure 2 below, CARE rates stay constant at \$0.09563/kWh for any consumption exceeding the baseline, while non-CARE rates continue to increase. Non-CARE rates rise rapidly once they reach Tier 3, which is priced at \$0.25974/kWh and is more than 2.7 times higher than the CARE rates. The rate difference continues to grow, with non-CARE rates more than 4.6 times higher than CARE rates at Tier 5. As a result, residential bill savings associated with CARE participation become more significant as household energy consumption becomes higher.

FIGURE 2
Tier Rates for Residential Customers



SF Power developed a small pilot initiative to examine whether carefully crafted implementation of energy efficiency and conservation measures could beneficially replace bill subsidies.⁵⁷ That is, rather than receiving a bill discount, low-income families would be eligible for a host of measures that would lower their energy use, with the goal of matching the investment with associated energy reductions so that for every dollar spent at least that much in utility bill savings is achieved.⁵⁸

Out of the nine low-income households examined, seven were found to benefit from a program in which a portion of the CARE subsidy was redirected to invest in electricity-saving measures that included replacing an inefficient refrigerator with an efficient refrigerator, installing and actively using power strips, and providing compact fluorescent light bulbs.⁵⁹ In the other two cases, the available energy-saving measures did

⁵⁷ SF Power received funding from the San Francisco Foundation for pre-pilot work.

⁵⁸ Under the CARE program, qualifying residential customers receive a discount on their electricity rate, See <http://www.gosolarnow.com/pdf%20files/PGE%20E6%20Rate%20Schedule.pdf>

⁵⁹ Key assumptions:

Population Factors in San Francisco	
<i>Population in San Francisco</i>	776,733
<i>Average Number of People per Household</i>	2.3
<i>Households with Low or Very Low Income</i>	40%
<i>Number of Public Housing Units</i>	5,045
<i>Low-Income, Non-Public Housing</i>	130,039
Maximum Payback Period (years)	13
CO ₂ Credit (\$/metric tons CO ₂)	\$20
Real Discount Rate	5%
Inflation Rate	3%
Capital Recovery Factor	0.155
Assumed Number of Bulbs Replaced	2

not provide a net benefit, as indicated in Table 4 below.⁶⁰ As shown in the table, the values in the right-hand column “Post-Intervention CARE Subsidy” indicate how much of the CARE subsidy would remain after the efficiency measures are implemented, subtracting out bill savings.

TABLE 4

Estimated Changes in CARE Subsidy Amount with Energy Efficiency Investments

Refrigerator Electricity Consumption (kWh/year)	Rate Tier (Summer/Winter)	Estimated CARE Subsidy (\$/year)	Gross Savings from Efficiency Investments (\$/year)	Post-Intervention CARE Subsidy Remaining (\$/year)
449	1/1	104.59	22.72	None
510	1/1	118.55	89.54	88.47
521	3/3	279.05	75.47	263.03
700	1/3	326.92	84.15	302.24
702	3/3	656.35	117.02	598.79
713	3/3	408.03	147.05	320.45
723	2/1	114.82	58.05	None
765	1/1	87.29	66.64	80.11
770	1/1	57.93	61.95	55.44

Table 4 shows that all households consuming electricity at the Tier 3 level in either the summer or winter will benefit from the opportunity to monetize the CARE subsidy.⁶¹ This result suggests that tier three customers are the best candidates for this approach. Roughly one-third of the pilot respondents meet that level of energy consumption, implying that approximately 42,000 households in San Francisco would potentially benefit from being able to direct all or part of their CARE subsidy to investments in energy-saving measures.⁶²

Figure 3 shows the results of redirecting a portion of CARE subsidies to energy efficiency investments. As indicated in the figure, under the monetization approach, the full \$1 million would be expended in the first year, followed by annual reductions in

⁶⁰ This analysis was based on the specific set of energy-using equipment in the subject households, principally power strips, CFLs, and refrigerators, as well as their overall electricity consumption, which impacted what rate tier they fell into. Households with a different mix of devices and with different consumption patterns would experience different outcomes. Because of San Francisco’s mild climate and limited use of air conditioning this approach is likely to be even more effective elsewhere.

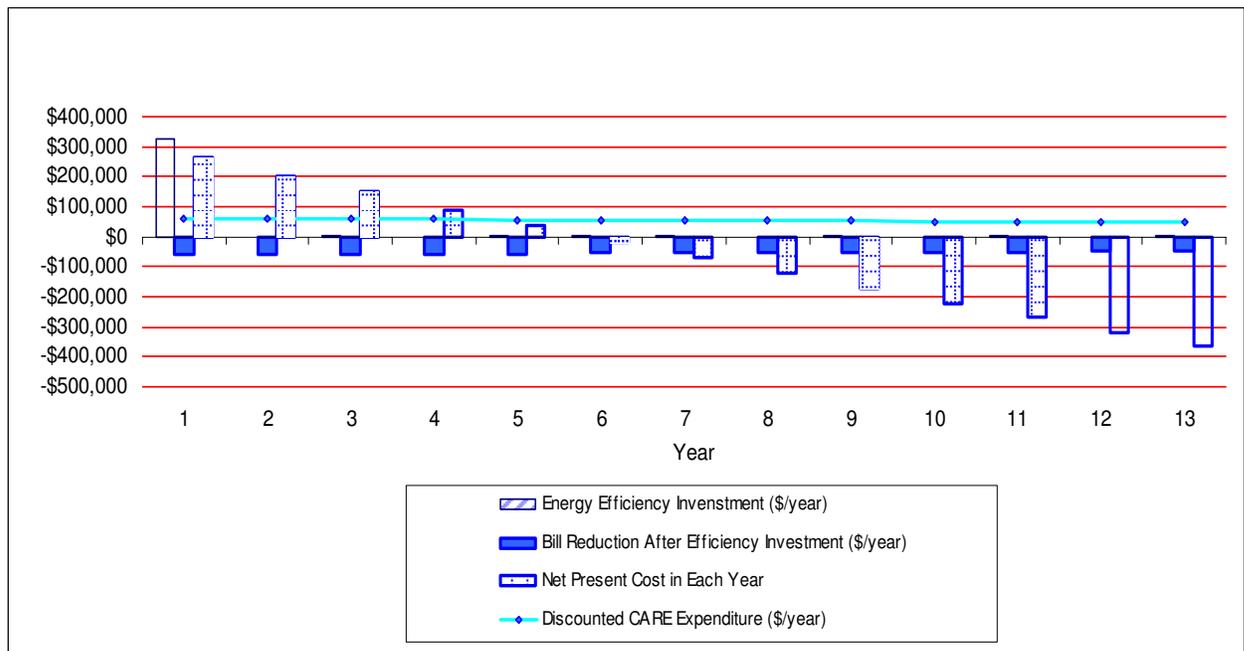
⁶¹ Rate tiers are assessed based on a customer’s electric consumption during each billing cycle. The tier one rate is applied to electricity use below the baseline consumption in the billing cycle: 8.2 kWh/day multiplied by the billing cycle days in summer; 12.6 kWh/day multiplied by the billing cycle days in the winter. Electricity use above the baseline is charged at higher rates. For instance, households are charged at the tier 2 rate for electricity use that exceeds the baseline by between one and 30 percent. Tier three rates are triggered when use exceeds 30 percent of the baseline. When consumption reaches 100 percent above the baseline, tier four rates are triggered. There is a substantial increase in residential electric rates at tier three, for which rates are 125 percent above tier one.

⁶² Roughly 67,000 San Francisco households are enrolled in the CARE program out of a total estimated 130,039 low-income, non-public housing households in San Francisco. This percentage is likely to be significantly higher in areas with more extreme weather.

utility bills. Of the \$1million, approximately \$324,000 is invested in high efficiency refrigerators, CFL light bulbs, and power strips in the first year, with another \$17,600 invested in replacement bulbs and power strips during the 13-year study period. The refrigerator is assumed to last 13 years, which is the reason we've shown a 13-year graph. The CARE subsidy remaining budget, approximately \$\$650,000, is delivered as subsidy payments. By year six the net present value (NPV) shows net benefits, as compared to ongoing costs associated with the maintaining the CARE subsidy. Because in most cases the investments would pay-off over multiple years, changes in the cash subsidy amounts would need to be tailored to match efficiency-driven reductions in energy bills.

FIGURE 3⁶³

CARE Subsidy Investments in Refrigerators, CFLs and Power Strips is Repaid in Five Years



The goal of a bill subsidy monetization policy is to create a win-win-win outcome: low-income families' use of and concomitant expenditures associated with energy would be reduced; polluting air and greenhouse gas emissions would be lowered; and, if the measures were implemented by the community members themselves, the

⁶³ Key assumptions:

Payback Period (years)	13
Budget	\$1,000,000
Real Discount Rate	5%
Inflation Rate	3%
CRF	0.106
Number of Targeted Households	711

effort would create green jobs. Over time public sector expenditures on the subsidies should fall if, as suggested by the economic literature, the adopted measures create persistent benefits that noticeably exceed costs. That is, under current policy, CARE subsidies require ongoing payments with no or negative environmental benefits, whereas directing the same resources to energy efficient investments would provide long-term savings.

Monetizing Greenhouse Gas Emission Reductions: Climate for Community

There are a number of ways greenhouse gas emission reductions could be used to fund efficiency investments. For example, Assembly Bill 32 (AB 32): California's Global Warming Solutions Act establishes a goal of capping statewide greenhouse gas emissions at 1990 levels by 2020. While substantial reductions are expected to come from major stationary emission sources, such as power plants, refineries and cement manufacturing, individuals and small business owners could provide important contributions to the fight against global warming. For example, small businesses and low-income families are (indirectly) responsible for a significant amount of polluting air and greenhouse emissions: small commercial, residential and transportation emissions accounted for nearly 60 percent of California's greenhouse gas emissions in 2007.

AB 32 requires that the framework adopted to reduce greenhouse gas emissions not disproportionately impact low-income communities and, where possible, produce overall societal benefits, including reductions in other air pollutants as well as economic and public health benefits. One approach to meeting these objectives – and to gaining access to a large, hard-to-reach emissions pool – would be to enable small, dispersed emission reductions by low-income households and small businesses to be aggregated and placed on available carbon markets, under a concept dubbed “Climate for Community.”⁶⁴ By so doing, a dynamic, ongoing incentive would be created to reduce emissions in vulnerable communities, with concomitant economic and equity benefits.

This approach would require that communities be vested with ownership rights of the emissions that occur in their neighborhoods. Homes and businesses located in areas that have historically been subjected to poor air quality and greenhouse gas emissions would be given the opportunity to reduce and sell their emissions reductions. In this way, populations that have previously suffered from poor air quality and are at greatest risk of harm from global warming would be able to benefit economically and environmentally from reducing those risk, while achieving significant greenhouse gas and other emission reductions.

⁶⁴ For more materials describing this concept, see Environmental Defense Fund's Climate for Community program at www.edf.org/C4C. Aggregating the energy savings from multiple households and companies and securitizing them into “white certificates” (i.e., tradeable documents indicating energy efficiency gains) or emission permits has been proposed in a number of policy forums. For example, see Diana Farrell and Janna K. Remes, “How the World Should Invest in Energy Efficiency,” *The McKinsey Quarterly*, July 2008.

For example, 22 percent of the refrigerators examined at low-income households as part of SF Power’s pilot – representing roughly 28,000 refrigerators in San Francisco – could be cost-effectively (i.e., the net present value of bill savings exceeds replacement costs) replaced with more efficient refrigerators. Replacing all of these inefficient refrigerators would induce almost \$4 million in net savings and avoid almost 30,000 tons of carbon dioxide (CO₂) emissions annually through reduced energy use.⁶⁵ Likewise, in a separate pilot, more than 2,000 toilets were identified that could be cost-effectively replaced with high efficiency models, saving 7 million gallons and avoiding 20 tons of CO₂ emissions per year. While the refrigerators have split incentives – they are typically owned by the landlord, while the tenant usually pays the electricity bill – toilets do not because landlords typically pay water bills. Nevertheless, toilet upgrade opportunities remain untapped even though they would quickly pay back the investment through water bill reductions, and continue to yield dividends throughout the toilet’s long useful life.

Low-income communities are concerned that large power plants and refineries, for example, will simply pay to continue polluting in their neighborhoods under a cap and trade regime. Likewise, cash-strapped business owners worry that increased regulation will raise energy prices and hurt their bottom line. A program to aggregate community-wide greenhouse gas reductions would serve the dual purpose of:

- Efficiently abating global warming pollution from small, dispersed sources that are hard to reach. Increased investments in energy efficiency have the potential to address equity issues associated with climate change policies. However, whether such investments are efficient depends on the effectiveness of the programs relied on to implement the measures. Climate for Community reflects a market-based approach to increasing efficiency within vulnerable populations.
- Beginning to address the most serious concerns of environmental justice communities and small business owners who are justifiably apprehensive about the effects that climate legislation will have on them.

Monetizing greenhouse gas emission reduction values could serve both as financing leverage and a catalyst when linked with other resources, and would offer an alternative funding mechanism to inspire third parties to implement utility-based efficiency programs. For example, pilot results indicate that with the addition of the value of avoided carbon emissions, even late model refrigerators using as little as 648 kilowatt-hours a year can become cost-effective to retire. Likewise, the already positive net present value of cost-effectively replacing the roughly 28,000 inefficient refrigerators

⁶⁵ How this cap-and-trade element would be constructed would depend on the AB 32 framework that’s ultimately adopted. For example, a “first-seller” allocation would allow for direct transactions between a community and an electric power wholesaler; a “load-based” allocation would require transactions between the community and the load-serving entity (LSE) to whom the emission responsibility has been assigned. Auctioning versus free allocation of allowances may have different implications related to what entity owns the emission reductions.

located at non-public low-income San Francisco households increases by \$400,000 with the addition of the value of avoided GHG emissions (valued at \$20 per ton CO₂e), an added value of approximately \$15 per refrigerator.

Existing geographic clustering of low-income populations with environmental hazards provides for a platform from which to focus emission-reducing efforts. Although the primary hazards (e.g., power plants, refineries) may be subjected to main cap-and-trade protocols, vulnerable populations that have been historically subjected to high emission levels may merit and be more accepting of focused community-based efforts to retire or replace inefficient appliances and vehicles.

Allowing aggregation of emission reductions by many households and small businesses could help overcome emission trading transaction costs. Although it would be difficult for individuals to effectively participate in a cap-and-trade regime, third-party aggregation could catalyze community-based efforts, with the value of avoided GHG emissions funding, in part, third party intervention efforts. For example, aggregation of modest-sized electricity use reductions – between 5 and 50 kilowatts – has proven to be cost-effective for small businesses during grid emergencies.⁶⁶

Carbon Market Funding Mechanisms

New policy developments focusing on global climate change will fundamentally change the way environmental compliance is viewed. Carbon markets – whereby emissions are capped and divided into tradable allowances – are likely to spur a variety of investments across the energy spectrum, from bio-fuels to efficiency. While policy-induced market pressures will reinforce progress spurred by placing a value on greenhouse gas pollution, it will not fully address the need to close efficiency gaps among low-income families and small businesses. Alone, pricing greenhouse gas emissions is not going to spark the level of investments needed to meet ambitious greenhouse gas reduction goals.

In this context several potential funding streams are noteworthy:

- *Cap-and-dividend*, also known as a sky trust or allowance revenue recycling, is based on capping carbon, auctioning allowances, and recycling revenue to all Americans. Under this approach the more energy used by a given household, the more they would be paid. While low-income families tend to use the least amount of energy, energy costs consume a greater percentage of their income: 3.3 percent, as compared with 1.7 percent for the richest Americans. However, after these factors are taken into account, and depending on how a cap-and-dividend policy is crafted, low-income families could obtain net benefits from such an approach.⁶⁷

⁶⁶ See www.sfpower.org.

⁶⁷ Memorandum from James K. Boyce to EAAC Revenue Subcommittee, August 6, 2009; Congressional Budget Office, *Policy Options for Reducing CO₂ Emissions*, February 2008.

- *Tax Adjustments*, in which the revenues generated through carbon reduction policies are used to offset income or payroll taxes, or to expand the Earned Income Tax Credit.
- *Community Benefits Fund (CBF)* would capture revenues generated from market mechanisms developed as a result of AB 32 to be directed to investments in low-income and historically polluted communities. Current proposals would require that a set proportion, such as 30 percent, of revenues be spent

"in the most impacted and disadvantaged communities in California to accelerate greenhouse gas emission reductions or mitigate direct health impacts of climate change in those communities."⁶⁸

If the CBF receives significant funds, it could provide a stable funding source for efficiency investments. However, this approach does not specifically tie revenue sources to funding levels and emission reductions, nor does it ensure that funds will be used for small-scale efficiency investments. For example, academic institutions might be funded to advance renewable energy research, or to provide student research scholarships. Many laudable investments could compete for community benefits funds. Without further elaboration of the concept, funding provided in this fashion may not incentivize ongoing behavior changes or even provide economic benefits or environmental improvements in disadvantaged communities. On the other hand, if well-directed, the funds could be focused on programs and organizations that help households and small businesses make permanent behavioral and structural changes that provide long-term economic and environmental benefits.

- *American Clean Energy and Security Act of 2009 (ACES, HR 2454)* was passed by the U.S. House of Representatives in June 2009. If signed into law, it would provide multiple ways for money to flow to low- and middle-income families, with about half of the value of the anticipated \$1.7 trillion carbon market⁶⁹ directed towards families and small businesses. The provisions described below are just a few of the ways a federal climate bill may provide financing to at-risk communities.
 - Section 264. Low Income Community Energy Efficiency Program – Allows the Energy Secretary to make grants to community organizations and financial institutions in low-income communities for small business energy efficiency and renewable energy projects.

⁶⁸ Global Warming Solutions Act of 2006: Community Benefits Fund, Assembly Bill 1405, Introduced by Assembly Members De Leon and V. Manuel Perez, as of February 27, 2009

⁶⁹ Assume a net present value from 2012 thru 2050.

- Subtitle H - Green Resources for Energy Efficient Neighborhoods – Establishes energy efficiency program incentives and multifamily housing demonstration energy efficiency projects; provides additional credit and serves underserved markets for energy-efficient and location-efficient mortgages; develops efficient mortgage outreach program; creates green banking centers.
- Section 789. Climate Change Consumer Refunds – Provides for all money collected in the Climate Change Consumer Refund Account be returned to taxpayers on a per capita basis.
- Section 2201. Energy Refund Program. – Provides monthly cash payments to reimburse low-income households for lost purchasing power.

Some of these provisions would dovetail with other financing mechanisms. However, none of them make a connection between the benefit received and actions taken by households or small businesses to reduce emissions. As a result, even if vulnerable populations are able to successfully navigate the bureaucracy to receive financial assistance, there is no guarantee that it will make lasting behavioral changes to their household economics or energy use patterns. Instead, the goal of lowering overall household costs may have the perverse and unintended effect of increasing energy consumption and concomitant greenhouse gas pollution. Only the Low Income Community Energy Efficiency Program would make direct investments in emission reductions, though the focus appears to be on small businesses rather than households. Further, the emphasis on competitive grants makes it unlikely that the most disadvantaged communities will be able to rely on the program as a funding source.

V. Conclusion

Although there are substantial subsidies available to energy and water users to purchase resource-saving products, the vast majority of these investments need to be paid for by the purchasers themselves; government and utility programs can only buy-down a fraction of the need. This, in turns, requires access to loans. There are a variety of mechanisms available that, at least in concept, could provide funds for low-income homes and small businesses to make efficiency investments. Unfortunately, most are limited in their applicability for this vulnerable population of energy users. While there are many promising new ideas, few have been tested at large scales.

As summarized in Table 5 below, there are a number of opportunities available to help small businesses and low income families finance efficiency investments – particularly during the current economic downturn – but there are significant barriers keeping these populations from accessing credit. For example, while sophisticated businesses and individuals able to navigate loan processes can obtain capital, most small businesses and low-income households do not have this capacity. Likewise, credit access remains virtually closed to families and businesses with poor or no credit history; and is limited for small (e.g., less than \$5,000) loan amounts. High transactions costs and perceived high levels of risk dissuade traditional lending institutions from seeking micro-loan opportunities in historically disadvantaged communities.

Various innovative financing approaches – such as on-bill and property tax financing – are gaining traction among policy makers and consumers. However, the basic building blocks to effectively address existing barriers to accessing credit, and to leverage this access to increase adoption of energy-saving measures by low-income families and small businesses, have yet to be implemented. Comprehensive marketing, financing, and installation approaches, effectively directing subsidies, and a diversity of approaches will need to be pieced together to provide sufficient funds, and associated programs, to achieve ambitious energy saving and greenhouse gas emission reduction goals.

New opportunities arising from possible federal climate legislation are promising. Like on-bill and property tax financing, opportunities based on revenues from emerging carbon markets are well intended but most fail to make a connection between the benefit received and actions taken by households or small businesses to reduce emissions. Pooling emissions reductions for carbon markets would allow small source reductions to earn revenues via third party aggregators, and thus offers the potential to dynamically link carbon market financing with the harvest of significant efficiency opportunities currently underutilized in low-income households and small businesses.

TABLE 5

How Available and Potential Financing Options Address Access Barriers

Mechanism	Description	Financier	Experience	Limitations for low-income households and small businesses
Utility financing	Rate payer funded subsidies	Ratepayers/Utility	Extensive	Insufficient penetration rates even after decades of experience
Traditional Loans	Loan repayments on regular schedule	Banks, Retail stores	Extensive	Split incentives; Lenders don't seek small loans or low-income customers due to credit risk and transactions costs
On-bill financing	Loan repayment via utility bills	Utility or energy services company	Limited but expanding	Billing system incompatibilities, consumer skepticism, needs associated education services
Energy Financing District	Loan repayment via property tax assessment	Local government	Limited but expanding	High transactions costs so not used for smaller interventions
Energy Efficiency Local Improvement District	Loan repayment associated with property, not tenant	Local government	Very limited	Requires majority approval by owners within district
Public loan fund base don municipal bonds	Traditional loan repayment but with better terms	Local government or private entity	Very limited	Similar access and transactions costs issues as traditional loans
Energy Efficiency Mortgages	Traditional loan repayment	Banks; mortgage brokers	Very limited	Only at time of sale; difficult in tough housing market; administrative and verification hurdles
Micro-loans	Low-interest loans for small businesses with limited access to credit to expand commercial operations	Development banks, federal or state government funds distributed by local lenders	Extensive in other countries	Not used typically to reduce operating costs
Third-Party Investments	Private service providers earn a share of avoided energy bills	Energy Services or Management Companies	Limited to larger commercial interests	Transaction costs must be overcome for small commercial and residential customers; consumer demand must grow to attract investors.

Mechanism	Description	Financier	Experience	Limitations for low-income households and small businesses
Leases and Power Purchase Agreements	Investments repaid via power contracts or leases	Utilities, On-site power companies	Extensive for large investments	Faces similar challenges as third-party investments for smaller energy users
Bill subsidy monetization	Rather than power rate discounts, use value for capital investments	Utilities	Limited	Requires education for customer to recognize beneficial tradeoff
Carbon market crediting	Aggregating emissions reductions for carbon market crediting	Community benefits organizations or local governments	Very limited, but examples from voluntary and regulatory GHG offsets programs and "white tag" efficiency programs	Transactions costs high for individual monitoring and verification
Carbon policy revenue returns	Climate policy revenues used for micro-financing	Regulators in association with utilities or banks	Limited, but similar example in Alaska's Permanent Fund	Revenues would likely be disbursed via traditional lending programs