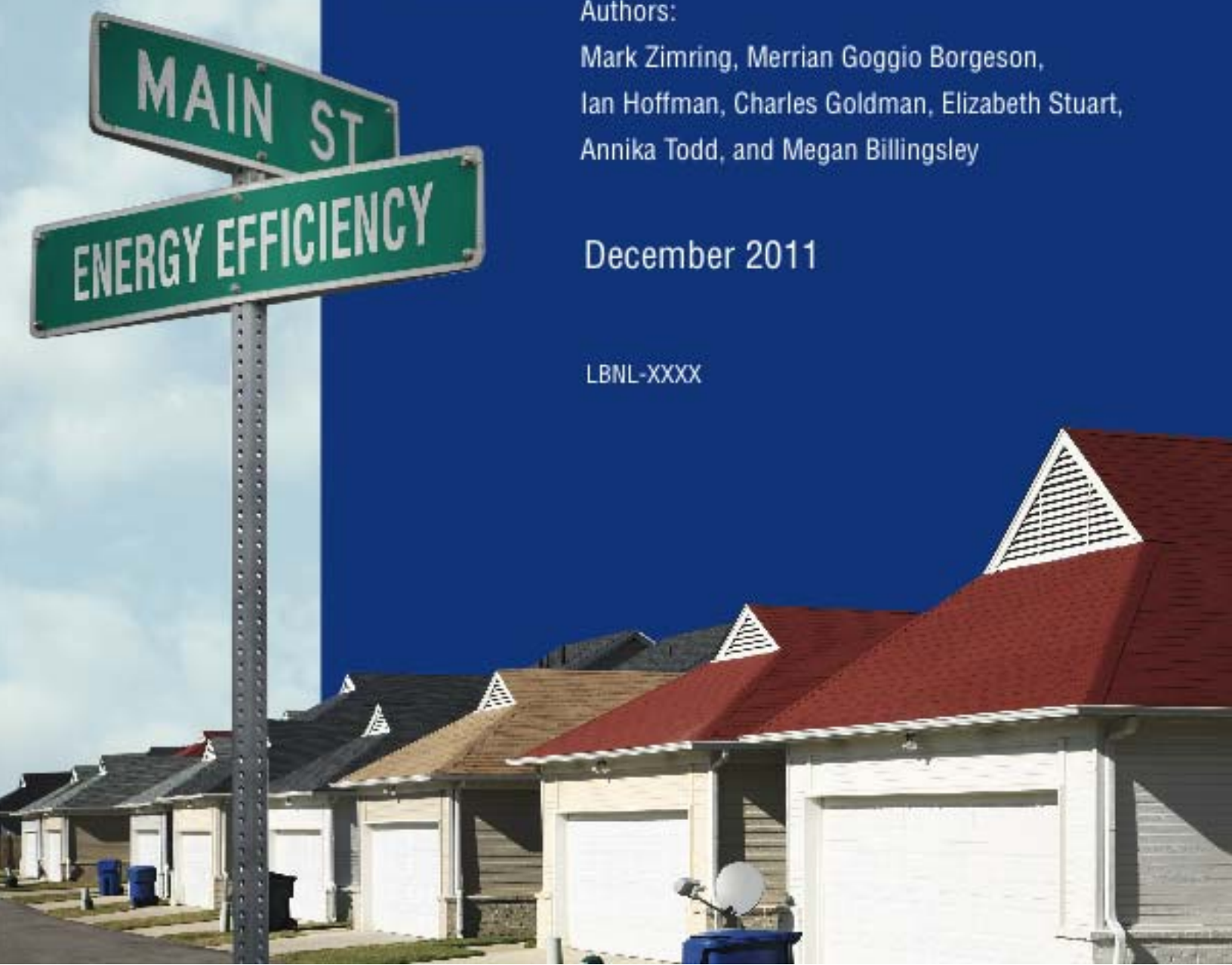
Delivering Energy Efficiency to Middle Income Single Family Households

Environment Energy Technologies Division
Lawrence Berkeley National Laboratory

Authors:
Mark Zimring, Merrian Goggio Borgeson,
Ian Hoffman, Charles Goldman, Elizabeth Stuart,
Annika Todd, and Megan Billingsley

December 2011

LBNL-XXXX



Acknowledgements

The work described in this report was funded by the Department of Energy Office of Energy Efficiency and Renewable Energy (DOE EERE), Weatherization and Intergovernmental Program under Contract No. DE-AC02-05CH11231. We would like to thank Christopher Lohmann and Roya Stanley (DOE EERE) for their support of this project. We would also like to thank Joel Freehling and Rick Gerardi, who provided valuable insights for the report. We would like to thank the industry experts and program administrators who we interviewed. Special thanks to Anthony Ma for the graphic design of this report.

We would also like to thank the following individuals who providing thoughtful comments and input on a review draft of this report: Amy Beley & team (ICF), Brandon Belford (National Economic Council), Danielle Sass Byrnette & team (DOE), Jonathan Cohen (DOE), Todd Conkey (WECC), Neely Crane-Smit (MNCEE), Kat Daniels (Green for All), Sarah Davies (VantageScore), Rick Diamond (LBNL), George Edgar (WECC), Lara Ettenson & team (NRDC), James Fine (EDF), Rebecca Foster (VEIC) Karen Hamilton (NYSERDA), John Hazlett (City of Indianapolis, Indiana), Philip Henderson (NRDC), James Irwin (COWS), Julie Hughes (DOE), Rebekah King (EPC), Jack Laverty (NiSource), Emily Levin (VEIC), Diana Lin & team (NASEO), Jane Mauldon (UC Berkeley), Martha Jane Murray (CCI), Ruth Ann Norton (GHHI), Kerry O'Neill (Clean Energy Finance Center), Ken Robinette (SCCAP), Rich Sedano (RAP), Liz Schlegel (CVCAC), Derek Smith (CEWO), Stockton Williams (DOE), Ed Vine (LBNL), Chandler Von Schrader (EPA), Mark Wolfe (EPC). While we benefitted immensely from the wisdom of the many people who gave feedback on this report, all mistakes are our own.

Disclaimer

This document was prepared as an account of work sponsored by the United States Government. While this document is believed to contain correct information, neither the United States Government nor any agency thereof, nor The Regents of the University of California, nor any of their employees, makes any warranty, express or implied, or assumes any legal responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by its trade name, trademark, manufacturer, or otherwise, does not necessarily constitute or simply its endorsement, recommendation, or favoring by the United States Government or any agency thereof, or The Regents of the University of California. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof or The Regents of the University of California. Ernest Orlando Lawrence Berkeley National Laboratory is an equal opportunity employer.

Table of Contents

Figures ……..……..……..……...……..…..…. XX

Tables ……...……..……..……...……..…..…. XX

List of Terms ...……. XX

Executive Summary ……. XX

1. Introduction …….……. XX

2. Middle Income Market Segmentation …….……. XX

3. Driving Demand in the Middle Income Market ….…….……... XX

4. Building Structure Issues ..…… XX

5. Access to Capital ..……. XX

6. The Role of Policy ..……... XX

7. Conclusion ……. XX

References ...……. XX

Appendix – Case Studies ……. XX

Green Jobs-Green New York Residential Program ……..…….……. XX

Clean Energy Works Oregon ..……..…….……. XX

Indianapolis EcoHouse Project …….…….……. XX

City of Boulder Smart Regs ….…….…….……. XX

Figures

Figure 1. Comparison of housing type and owner/renter status across income groups

Figure 2. Case-Shiller 20-City Composite Home Price Index. January 2007 to June 2011 in 3 major U.S. cities, tiered by initial property value

Figure 3. LBNL definition of middle income households compared to HUD eligibility in selected states

Figure 4. Eligibility for Federal Energy Assistance, By Income

Figure 5. Comparison of housing type and owner/renter status across income groups

Figure 6. Percent of households and U.S. residential energy consumption by housing type and income

Figure 7. Comparison of shares of pre-1970s housing and related energy use

Figure 8. Changes in middle income household energy use from 1987 to 2005

Figure 9. Ice dam prevention postcards mailed to households by Minnesotta's Center for Energy and Environment

Figure 10. The prevalence of selected health and safety issues in homes inspected in 12 GHHI pilot cities

Figure 11. Reason for INHP EcoHouse Loan Project non-participation

Figure 12. America's uninsured individuals by income and percentage of population

Figure 13. Home improvement financing patterns by income in 2001

Figure 14. Case-Shiller 20-City Composite Home Price Index of single family home values January 2007 to June 2011 in 3 major U.S. cities, tiered by initial property value (repeat)

Figure 15. Homeowner credit scores above and below 650 by income in Q4 2010

Figure 16. Reasons for application rejection in NYSERDA's residential energy efficiency loan program November 2010-October 30, 2011

Figure 17. Summary of NYSERDA's GJGNY loan application process and data (November 2010 to October 30, 2011)

Figure 18. Taxpayer and utility customer funding ($ billions) for multi-measure home energy efficiency improvements

Figure 19. 2010 Distribution of Indianapolis Neighborhood Housing Partnership customer funding

Figure 20. Reason for INHP Eco House Loan Project non-participation (repeat)

Figure 21. Reason for application rejection in NYSERDA's residential energy efficiency loan program November 2010-August 2011 (repeat)

Figure 22. Summary of NYSERDA's GJGNY Loan Application Process and Data

Tables

Table 1. Number of earners for all households and middle income households, 2007 to 2010

Table 2. How Wisconsin's Targeted HPwES 2009 participants participants first heard about the program

Table 3. Keystone HELP loan application, approval, and loan size rates (by income) – January 2010-August 2011

Table 4. Changes in VantageScore loan delinquency rates for new loans originated from 2003-2005 compared to loans originated from 2008-2010 (anticipated)

Table 5. Credit score and corresponding delinquency projections

Table 6. Milwaukee/Madison-Summit Credit Union loan loss reserve agreement

Table 7. New York's Green Jobs-Green New York financing underwriting criteria

Table 8. Key policy drivers for energy efficiency spending and savings projects

Table 9. Indianapolis EcoHouse Project Loan Program loan terms and eligibility

Table 10. New York's Green Jobs-Green New York financing underwriting criteria

Table 11. Summary of Boulder County and City of Boulder EnergySmart incentives

List of Terms

AHPwES – Assisted Home Performance with ENERGY STAR®

AMI – Area Median Income

APS – Arizona Public Service

ARRA – American Reinvestment and Recovery Act

ASEC – Annual Social and Economic Supplement, U.S. Census Current Population Survey

Better Buildings – DOE's Better Buildings Neighborhood Program

BPI – Buildings Performance Institute

CCI – Clinton Climate Initiative

CEWO – Clean Energy Works Oregon

COWS – Center on Wisconsin Strategy

CVCAC – Central Vermont Community Action Council

DIY – Do-It-Yourself

DOE – Department of Energy

DOE EERE – Department of Energy Office of Energy Efficiency and Renewable Energy

CDFI – Community Development Financial Institution

CEE – Center for Energy and Environment

Census – United States Census Bureau

CFL – Compact Fluorescent Light Bulb

Commerce – United States Department of Commerce

DTI ratio – Debt – to – Income ratio

EDF – Environmental Defense Fund

EE – Energy Efficiency

EER – (Australian) Energy Efficiency Rating

EEPS – Energy Efficiency Performance Standard

EERS – Energy Efficiency Resource Standard

EIA – United States Energy Information Agency

EPA – United States Environmental Protection Agency

EPC – Energy Programs Consortium

ESCO – Energy Service Company

FPL – Federal Poverty Line

GETS – Green Energy Training Services

GHHI – Green & Healthy Homes Initiative

GJGEI – Green Jobs, Green Energy Initiative

GJGNY – Green Jobs, Green New York

HEAL – Home Energy Affordability Loan Program

HEM – Home Energy Management

HERS – Home Energy Rating System

HFHI – Habitat for Humanity International

HHQ – Home HeadQuarters

HPwES – Home Performance with ENERGY STAR®

HUD – United States Department of Housing and Urban Development

HVAC system – Heating, ventilation and air conditioning system

IAQ – Indoor Air Quality

INHP – Indianapolis Neighborhood Housing Partnership

IPMC – International Property Maintenance Code

Keystone HELP – Keystone Home Energy Loan Program

LBNL – Lawrence Berkeley National Laboratory

LEAP – Local Energy Assistance Program

LIGH – Long Island Green Homes

LIHEAP – Low Income Home Energy Assistance Program

LLR – Loan Loss Reserve

MNCEE – Minnesota Center for Energy and Environment

MSA – Metropolitan Statistical Area

NASCSP – National Association for State Community Services Programs

NASEO – National Association of State Energy Offices

NRDC – Natural Resources Defense Council

NREL – National Renewable Energy Laboratory

NWWVT – NeighborWorks of Western Vermont

NYSERDA – New York State Energy Research & Development Authority

OBF – On-Bill Financing

PACE – Property Assessed Clean Energy

RAP – Regulatory Assistance Project

RECO – Residential Energy (and water) Conservation Ordinance

RECS – Residential Energy Consumption Survey

RPS – Renewable Portfolio Standard

S&P – Standard & Poors

SAHF – Stewards for Affordable Housing for the Future

SAVE Act – Sensible Accounting to Value Energy Act

SCCAP – South Central Community Action Partnership

SEE Action – State Energy Efficiency Action Network

SIR – Savings to Investment Ratio

SMI – State Median Income

SPM – U.S. Census Supplemental Poverty Measure

SRP – Salt River Project

TRC test – Total Resource Cost test

UC Berkeley – University of California, Berkeley

VEIC – Vermont Energy Investment Corporation

WAP – Weatherization Assistance Program

WECC – Wisconsin Energy Conservation Corporation

WHEAP – Wisconsin Home Energy Assistance Program

WIPP – DOE's Weatherization Innovation Pilot Program

WRAP Project – Weatherization, Rehabilitation and Asset Preservation Project

WES – Wyoming Energy Savers

Executive Summary

Middle income American households – broadly defined here as the middle third of U.S. households by income[1] – are struggling. The recession has exacerbated long term trends that are putting downward pressure on these households, threatening fundamental aspirations like economic stability, secure retirement, and educational opportunities (Commerce 2010). Many middle income households are under significant financial strain, and rising energy bills are a contributor to this stress.[2] Energy efficiency improvements have the potential to provide significant benefits to these households – by lowering bills, increasing the structural integrity of homes, improving health and comfort, and reducing exposure to volatile, and rising, energy prices. Middle income households are also responsible for a third of U.S. residential energy use (EIA 2005).[3] Increasing the energy efficiency of their homes would deliver substantial public benefits: reducing power system costs, easing congestion on the grid, and avoiding emissions of greenhouse gases and other pollutants.

To achieve those goals, utilities and governments are beginning to look beyond typical residential energy efficiency programs that discount compact fluorescent light bulbs (CFLs) or provide rebates for high-efficiency appliances and equipment. Increasingly, they are turning to programs that improve the energy efficiency of the entire house – by sealing up leaks, reducing plug loads, adding insulation, and replacing inefficient heating and cooling systems. These more comprehensive programs typically offer the same incentives for all non-low income households and usually require customers to pay a significant portion of the costs. These comprehensive home energy improvements often cost $5,000 to $15,000 per home. In practical terms, higher income households are better positioned financially to take advantage of programs that promote comprehensive home energy upgrades and require substantial household investment.[4]

This leaves millions of middle income homes leaking energy and exposed to rising energy costs. Delivering comprehensive energy efficiency improvements to just one-third of the 32 million single family middle income households could save roughly as much energy each year as is used by every home in Houston, Phoenix and San Francisco, for as long as the more efficient measures last. These energy upgrades— at minimum, adding insulation, sealing air leaks and repairing ducts – would require an investment of roughly $30 billion to $100 billion for just a third of the market.[5] By comparison, total estimated program funding for multi-measure home energy efficiency upgrades targeted at all non-low

---

[1] Middle income households earn roughly $32,500 to $72,500 per year. See *Chapter 2: Middle Income Market Segmentation* for a detailed explanation of our definition.

[2] In 2005, middle income households paid $64.4 billion a year in home energy costs, an average of $1,766 per household (EIA 2005). We estimate that middle income households will spend about $80 billion in nominal dollars on residential energy in 2011.

[3] Total consumption includes energy from electricity, natural gas and delivered fuels.

[4] While most non-WAP energy efficiency programs do not formally track income of their participants, discussion with program administrators and other experts from around the country reveal that early participants in home energy upgrade programs, while not exclusively higher income, are more likely to be higher income households. One important first step for program administrators is to begin tracking income demographics of participants in residential energy efficiency programs, unassociated with other identifying information to preserve privacy. We have not discovered any non-low income or non-assisted program that formally evaluates marketing success and program impact by income; this information is crucial to rigorously assessing the extent to which different groups of residential customers are being served by existing and future energy efficiency programs.

[5] Assumptions behind this estimate include: 1) A low-end cost for basic insulation and airsealing of $3,000 per home; 2) A higher-end cost of $10,000 per home for a full home energy assessment followed by some combination of measures that include HVAC replacement, air sealing, duct sealing, additional wall, floor, and attic insulation (where appropriate). The resulting aggregate cost estimate is derived as follows: $3,000 to $10,000 * 38.5 million middle income households * 83 percent single family households * 33 percent of eligible market = $32 billion to $105 billion.

income households is about $7.7 billion over the next decade.[6] Thus, the costs of delivering multi-measure energy upgrades to the middle income market far exceed expected public resources. A more aggressive effort to target middle income households will require both significant customer contributions to fund these energy saving measures and an interlocking framework of supportive public policy and more innovative program design.

Research Scope & Methodology

The large majority (83 percent) of middle income households lives in single family homes, and 67 percent of middle income households own their home (over 75 percent of single family dwellers own their home) (Figure 1). The highest concentrations of middle income households live in metropolitan areas, but chiefly in the smaller cities and suburbs outside of the largest cities. Their homes present good energy savings opportunities as they are are often older and less efficient than those of their wealthier peers. This report focuses on that 83 percent of middle income households who live in single family homes and either rent or own them– a total of 32 million U.S. households.[7]

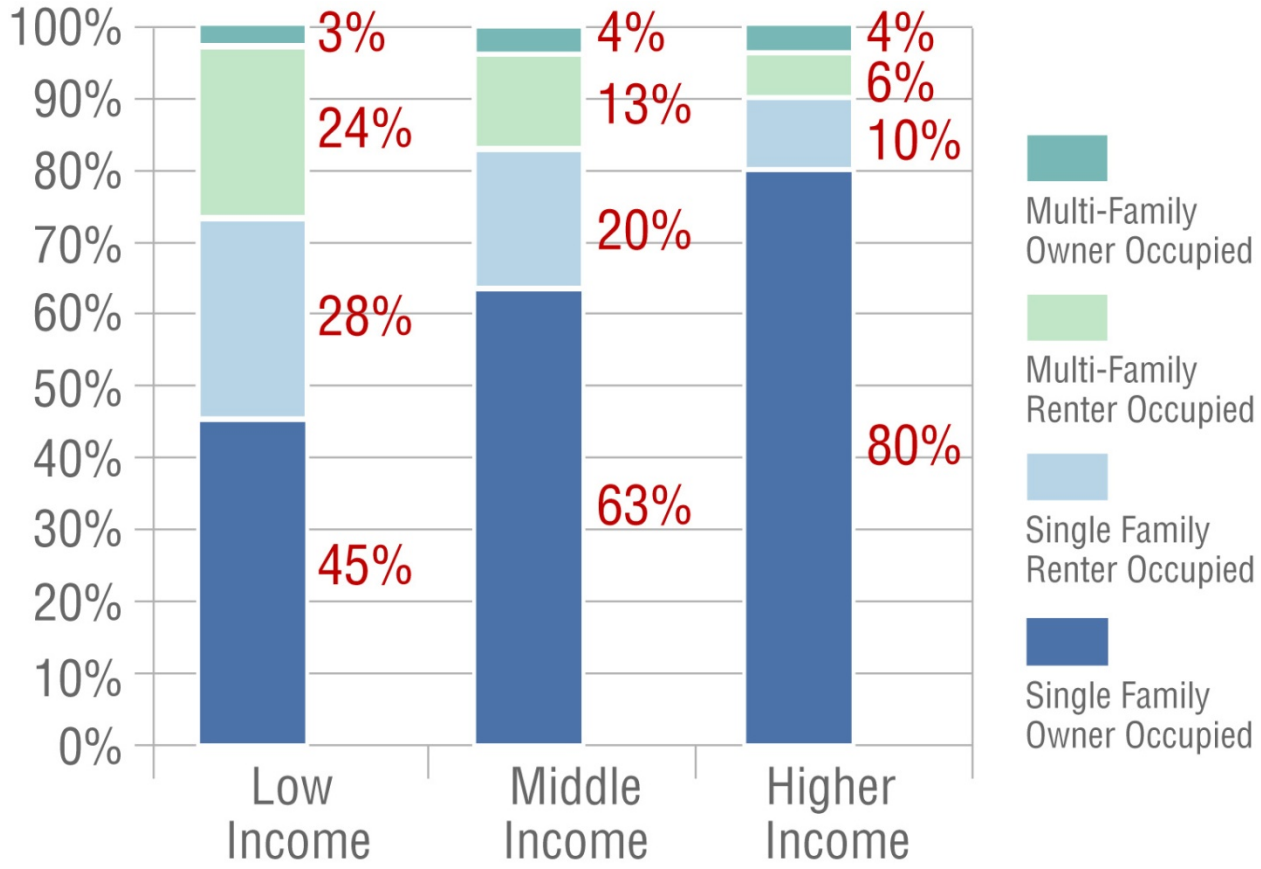


Figure 1. Comparison of housing type and owner/renter status across income groups (2010 Census)[8]

[6] Estimate is drawn from an analysis of taxpayer and utility customer funding for home energy upgrades done for the SEE Action Residential Retrofit Working Group. Reports from this group are available here: http://www1.eere.energy.gov/seeaction/residential_retrofit.html

[7] Single family homes include manufactured homes.

[8] Note that the single family classification includes manufactured homes.

The question posed in this report is: **How can programs motivate these middle income single family homeowners to seek out more comprehensive energy upgrades, and empower them to do so?** Research methods included interviews with more than 35 program administrators, policy makers, researchers, and other experts; case studies of programs, based on interviews with staff and a review of program materials and data; and analysis of relevant data sources and existing research on demographics, the financial status of Americans, and the characteristics of middle income American households.

While there is no 'silver bullet' to help these households overcome the range of barriers they face, this report describes outreach strategies, innovative program designs, and financing tools that show promise in increasing the attractiveness and accessibility of energy efficiency for this group. These strategies and tools should be seen as models that are currently being honed to build our knowledge and capacity to deliver energy improvements to middle income households. However, the strategies described in this report are probably not sufficient, in the absence of robust policy frameworks, to deliver these improvements at scale. Instead, these strategies must be paired with enabling and complementary policies to reach their full potential.

Driving Demand for Energy Improvements

Middle income households face many of the same barriers to investing in energy upgrades described in Lawrence Berkeley National Lab's (LBNL) 2010 report, *Driving Demand for Home Energy Improvements*.[9] But they also face additional challenges. In the wake of the recession, many households either lack access to capital or are reserving these funds for emergencies. Others are seeking to pay down their debt and increase savings, rather than making proactive investments in energy efficiency (or anything else). Middle income households are more sensitive to the risk associated with project performance than their wealthier peers. How do customers know they will save energy and come out ahead? Savings are often realized *on average*, but there can be significant variance between individual homes. Even for those projects that deliver the expected energy savings, in regions with mild climates and/or low energy prices these investments may not yield sufficient savings to offset project costs during the expected useful life of the improvements.[10] Though they cannot solve all the challenges faced by middle income households, the following outreach strategies show some promise in overcoming the barriers specific to this market segment.

Reduce Participant Costs & Risk

Middle income households are sensitive to the risk that upgrades won't yield the savings estimated. It may also not be realistic in today's policy and economic environment to expect middle income households to make $5,000 to $15,000[11] proactive energy efficiency investments, even if they do pay back. This report identifies a range of strategies for reducing total cost and risk for participants:

[9] Key lessons from this report are excerpted on page X; for the full report and resources visit: http://drivingdemand.lbl.gov/
[10] Many programs use a simple calculation, the Savings-to-Investment Ratio (SIR) to calculate whether an energy upgrade will generate savings in excess of investment costs. The SIR is computed by divided the expected lifetime dollar savings of an energy upgrade by the investment cost. If the SIR is greater than 1, measures are deemed 'cost effective' for the customer. SIR calculations do not typically account for the time value of money, inflation, uncertainty in future energy prices, or maintenance.
[11] This is a rough estimate of the range of project costs currently reported by administrators of comprehensive home energy upgrade programs.

- **Start With the Basics.** Encourage homeowners to do the basics today – for example, air sealing and climate-appropriate insulation – and then in the future every time they remodel living spaces, or replace equipment (e.g., furnace, water heater, air conditioner, windows), encourage or require the most efficient measures.

- **Targeted rebates.** It is clear that rebates help to drive demand. Some programs are monetizing the various public benefits that energy upgrades provide to deliver additional capital for participant incentives. It may be appropriate to tier these incentives by income to enable access for those who can least afford upgrades. With limited public funding, one outstanding challenge is finding the "sweet spot" where incentives reduce a household's financial contribution *just enough* to motivate action, but avoid paying more than needed or discouraging households to invest in improvements beyond the basics.

- **Leverage existing public programs.** Several programs are making existing public investments go further – for example by using publicly-funded workforce training programs to deliver free or deeply incented energy improvements to middle income households.

- **Pre-packaged Improvements.** Many energy efficiency programs rely on energy assessments that can cost $100 to $600 to identify the energy saving improvements for each participating household. A less costly option is to forego an onsite home assessment, and use prescriptive approaches – offering a standard set of measures that are widely expected to save energy across a range of properties or within a specific type of targeted housing. Health and safety testing would still be required after upgrades are completed.

- **Do-It-Yourself (DIY) Improvements.** About one third of all middle income home improvements including energy related home improvements were "do-it-yourself" projects in 2008-2009 (Census 2009). Several pilots have provided participants with training, professional guidance, and financial incentives for DIY improvements.

- **Flexible Loan Terms.** Loan terms can be modified based on project performance—the term might be set at five years based on expected savings to ensure that monthly energy bill savings exceed improvement financing costs, but if the savings are less than estimated, program managers could have the flexibility to reduce monthly payments by extending the loan repayment period to ensure that savings are greater than loan payments.[12]

- **Performance Guarantees.** In theory, the residential energy efficiency market is a potential market for insurance products – such as performance guarantees that ensure households save money on energy improvement investments. Today, however, performance guarantees are expensive to offer to individual homes. The process of monitoring and responding to claims is costly, and there is plenty of room for debate about the causes of failure to meet predicted savings. Despite these challenges, programs should consider piloting guarantees to assess the cost of offering them, their value in driving demand for energy efficiency and their impacts on household behavior.

[12] When a loan term is extended, the overall loan amount is not changed, but monthly payments are reduced. While a longer term may ensure that a customer's monthly energy savings exceed monthly loan payments, extending the loan term also means that the borrower pays interest for a longer period of time, thus incrementally increasing the cost of the investment.

Use Trusted Messengers

Tapping trusted sources of information—such as local leaders, local organizations, and peers—can get attention and overcome uncertainty by building upon existing relationships and networks. These trusted parties may differ across income groups and even within middle income households in a region. Peer-to-peer information sharing seems particularly important in middle income communities and some programs have had early success leveraging existing social service providers and community development financial institutions (CDFIs) to market energy improvements.

Solve a Problem that Households Recognize

It is also important to sell energy upgrades in ways that most appeal to middle income households. Below we include some messages that may resonate with the middle income market:

- **"Maintain the Value of Your Home"** – Middle income households have historically made significant home improvement investments[13] – many of which have no short term positive impact on household cash flow, but maintain or increase the value of the home or improve quality of life. These investments are seen as part of the ongoing cost of owning and maintaining one's home. Framing energy improvements as investments in maintaining the value of their largest asset may be an important motivator.

- **"Replace Aging/Broken Equipment"** – Many middle income households have aging or broken equipment that they know needs to be replaced – and enabling them to invest in more efficient equipment can be attractive. Allowing participants to make weatherization investments in conjunction with these equipment replacements may increase program participation.

- **"Solve Health & Safety Issues"** – Specific health-related triggers can open significant markets for energy improvements among low and middle income families. For example, consider focusing on households with asthmatic children where unhealthy home air quality is a trigger for asthma attacks which can be ameliorated by upgrades that focus on airflow, adequate ventilation, and using building materials that do not aggravate or cause health problems.[15]

- **"Save Money by Reducing Energy Bills"** – While high energy bills are not a priority issue for some, many middle income households face significant housing affordability challenges, and reducing their energy bills can increase their financial stability. Reducing the cost of heating or cooling may also allow households to afford greater comfort in their homes.

Make It Easy (But Not Too Easy)

Offering simple, seamless, streamlined services is particularly important for middle income households. Packaging incentives, minimizing paperwork, and pre-approving contractors gives people fewer reasons to decide against or delay energy upgrades. However, while an easy process is vital, making program elements free (such as the initial energy assessment) may attract "tire kickers" who do the first step, but never make improvements.

---

[13] From 2008-2009, middle income homeowners spent approximately $42.5 billion on home improvements. Tabulations from the 2009 American Housing Survey, U.S. Census Bureau. Home improvement spending by renters is not available.

[15] There are options to simultaneously improve Indoor air quality (IAQ) and improve energy efficiency. However, IAQ can be improved or degraded by energy efficiency improvements. It is important that energy improvements include adequate ventilation to mitigate any potential air quality risks caused by reducing air leakage from homes.

Building Structure Issues

A significant number of middle income houses have building structure and maintenance issues that reduce their value and can adversely affect the health and safety of their occupants. Households are often aware that these problems need to be addressed, but in an uncertain economy, households are reluctant or unable to invest scarce resources in making fixes before those problems turn into emergencies. Frequently, these problems must be addressed before – or in conjunction with – the installation of energy improvements. While more expensive in the short run, addressing non-energy issues as part of energy efficiency program delivery can attract more participants and address important health and safety hazards. The following program elements may make addressing these issues easier for programs and households alike.

- **Leverage Weatherization Contractors.** The existing network of over 1,000 organizations that deliver the services of the federal Weatherization Assistance Program may have the skills and experience needed to serve middle income households with both energy and non-energy housing issues.

- **Allow Non-Energy Measures in Energy Efficiency Financing.** Allowing households to use a portion of their energy efficiency loan for non-energy measures may be an attractive way to address these issues.

- **Coordinate Public Funding from Multiple Sources.** Streamlining existing funds and services can reduce intervention costs and enhance benefits for households by presenting the homeowner with multiple complementary services in a single, coordinated package. For example, the Green & Healthy Homes Initiative is bundling weatherization services with home health services (such as lead hazard reduction and indoor allergen reduction) to implement a comprehensive assessment, intervention, and education program that improves health, economic and social outcomes of low and middle income families.

Access to Capital

The upfront cost of home energy improvements is a significant barrier to investment. Middle income households have historically invested in home improvements, and many (65 percent) have not needed financing to do so (Guererro 2003). But the recession has depleted household savings, suggesting that many middle income households need financing to overcome this barrier.

Challenges to Accessing Capital

Housing wealth is the primary asset against which middle income households have historically borrowed, and that foundation has eroded. Nationally, housing prices have declined by almost a third (32 percent), but middle income households have been disproportionately impacted, as they had more of their wealth invested in their primary residences heading into the recession and their primary residences have lost a greater percentage of property value as compared to the homes of their wealthier peers (see Figure 2).[16]

[16] The median middle income home value in 2007 was $150,000 (U.S. Census). Assuming a value decline of approximately a third, this median value is likely to be approximately $100,000 today. This value falls into the ”low tier” of the three-tiered Case-Schiller 20-City Composite Home Price Index across all of the index’s 20 major metropolitan statistical areas (MSAs) except for Phoenix (where properties under $95,901 are in the “low tier”).

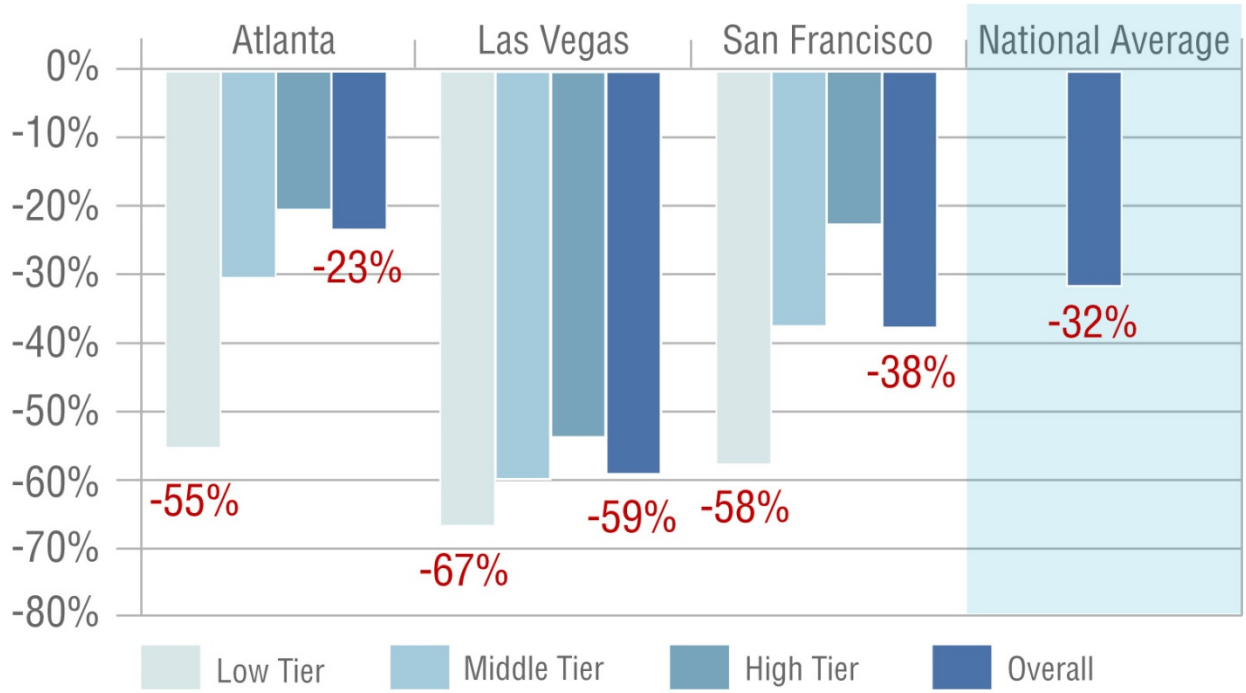


Figure 2. Case-Shiller 20-City Composite Home Price Index. January 2007 to June 2011 in 3 major U.S. cities, tiered by initial property value (S&P 2011)

At the same time that home equity has declined, lenders have responded to increasing consumer risk by restricting access to other types of loan products. Today, many of the largest energy efficiency loan programs have application rejection rates in the 30-50 percent range – and these rejection rates are higher among middle income households than upper income households.

Opportunities for Increasing Access to Capital

A number of energy efficiency programs are deploying credit enhancements, novel underwriting criteria, and innovative financing tools to reduce risks for both financiers and borrowers in an effort to increase the availability of energy efficiency financing for middle income households.[17] Many of these initiatives are new, and it is important that their impacts on middle income participation in home energy improvement programs be evaluated as programs mature.

Credit Enhancements. By reducing lender risk, publicly-supported credit enhancements can leverage limited public monies and attract additional private capital for residential loans.[18] Credit enhancements – in the form of loan loss reserves (LLRs), subordinated debt, and guarantees – can reduce a lender's risk by sharing in the cost of losses in the event that a borrower defaults. Several programs are using credit enhancements to incentivize their financial partners to offer energy improvement loans to households who would otherwise not have access to capital. Some are simply using larger than average LLRs to

[17] Underwriting criteria exist to ensure that those who get access to financing are willing and able to repay it. Care needs to taken with who is given access to credit and what claims are being made about the benefits of energy improvements, particularly in the absence of certainty that energy savings will be sufficient to cover the full cost of the improvements.

[18] LLRs reduce lender risk by providing first loss protection in the event of loan defaults. For example, a 5 percent LLR allows a private lender to recover up to 5 percent of its portfolio of loans from the LLR. A $20 million fund of private capital would need a $1 million public LLR (5 percent coverage), leveraging each public dollar 20 to 1. On any single loan default, the LLR typically pays only a percent of the loss (often 80 percent) to ensure the lender is incentivized to originate loans responsibly.

compensate lenders for the additional risk associated with more lenient underwriting standards, while other programs are providing lenders with tailored enhancements for each loan issued to a less qualified borrower.

Alternative Underwriting Criteria. Rather than using credit enhancements to expand financing to "riskier" borrowers, a number of energy efficiency financing programs are deploying alternative underwriting criteria to identify creditworthy borrowers who do not meet traditional lending standards. These programs take a number of approaches, but most rely on strong utility bill repayment histories to replace or reduce the importance of credit scores and/or debt-to-income (DTI) ratios.

Innovative Financing Tools. New financial products may be more effective at serving middle income households. Here we highlight four of these financing tools:

- *On-bill financing (OBF).* Many households have long histories of paying their utility bills regularly, and some financial experts believe that on-bill repayment will reduce loan delinquency and increase household willingness to finance energy improvements. In some cases, programs attach the repayment obligation to a household's utility meter (instead of the individual customer). Subject to existing regulatory practices, nonpayment could also trigger utility shut-off, a powerful customer incentive to make payments.[19]

- *Loan products that are paid off when properties transfer (deferred loans).* Some middle income households – particularly those on fixed incomes – simply do not have the financial capacity to make consistent principal and interest payments on debt. This is especially true when the financed improvements lead to uncertain cash flow, or if building rehab needs to be funded in addition to energy upgrades, increasing net monthly payments. There are many housing and economic development agencies around the country that will fund home improvements through deferred loans – often health and safety-related rehab for fixed income seniors that have equity in their homes. No monthly payments are required, but a lien is attached to the property that must be paid off when the property is sold or otherwise transferred.

- *Paycheck-deducted loans.* Paycheck-deducted financing involves repaying a loan through regular, automatic deductions from an employee's paycheck. Under one model developed by the Clinton Climate Initiative, a credit union provides the loan capital, and loan repayment is deducted through payroll and automatically transferred to the credit union. The security of the payroll deduction allows credit unions to do more lenient underwriting and offer a lower interest rate than they would otherwise offer for standard unsecured loans.

- *Property assessed clean energy (PACE).* For those middle income households who have equity in their homes, PACE may be a promising financing tool if it gets past the current regulatory hurdles. PACE programs place tax assessments in the amount of the improvement on participating properties, and property owners pay back this assessment on their property tax bills. Like other property taxes, these assessments are treated as senior liens – which makes them very secure. PACE is debt of the property, which suggests that underwriting need not be based on a borrower's personal creditworthiness (and that the financing can be transferred with the property) – potentially getting around the credit score and debt-to-income issues highlighted in *Chapter 5: Access to Capital*. PACE

[19] The same consumer protections that guard against utility service cancellation in the event of utility bill nonpayment also protect on-bill financing borrowers from meter shutoff in the event of loan nonpayment.

currently faces significant regulatory hurdles, which have largely eliminated its use around the country for the residential market, pending court rulings or federal legislation.

The Role of Policy

While important for reaching middle income households, the program design, outreach and financing strategies outlined in this report are probably not sufficient to deliver energy improvements to this market at scale. Instead, they should be seen as potential bridges or complements to more robust public policies that bring additional focus and funding to bear on unlocking this energy efficiency resource. A range of policy options are discussed below—and several are likely to enhance energy efficiency across all markets, in addition to ensuring that substantial allocations are made for delivering home energy improvements to middle income households.

Energy Savings Targets

More than half of the states have established energy savings targets of some sort through an Energy Efficiency Resource Standard (EERS), a statutory requirement for utilities to acquire all cost-effective energy efficiency, or energy efficiency goals that are described in utility resource plans. These states and the federal government are expected to spend $7.7 billion on multi-measure home energy efficiency programs over the next 10 years (SEE Action Residential Retrofit Working Group 2011). The design features of these policies influence the degree to which energy efficiency program administrators are motivated to provide more comprehensive home energy services. EERS's with comprehensive, long-term savings goals and "all cost-effective" policy guidelines that consider a societal perspective (e.g. including social impacts, environmental externalities) are more likely to encourage comprehensive residential energy efficiency programs.

Cost Effectiveness Considerations

More than two thirds of the 43 states with energy efficiency programs funded by utility customers place primary weight on the total resource cost (TRC) test to select those programs, which typically includes a limited set of non-energy benefits that residential energy upgrades deliver in calculating total benefits. Approaches that may enhance and broaden opportunities for home energy upgrade programs targeted at middle income households include the following:

- **Measuring Cost Effectiveness on a Portfolio Basis.** Screening energy efficiency efforts at the portfolio level – across a full suite of programs – allows program administrators to pursue efficiency across multiple sectors, including hard-to-reach markets such as low and middle income households, small business, and others.

- **Balancing Program Screening Decisions Across Multiple Cost Effectiveness Tests.** Program administrators and regulators can weigh the merits of programs and portfolios across multiple tests that bring a broader array of values into consideration. Regulators can also specify that program administrators use specific inputs to cost-effectiveness screening (e.g., a social discount rate, methods to quantify non-energy benefits).

- **Valuing Non-Energy Benefits.** Public health, safety, equity, and economic development could be considered as explicit policy goals in developing a portfolio of energy efficiency programs.

- **Exempting Project Components and Programs from Resource Testing.** Necessary, non-energy project costs such as mold remediation and roof repair could be exempted from cost effectiveness testing screening methods for programs that target these households. For example, in some states, low-income energy efficiency programs are treated as "non-resource" programs that help meet equity objectives (e.g. opportunities for all customers to participate in energy efficiency programs) and are not required to pass a TRC test as a condition for being offered. A similar approach could be extended to efficiency services for some middle income households – particularly those concentrated near the income eligibility threshold for low income programs that have been hit by the recession.

Building From Voluntary Programs to Regulatory Solutions

Better funding for voluntary programs targeted at driving demand for middle income energy improvements are just one piece of an evolving effort to secure energy savings for the public at large. Additional policy options include codes, standards, labeling, and upgrade regulations.

- **Codes, Standards and Work Specifications.** Building energy codes and appliance, lighting, and equipment standards can contribute substantially to efficiency among middle income households. "Reach" codes and financial incentives for even higher efficiency buildings and equipment can encourage market innovation.

- **Labeling, Disclosure and Upgrade Regulations.** Labeling and energy use disclosures can build a more efficient marketplace by making the full costs of operating a home more transparent to renters and homebuyers. These tools make energy efficiency more visible—and valuable—in the home real estate market. They can also build the foundation for the implementation of regulations as these disclosures can be transitioned into minimum energy performance standards. Augmenting voluntary programs with regulations may allow policymakers and energy efficiency program administrators to target limited public funds toward increased support for the most financially vulnerable low and middle income households.

Conclusion

It is important to recognize that progress is being made on delivering home energy efficiency upgrades to the residential sector. Many residential energy efficiency program administrators are reducing their reliance on lighting and appliance rebates and increasing their emphasis on more comprehensive home energy upgrade program offerings. As the mix of residential programs evolve, contractors are adding to their skill sets and adjusting their business models. Despite this progress, improving the home energy efficiency of middle income households is a challenging prospect. There is no single solution to this challenge. Beyond the significant barriers to driving demand that exist in the general population, middle income households face greater financial insecurity that can make proactive investment in energy improvements prohibitive. Those middle income households who are motivated to act are often unable to access financing or must address costly structural and maintenance issues in their homes before investing in energy efficiency. This report describes a number of financing tools, program delivery models, and outreach strategies that show promise in overcoming these barriers. However, it is clear that while these approaches may prove effective on the margin, they are not enough to be effective at the requisite scale for addressing broad public policy goals. Instead, these approaches should be seen as potential bridges or complements to robust public policies that provide access to energy efficiency for all market segments.

Chapter 1: Introduction

Middle income American households – broadly defined here as the middle third of U.S. households by income[21] – are struggling. The recession has exacerbated long term trends that are putting downward pressure on these households, threatening fundamental aspirations like economic stability, secure retirement, and educational opportunities (Commerce 2010). Many middle income households are under significant financial strain, and rising energy bills are a contributor to this stress. Energy improvements have the potential to provide significant benefits to middle income households – by lowering bills, increasing the integrity of their homes, improving their health and comfort, and reducing their exposure to volatile, and rising, energy prices. Middle income households are also responsible for a third of U.S. residential energy use, suggesting that increasing the energy efficiency of their homes is important to deliver public benefits such as reducing power system costs, easing congestion on the grid, and avoiding emissions of greenhouse gases and other pollutants.

To achieve those goals, utilities and governments are beginning to look beyond typical residential energy efficiency programs that discount compact fluorescent light bulbs (CFLs) or provide rebates for high-efficiency appliances and equipment. Increasingly, they are turning to programs that improve the energy efficiency of the entire house – by sealing up leaks, adding insulation, repairing ducts, and replacing inefficient heating and cooling systems. These more comprehensive programs typically offer the same incentives for all non-low income households and usually require customers to pay a significant portion of the costs. These comprehensive home energy improvements often cost $5,000 to $15,000 per home. In practical terms, higher income households are better positioned financially to take advantage of programs that promote comprehensive home energy upgrades and require substantial household investment.[22]

Middle income households are struggling and energy improvements can provide significant benefits to them.

This leaves millions of middle income homes leaking energy and exposed to rising energy costs. Delivering comprehensive energy efficiency improvements to just one-third of the 32 million single family middle income households could save roughly as much energy each year as is used by every home in Houston, Phoenix and San Francisco, for as long as the more efficient measures last. Delivering these energy upgrades— at minimum, adding insulation, sealing air leaks, and repairing ducts – would require

[21] These 38.5 million middle income households earn between $32,500 and $72,500 annually, and constitute 32.4 percent of U.S. households. See *Chapter 2: Middle Income Market Segmentation* for a detailed explanation of our definition.

[22] While most non-WAP energy efficiency programs do not formally track income of their participants, discussion with program administrators and other experts from around the country reveal that early participants in home energy upgrade programs, while not exclusively higher income, are more likely to be higher income households. One important first step for program administrators is to begin tracking income demographics of participants in residential energy efficiency programs, unassociated with other identifying information to preserve privacy. We have not discovered any non-low income or non-assisted program that formally evaluates marketing success and program impact by income; this information is crucial to rigorously assessing the extent to which different groups of residential customers are being served by existing and future energy efficiency programs.

an investment of roughly $30 billion to $100 billion for just this third of the market.[23] By comparison, total estimated program funding for multi-measure home energy efficiency upgrades targeted at all non-low income households is about $7.7 billion over the next decade.[24] Thus, the costs of delivering multi-measure energy upgrades to the middle income market far exceed expected public resources. Ultimately, in recognition of the public benefits that energy efficiency provides, greater public funding will be necessary to extend and expand programs that promote home energy improvements. A more aggressive effort to target middle income households will also require significant customer contributions to the cost of the energy saving measures and an interlocking framework of program design and supportive policies. If aggressive energy savings goals are to be met, middle income households are likely to need more support under current economic conditions and may need different program models altogether. It is important that program benefits be distributed equitably across the customer base to maintain broad support for public energy efficiency funding.

> Greater—and tailored—public support is needed to scale middle income investment in home energy upgrades.

Middle income households represent a diverse market – encompassing fixed-income elderly households in the suburbs, economically disadvantaged urban residents, dual-income families working for relatively low wages, recent college graduates, and others. This study describes innovative program designs, financing tools, and outreach strategies that show promise in increasing the attractiveness and accessibility of energy efficiency for this group. These strategies and tools should be regarded as models that can be refined today to build our knowledge and capacity to deliver energy improvements to middle income households. However, the strategies described in this report are not sufficient, in the absence of robust and supportive policies, to deliver these improvements at scale. Instead, these strategies and tools will only reach their full potential as complementary policies are developed and deployed.[25]

Research Scope & Methodology

The objective of this report is to provide program administrators, policy makers, contractors, and community organizations with actionable insights to improve their ability to serve the 38.5 million middle income households. We are primarily focused on comprehensive energy saving improvements in single family homes, which account for roughly 83 percent (about 32 million) of the households in this target segment.[26] Comprehensive improvements save at least 20 percent[27] of annual energy use and typically include some combination of air sealing, insulation, lighting efficiency measures, window replacement or enhancement, duct sealing, furnace or heat pump replacement, water heater replacement, air conditioner

---

[23] Assumptions behind this estimate include: 1) A low-end cost for basic insulation and airsealing of $3,000 per home; 2) A higher-end cost of $10,000 per home for a full home energy assessment followed by some combination of measures that include HVAC replacement, air sealing, duct sealing, additional wall, floor, and attic insulation (where appropriate). The resulting aggregate cost estimate is derived as follows: $3,000 to $10,000 * 38.5 million middle income households * 83 percent single family households * 33 percent of eligible market = $32 billion to $105 billion.

[24] Estimate is drawn from an analysis of taxpayer and utility customer funding for home energy upgrades done for the SEE Action Residential Retrofit Working Group. Reports from this group are available here: http://www1.eere.energy.gov/seeaction/residential_retrofit.html

[25] These policy frameworks are discussed in *Chapter 6: The Role of Policy*.

[26] This report defines single family homes as those with four or fewer units. Homes with five or more units are defined as multifamily. Single family renters are discussed in a sidebar on page X.

[27] Home energy upgrades are defined according the State Energy Efficiency Action Network Residential Retrofit Working Group Roadmap, information and reports from this group are available here: http://www1.eere.energy.gov/seeaction/residential_retrofit.html

replacement, solar thermal water heating, etc. We also discuss the benefits and policy implications of less comprehensive interventions. Onsite renewable energy generation (e.g., solar photovoltaic and hot water systems, small scale wind) is also within the realm of "home energy improvements" but is not a focus of this report.

The insights and findings in this report come from four main sources:

- Interviews with more than 35 program administrators, policy makers, researchers, and other experts with experience working on energy efficiency programs and/or other housing and community development programs that are relevant to serving middle income families.

- Case studies of programs, based on interviews with staff and a review of program materials and data. Insights from more than 30 programs are included throughout this report and four longer case studies are available in the Appendix. In selecting case studies we looked for programs that are particularly focused on middle income households, models that show promise in overcoming barriers specific to middle income households, programs that achieved significant market penetration, and geographic diversity. It was extremely difficult to find programs that met all these criteria; thus, we selected programs that could provide a range of examples most instructive to our target audiences.

- A review of relevant reports and presentations on the characteristics of middle income American households, and how both historical trends and the more recent recession have impacted them.

- Analysis of relevant data sources including the Current Population Survey of the U.S. Census Bureau (Annual Social and Economic Supplement, March 2011), the 2005 Residential Energy Consumption Survey of the U.S. Energy Information Administration, the 2009 Consumer Finance Survey of the Federal Reserve Bank and other material.

What This Report Covers

This study highlights the range of barriers to investing in energy efficiency that middle income households face and strategies that may be able to overcome them in single family buildings – though the implications of this research may be applicable more widely. It is important to note that many strategies discussed in this report have often not been rigorously evaluated. Thus, the strategies profiled should be taken as suggestions of what appears to be most promising, with the understanding that different techniques will be more or less applicable for different stakeholders and target households.

Chapter 2 reviews the demographics of middle income households, what types of buildings they live in, where they reside, and how they use energy. Chapter 3 highlights the range of barriers to driving demand for energy upgrades in this sector and strategies for overcoming them. Chapter 4 discusses challenges of deferred maintenance and health and safety risks associated with some middle income homes– and ways to address them. Chapter 5 provides an overview of the financial status of middle income households and approaches to increasing their access to capital. Chapter 6 discusses the larger policy framework and specific policy options that will be critical to serving middle income families. The Appendix includes four case studies that highlight several noteworthy programs.

Chapter 2: Middle Income Market Segmentation

For the purposes of this study, we broadly define middle income households as the middle third of U.S. households by income. These 38.5 million middle income households earn between $32,500 and $72,500 annually.[28] We have chosen this definition partly because available data on energy use constrains our ability to use more nuanced income data reflecting cost of living differences between and within regions.

Our observations should be regarded as a broad, national portrait of middle income households. Care should be taken before extending these national observations to a specific local or regional market. Figure 3 compares our definition of "middle income" households to HUD Very Low and Low Income definitions that are utilized in various states and for the U.S. overall.

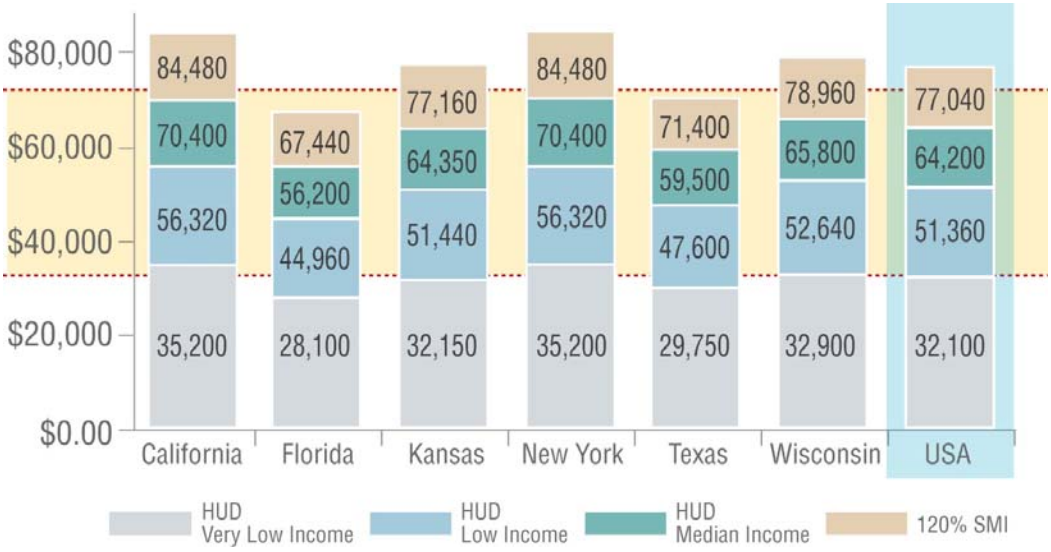


Figure 3. LBNL definition of middle income households (red lines at $32,500 and $72,500 mark the boundaries of our definition) compared to HUD eligibility in selected states[29] (HUD FY2011 median family incomes for states)

[28] This income range was selected in order to take advantage of the most current available data on household income. The data from the Current Population Survey, Annual Social and Economic (ASEC) March 2011 Supplement, reflect significant recessionary shifts in the welfare of middle income households. The ASEC survey divides income cohorts by $2,500 increments of income. Micro-data is not yet available for this data, so a precise selection of one-third of U.S. households around the national median income was not possible.

[29] HUD defines Very Low Income as households earning 50 percent or less of state median income and Low Income as households earning 50 percent to 80 percent of state median income.

Our middle income definition runs from roughly 135 percent to 325 percent of the Federal Poverty Line (FPL).[30,31] The majority of these households – 64 percent – do not qualify for the Weatherization Assistance Program (WAP), which typically offers a set of energy efficiency measures at no cost to eligible households.

Most middle income households do not qualify for energy assistance programs. They are eligible for the same incentives as their higher income peers.

Nonetheless, it is important to acknowledge that a significant minority – about 36 percent – of middle income households may qualify for public energy assistance programs.[32] However, among single-family middle income households only about 2 percent are eligible for free weatherization services through WAP (See Figure 4).[33]

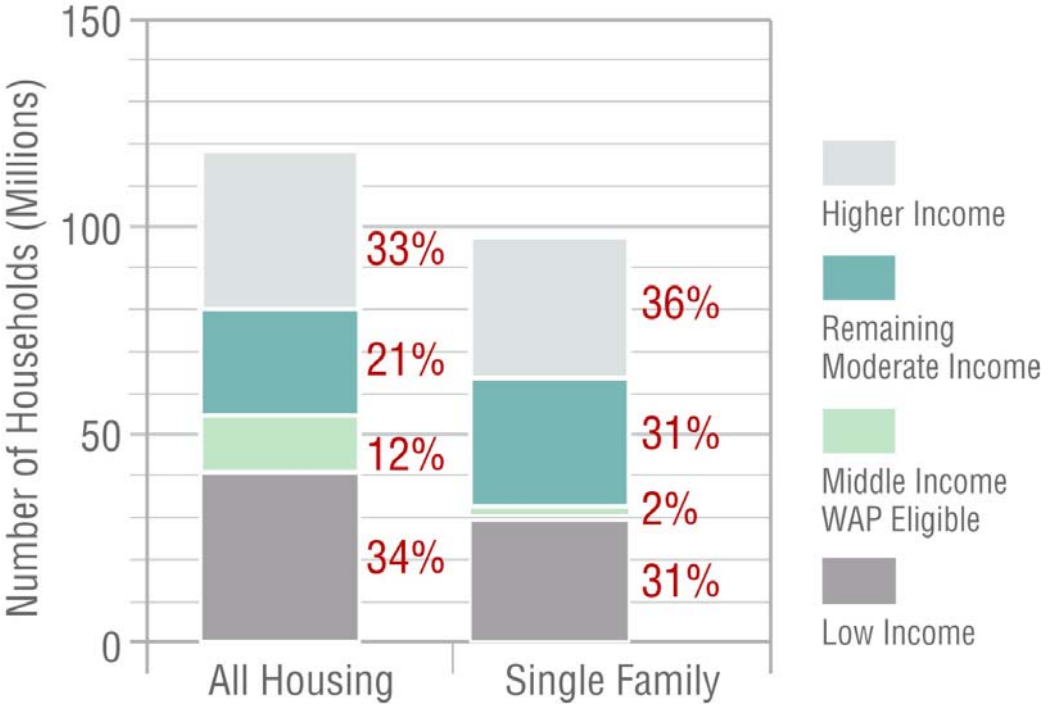


Figure 4. Eligibility for federal energy assistance, by income group (Census 2010)

[30] Official Poverty Measures, also known as the federal poverty line (FPL), are a series of income amounts for different family sizes. A family is deemed "in poverty" if its income is below the amount specified for a family of that size. References to percentages of the FPL in this study refer to percentages of the poverty-level income for a family of four.

[31] The U.S. Census bureau recently released a Supplemental Poverty Measure (SPM) to better reflect on-the-ground realities than its Official Poverty Measure. While the Official Poverty Measure takes only gross before-tax income into account, the SPM considers net cash income, in-kind benefits (such as food stamps), work expenses including transportation and child care, regional housing costs and out-of-pocket medical expenses. While not directly comparable to our middle income definition, the SPM indicates that, compared to the OPM, relatively more households are living close to poverty, and relatively fewer households are living below 200 percent of the poverty line.

[32] These programs include the Low Income Home Energy Assistance Program (LIHEAP), with eligibility set at 150 percent of the FPL, and the Weatherization Assistance Program (WAP) with eligibility set at 200 percent of the FPL.

[33] More than 90 percent of WAP-eligible middle income households only recently became eligible—largely because the American Reinvestment and Recovery Act (ARRA) raised the maximum qualifying income from 150 to 200 percent of the FPL, but also due to the drop in household incomes over the course of the recession. As a practical matter, low income programs nationwide perform a large number of weatherizations annually but typically this amounts to serving less than one percent of eligible households each year. Thus, a large portion of WAP-eligible middle income households could face long waiting lists. Although many WAP-eligible households do not have capacity for sharing the cost of comprehensive home energy improvements, some households (particularly those on the upper end of the WAP-eligible income scale), may be appropriate candidates for the program models described in this report.

Household Characteristics

Families make up nearly 80 percent of middle income households. The remaining 20 percent are men and women living alone in roughly equal numbers. A little more than a third of middle income households have children.

Education is a strong determinant of income; people with more formal education tend to have higher incomes. The typical middle income householder is a high school graduate or has some college but no degree.[35] About 26 percent have a bachelor's degree or higher. The average level of educational attainment for middle income households is slightly lower than for all U.S. households. The difference in earning potential is substantial; across the middle income band, those with a bachelor's degree make roughly $10,000 more per year than those with a high-school diploma or even some college without a degree.

Typical occupations for middle income householders are in nursing, teaching, truck driving, retail sales and office work. Middle income earners are ubiquitous at the middle and lower levels of government, law offices, banks, doctors' offices and accounting firms. Nearly 59 percent had full time jobs in 2010 – a higher level than among all householders. About 12 percent worked part time. The remaining 30 percent did not work in 2010.

Since about the 1980s, U.S. households have increasingly relied upon two or more incomes to make ends meet. During the recession, however, multiple-earner households declined, and this loss of an earner was more than twice the national average among middle income households (See Table 1).

Number of Earners per Household	Total Households, All Incomes			Middle Income Households		
	2007	2010	Change	2007	2010	Change
No earners	21%	23%	2%	12%	16%	4%
One earner	37%	38%	1%	45%	49%	4%
Two earners and more	42%	39%	-3%	43%	35%	-8%
2 earners	34%	32%	-2%	37%	30%	-7%
3 earners	6%	6%	-1%	5%	4%	-1%
4 earners or more	2%	2%	0%	1%	1%	0%

Table 1. Number of earners for all households and middle income households, 2007 to 2010 (Census 2011)

Take-home pay is about 60 percent of wages or salary after average withdrawals for taxes, Social Security, Medicare, and other insurance for health, unemployment and disability.

Middle-income single family households typically live in a house for a decade or more. This tendency to hold onto homes for longer than their higher income peers suggests that energy efficiency may be appealing as an investment in home value and comfort.

[35] A householder is the person who owns or rents a housing unit and is equal to the number of households. If a couple rents or owns a home, either can be the householder. Often, the householder is whomever the census-taker talks to and lists first.

In terms of energy use and housing stock, middle income households are highly diverse, sharing some characteristics with low income households and others with higher income households. These differences can pose challenges for program administrators in delivering energy efficiency services to these households.

On balance, middle income households have more in common with low income households across many of the metrics of interest in this report: where they live; the age and condition of their housing; their energy consumption patterns; and what their economic circumstances bode for undertaking home energy improvements. Part of the reason for this closer linkage with low income households is the distribution of households within the middle income range. Of the 38.5 million middle income households, nearly 60 percent are living on $32,500 to $52,500 annually, the bottom half of the middle income range. However, middle income households share some key similarities to higher income households – both in the prevalence in which they reside in single family housing and in penetration rates of appliance ownership.

Middle income households are found predominantly in single family homes—and most are homeowners.

Housing Type and Ownership

While middle income households can be found in all types of housing, the large majority (83 percent) live in single family homes (See Figure 5). These 32 million middle income households who rent or own single family homes are the subject of this report.[36] About 63 percent of middle income households (24 million) own single family homes, compared to 80 percent of higher income households and 45 percent of low income households.

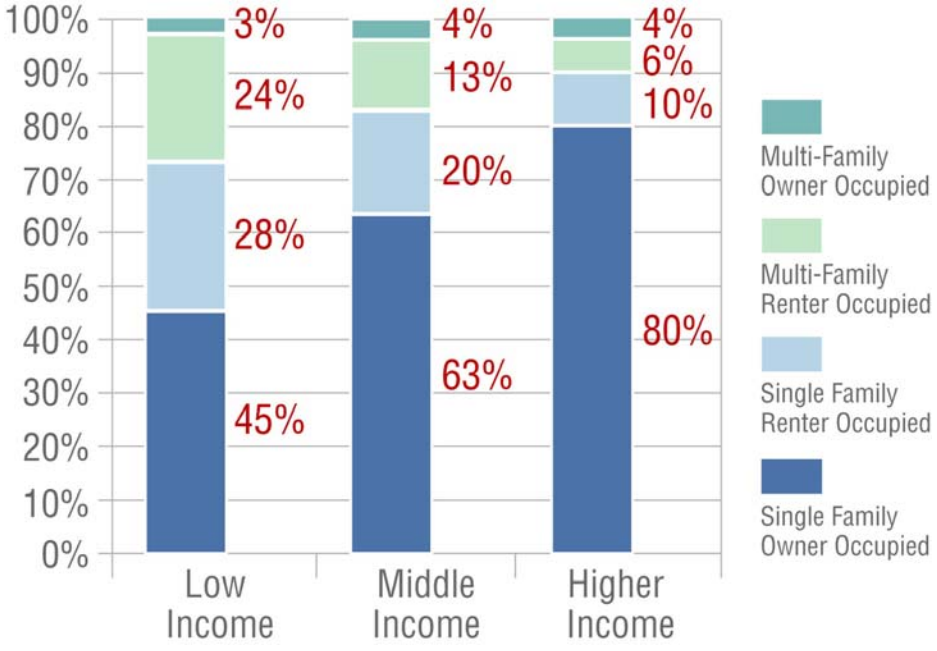


Figure 5. Comparison of housing type and owner/renter status across income groups (2010 Census)[37]

[36] While the primary focus of this report is middle income single family homeowners, we address renters on page X.
[37] Note that the single family classification includes manufactured homes.

Middle income households include a share of renters more comparable to households at lower incomes – 33 percent of middle income households rent their homes, more than twice the share of renters among higher income households (16 percent) but less than the share of renters among low income households (52 percent). Where low income renters are nearly evenly split between multi-family and single-family homes, a larger percentage of middle income renters live in single family homes.

Urban/Rural Areas

About 82 percent of middle income households live in metropolitan areas, in line with low income households (Census 2011). A majority of low income households in metropolitan areas live within the core cities of those regions, while middle income households are more likely to live in smaller nearby cities or suburbs within the metro areas.

These observations suggest that programs focusing on middle income households will find the highest concentrations in single family neighborhoods in metropolitan areas outside of the largest cities.

Energy Consumption & Age of Housing

Low and middle income households, in aggregate, consume less energy than these households' numerical shares of the total population. In contrast, higher income households use more energy than any other income group and more than their share of the population (see Figure 6).

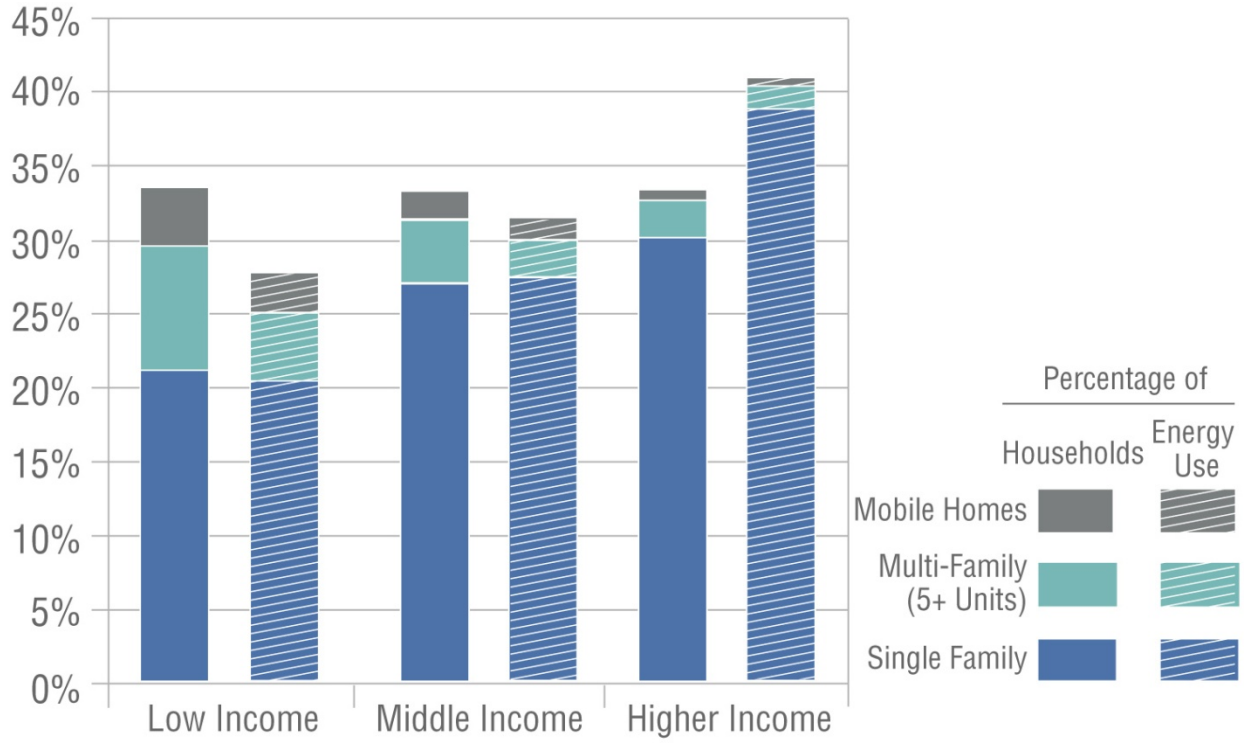


Figure 6. Percent of households and U.S. residential energy consumption by housing type and income[38] (EIA 2005)

[38] LI = Low Income MI = Middle Income HI = Higher Income. The differences in average energy consumption among the low, middle and high income ranges are statistically significant beyond the 99% confidence level.

The explanation for unequal energy use across income levels lies primarily with growth in the size of homes as income rises; higher income households, on average, have more square footage to heat, cool and light and more amenities both inside and outside of the home. Compared to higher income households, middle income households have a larger share of homes that pre-date modern energy codes for residential buildings and are associated with higher energy use and operating costs per square foot (See Figure 7). Among middle income households, 43 percent live in pre-1970 housing but this group uses half of the energy consumed by middle income households. These older, less efficient homes are overwhelmingly owner-occupied single family homes but include some single-family rentals, especially duplexes and quads.

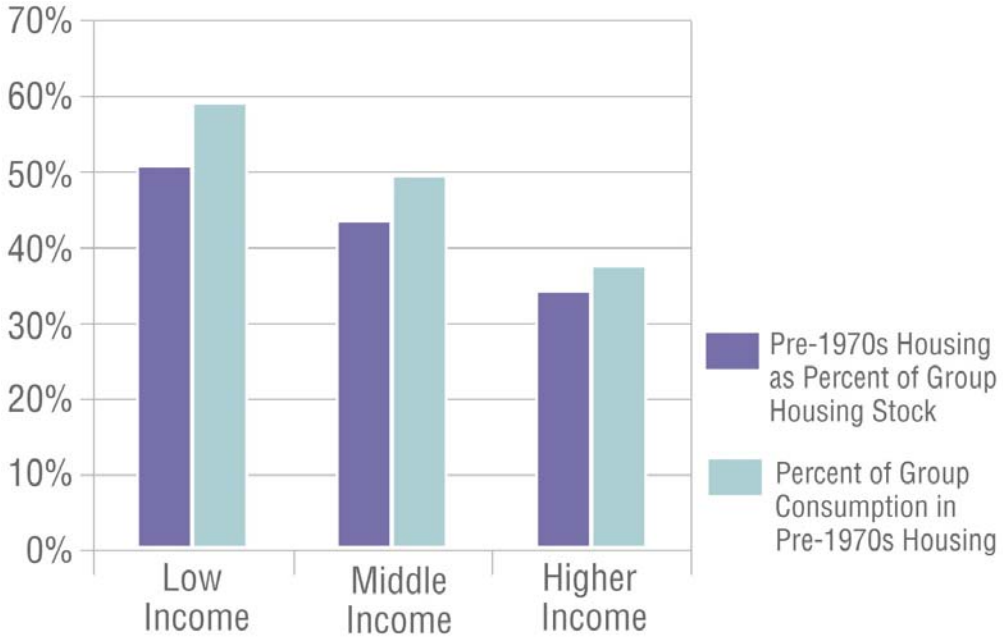


Figure 7. Comparison of shares of pre-1970s housing and related energy use (EIA 2005)

The largest single share of energy use across income groups comes from space heating. Yet the energy use from heating homes has been declining, dropping by nearly a third from 1978 to 2005 as more stringent federal equipment standards have improved the efficiency of furnaces. Meanwhile, the share of household energy consumption used for consumer electronics, lighting and other plug loads has nearly doubled in the same period (EIA 2011). Much of this shift in consumption patterns started in the late 1980s and is reflected in Figure 8.

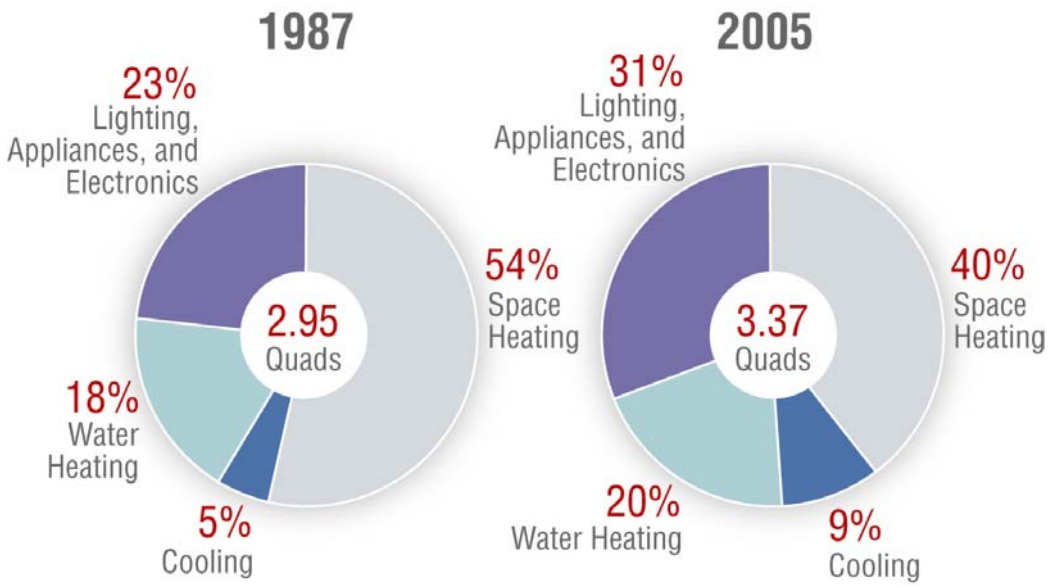


Figure 8. Changes in middle income household energy use from 1987 to 2005[39] (EIA 1987 and EIA 2005)

A large majority of middle income households (75 percent or more) have all of the standard appliances and equipment for a home: a stove, an oven, at least one refrigerator, a clothes washer and dryer.

Consumer electronics, in particular, are the fastest growing source of consumption among U.S. households, and middle income households are part of this trend (EIA 2011). The average middle income household has at least one color television , a VCR or DVD player or both, a cordless phone and at least one cell phone. More than 70 percent have at least one personal computer, and about 60 percent have a printer and internet access at home

However, this growth in electronics is not uniform across middle income households – those with lower incomes tend to have far less electronics usage than those on the high end of middle income, who look much more like high income households (EIA 2005).

In short, patterns of residential energy consumption are changing, and strategies for delivering energy savings to middle income households should expand beyond the traditional focus on reducing heating and cooling demand to include uses such as plug loads. Many utility bill payer-supported energy efficiency portfolios include rebates for lighting and appliances, and some also include programs for rebating consumer electronics.[40] Program administrators also could consider addressing consumer electronics at the manufacturer or retail level, as well as providing support for appliance standards. The challenge for administrators of home energy upgrade programs is integrating these programs into their offerings in ways that are consistent with a whole-home approach.

[39] The breakdown of household energy consumption by end use and the relative change in that breakdown from 1987 to 2005 is mirrored across income groups.
[40] Summaries of appliance and consumer electronics programs have been compiled by the Consortium for Energy Efficiency and can be found at http://www.cee1.org/resid/rs-ce/consumer_electronics_prog_sum.php3 and at http://www.cee1.org/files/CEEAppliancePrograms SummaryMay2011.pdf

Energy Costs

In 2005, middle income households paid $64.4 billion a year in home energy costs, an average of $1,766 per household – same as the national average (EIA 2005). Based on current fuel prices, we estimate that middle income households will spend about $80 billion in nominal dollars on residential energy in 2011.[41]

Households with incomes at the national median (within our middle income definition) reported home energy costs of about $1,900 in 2010 (Census 2011). The average annual payments for gas and delivered fuels have declined slightly in recent years, but the payments for electricity have risen. The net effect is a steady increase in the overall cost of home energy.

> Incorporating energy efficiency into existing middle income home improvement spending is a promising strategy.

This total home energy cost remains a small fraction of gross income – about 4 percent – but is very substantial compared to other typical categories of household spending. Energy spending is more than 55 percent of what a median income household spent on food at home in 2010, 65 percent of total healthcare spending and about 38 percent more than all spending on clothing. Home energy costs are considered an integral part of gross housing costs, and about a third of middle income households have housing cost burdens at or above 30 percent of income, a threshold that the U.S. Department of Housing and Urban Development uses to define households as "cost burdened" and facing difficulty affording other necessities such as food, clothing, transportation and medical care (BLS 2011). Saving a modest 15 percent on energy bills would pay for all men's and boy's clothing for the median income household.

Home Improvements

> Energy costs are a substantial household expenditure. Saving energy can free up needed cash.

Middle income households make improvements to their homes in the form of alterations, additions, repairs and replacements – in 2008 and 2009, more than 60 percent of middle income households performed some type of improvement on their homes, spending $83.6 billion in those two years (Census 2009). This expenditure is lower than middle income spending on home improvements in 2006-2007, prior to the recession (Census 2007,2009).[42] As in previous years, higher income households spent considerably more in home improvements – about $211 billion or 62% of the total in 2008-2009. But the work being performed by middle income households is nonetheless large in magnitude and represents a large opportunity for program administrators.

About $18.2 billion of the home improvements that middle income households performed from 2008 to 2009 – roughly 22 percent – were potentially energy related.[43] This private, potentially energy-related

---

[41] This calculation is based on the simplifying assumption that electricity accounted for all of the increase in consumption from 2005 to 2011 and that consumption of all other fuels remained the same as in 2005. It includes expenditures by both homeowners and renters.

[42] Recently, some analysts have reported signs of a rebound in total home improvement spending (JCHS 2011). However, total U.S. expenditure on home improvements has been heavily dr iven by large scale projects performed by higher income households. In 2009, for example, households with incomes of at least $80,000 accounted for 57 percent of total U.S. home improvement spending; 54% of spending was on projects in homes valued at $250,000 or higher (JCHS 2011)—values that are well above those for most middle income homeowners. For more information on housing values, see *Chapter 5: Access to Capital.* Given this weighting of home improvement spending toward higher incomes and home values, it is unclear whether home improvement spending by middle income households has begun to recover.

[43] Potentially energy-related improvements include installation, replacement or repairs to insulation, roofing, central heating or central air conditioning systems. More than half of this spending – about $10.2 billion – was on roofing repairs, additions and replacements. The only expenditure that we can assert explicitly reflects an intent to increase energy efficiency (or meet building

spending by middle income households is more than twice the $7.7 billion in utility bill payer-funded spending on energy efficiency programs for all sectors in 2008 and 2009, the largest single source of energy efficiency funding for those years. (CEE 2008, 2009) The size of this investment and the needs that drove it suggest that programs can deliver energy efficiency gains by "nudging" households – encouraging selection of better materials and high-efficiency equipment and incentivizing add-on improvements.[44]

Key Takeaways

Middle income households are a diverse group. Some of the key characteristics of the middle income market are:

- These households earn between $32,500 and $72,500 or roughly 135 percent to 325 percent of the Federal Poverty Line (FPL). The majority do not qualify for public energy assistance.
- Most middle income households live in (83%) and own (63%) single-family homes.
- Middle income homes are older and leakier than those of their higher income peers—many pre-date modern energy codes.
- Middle income households make substantial investments in improving their homes, providing an opportunity to incorporate energy efficiency into existing spending.

codes that reflect that intent) is insulation, which makes up $1 billion of this potentially energy-related home improvement spending.

[44] This approach and others are discussed in *Chapter 3: Driving Demand in the Middle Income Market.*

Chapter 3: Driving Demand in the Middle Income Market

How can we motivate homeowners – and middle income single family homeowners in particular – to ***want*** to invest in energy upgrades?[45] Before building structural/maintenance problems (Chapter 4) or access to capital (Chapter 5) become issues, the homeowner has to want to do the work. As witnessed by energy efficiency programs over the last few decades, and recent research (Fuller et al 2010), motivating this interest is no small feat. We must get a customers' attention in a market with many other competing uses for time and money, and then make the case compelling enough that homeowners choose to invest limited resources. Middle income households face many of the same barriers to investing in energy upgrades described in Lawrence Berkeley National Lab's 2010 report, *Driving Demand for Home Energy Improvements.* Key lessons from this report are excerpted on page X. But middle income households also face additional challenges; strategies for tailoring outreach to this segment of the population, which are discussed in this chapter.

Challenges in the Middle Income Market

The recession has increased financial stress and risk aversion among middle income households, which, when combined with uncertainty about the benefits of investment, make energy efficiency a particularly difficult sell.[46] Especially in a bad economy, these Americans face an array of challenges–and for many households energy use is simply not a high priority compared to other issues. Even for households who have some access to capital, many are reserving this for emergencies or seeking to reduce their debt and add savings buffers, rather than making proactive investments in energy efficiency (or anything else). Todd Conkey, Energy Finance Director at the Wisconsin Energy Conservation Corporation (WECC), noted that, "Many people would rather pay more per month on their utility bills than have a $6,000 loan hanging over their heads at a time that they are really concerned about keeping their jobs amid the weak economic outlook."

Energy upgrades also have both perceived and real performance risks. How does a customer know they will save energy and come out ahead? For the data we have,[47] savings are often realized *on average*, but there can be significant variance between estimated savings and actual performance in individual homes (Hirst et al 1989;Hirst 1986).[48] Even for those projects that deliver the expected energy savings, in regions with mild climates and/or low energy prices, these investments may not yield sufficient utility bill

[45] Chapters 3, 4 and 5 are primarily focused on strategies for delivering energy efficiency to middle income homeowners. See breakout box on page X for information on delivering energy efficiency to middle income renters.
[46] See *Chapter 5: Access to Capital* for more information on the financial picture for middle income households.
[47] In some cases, energy efficiency programs have either not documented or not published evaluations of actual energy savings for individual homes so distributions of savings among participants can be assessed.
[48] Part of the reason for the wide variance is that, in some cases, initial energy savings estimates were not calibrated to pre-upgrade baseline usage. There have been significant improvements in the estimation capabilities since the 1980's.

savings to offset project costs during the expected useful life of the improvements.[49] Middle income households are far more sensitive to the risk associated with project performance than their wealthier peers. Several program managers emphasized that while issues like comfort and health drive energy efficiency interest across income groups, middle income households often *need* to save money, or at least break even.

Similarly, there is uncertainty about the impact of efficiency on home values. While home value appreciation has been demonstrated for residential solar arrays in California (Hoen et al 2011), there has not yet been sufficient analysis to definitively assess how the value of efficiency is reflected in home prices – and how valuing efficient homes might influence demand for efficiency.[50] Several labeling initiatives show promise in increasing the degree to which a home's energy use is reflected in its value by making this information more visible to potential home purchasers (see text box). But to date, the impact of efficiency upgrades on home valuation in the U.S. remains uncertain, and most parts of the U.S. have not yet adopted programs to make buildings' efficiency apparent to buyers so that the effect on home values can be tested.

Can Building Labeling Help Drive the Market for Energy Upgrades?

Labels, certifications, and rating systems for energy efficiency performance and "green" attributes of buildings have been available in some parts of the U.S. for over 10 years, and used extensively in the European Union and Australia for longer. Such certifications and ratings can make energy efficiency more visible, and could help spur demand for energy upgrades if these designations are shown to have a positive impact on property value, rental rates, or tenancy. A LBNL policy brief (Stuart 2011) discusses the findings and methodologies from recent studies on this topic. Although there have been just a handful of studies investigating these effects, researchers have found some evidence that labels can have a positive impact on home value:

- A 2010 study by Brounan and Kok reported that 31,000 homes sold in the Netherlands between 2008 and 2009 that were "green" rated (A, B, or C rating) under the European Energy Performance Certificate garnered an average price premium of 3.7 percent, compared to non-labeled homes. "A" rated homes sold for a 10.2 percent premium, while "D" labeled homes sold for an average of 5.1 percent **less** than non-labeled homes.

- A 2008 Australian study found that under the Australian Energy Efficiency Rating (EER) system (a 10-point rating scale of 1 to 5 stars at 0.5 star increments) 2,385 homes garnered an average price premium of 1.23 percent for each 0.5 EER star in 2005, and 2,719 homes sold for a 1.9 percent premium for each 0.5 EER star in 2006.

While this data is promising, there is significant uncertainty regarding the extent to which the value of energy efficiency can be monetized and valued – more evidence is required to make assurances to middle income households in the US about the impact of these improvements. DOE's Home Energy Score, and other new labeling initiatives, may help to deliver this evidence. The Home Energy Score

[49] Many programs use a simple calculation, the Savings-to-Investment Ratio (SIR) to calculate whether an energy upgrade will generate savings in excess of investment costs. The SIR is computed by dividing the expected lifetime savings of an energy upgrade by the investment cost. If the SIR is greater than 1, measures are deemed 'cost effective. SIR calculations may also account for the time value of money, inflation, and/or maintenance costs.

[50] Many Recovery Act-funded residential energy efficiency programs recently launched around the country may provide robust data on the performance of energy upgrades and their impact on home values.

allows a household to compare their home's energy consumption to that of other homes, similar to a vehicle's mile-per-gallon rating.[51]

Together, financial strain and concern about investing in a 'new' product with uncertain benefits make energy efficiency a particularly tough sell for middle income households. Many of these households have deferred basic home investments – with which they are familiar – so it is important to recognize that motivating proactive investments in energy improvements is an exceptional challenge. The following section highlights a range of outreach strategies and service delivery models that show promise in overcoming these barriers, but it is important to note that there are no panaceas and middle income households may be harder (and more expensive) to reach than their wealthier peers. Instead, these approaches should be seen as efforts that can complement robust public policies to encourage participation across the residential sector.[52]

Opportunities for Reaching Middle Income Households

While there are challenges to driving demand in the middle income sector, a number of programs show promise in motivating investment in energy upgrades. Some programs work with well-respected organizations and individuals in the community to get attention and build trust. Several programs offer additional financial incentives for middle income households to reduce risk and create demand for existing comprehensive energy upgrade programs. Others attempt to use minimal, if any, direct incentives in favor of low-cost financing. Several initiatives focus on basic weatherization instead of comprehensive improvements, and still others focus on do-it-yourself projects to reduce costs. All of these approaches, and others outlined in this chapter, may have merit – though none has reached middle income households at scale. They speak to the diversity of the middle income sector and the range of program designs and delivery channels that it may take to serve these households.

Reduce the Cost of Upgrades

One way to make energy upgrades more appealing to middle income households is simply to reduce the project cost. It may not be realistic in today's policy and economic environment to expect middle income households to make $5,000 to $15,000 proactive investments in energy efficiency, and it may not be cost-effective for programs to try to motivate them to do so. Here we highlight several alternative models that may make energy efficiency more accessible.

> $10,000 proactive upgrades may not be realistic for many middle income households.

[51] For more information, visit the DOE Home Energy Score website: http://www1.eere.energy.gov/buildings/homeenergyscore/
[52] See *Chapter 6: The Role of Policy* for more information on policies critical to delivering energy efficiency – at scale – to middle income households.

Key "Driving Demand" Lessons for Program Designers

"Retrofits" are a Tough Sell

- Programs must make an appealing case to potential customers, many of whom are not currently interested in upgrading the energy performance of their homes.
- Demands on homeowners, particularly around time and effort, must be minimized. Consolidate the number of steps required. Participants drop out with each additional step and with each time delay.

Lessons from Behavioral Research

- Behavioral science research and practical application confirm that simply providing information and financing is insufficient to encourage widespread adoption of energy improvements.
- Social norms, competition, public commitment and feedback may all be useful tools to guide program design.
- Programs that opt for a *small concessions* approach need to make sure that the participant understands upfront that this is just the first step – and the fewer steps the better.[53]

Sell Something People Want

- Use focus groups and market segmentation research to identify the target audience; understand the specific barriers and effective messages to reach this audience. Different messages may be effective for different customer segments.
- Selling something the customer wants is vital to program success. Messages about home comfort, cost and energy savings, health, and community pride may be effective in engaging potential customers. See "*Solve a Problem that Households Have*" in this chapter for specific messages that may resonate with middle income households.
- Programs should consider creative uses (e.g. iPads with home energy monitors in lieu of interest rate buy downs) of incentive funds – what will get the target audience's attention?

Language Matters

- Words have power – programs should choose the language they use carefully. The terms "audit" and "retrofit" may not be effective. Consider terms like "assessment" or "check-up" and "home performance upgrade" or "home energy improvements". Communication style matters, and this can require training to get right. Programs should consider using vivid examples, personalizing information, using statements of loss (e.g. wasting energy) rather than gain (energy savings), and inducing a commitment from the homeowners.

Engage Trusted Messengers

- Identify and recruit the opinion leaders in the community to model the program's benefits.
- Encourage peer-to-peer conversations to generate "buzz" within the community. One way to do this is through Community Energy Challenges like those being piloted in cities and states around the U.S. including in Kansas, Connecticut and Bellingham, Washington.
- Ask for the support of local organizations, especially nonprofits

[53] The *small concessions* approach seeks to engage people in the community with actions that are easier (which may be as simple as changing a light bulb) and then, through additional program contact, encourage them to make larger changes. There is research that shows a big commitment is more likely after a small commitment,, and that making small efficiency improvements can encourage people to view themselves as more energy efficient individuals, which may make them more likely to choose a comprehensive upgrade in the future (Fuller 2009). More research is needed into whether the small concessions approach is an effective driver of larger energy efficiency investments.

- Allow the local community to have ownership of the program
- In some areas of the country, utilities are considered trusted messengers

Work Closely With Contractors

- Contractors need to buy into the program and may need complementary sales training in addition to their technical skills. They are often the primary sales force for home energy improvements, and are ideally positioned to sell energy efficiency as an add-on to existing remodeling projects.
- Leveraging contractors' existing relationships to deliver program messages can be a cost-effective way to increase demand for comprehensive energy upgrades.
- Quality assurance is vital – customers are likely to view private contractors as extensions of the program, and the quality of the contractors' work will significantly impact program success.

One Touch Is Not Enough

- Outreach campaigns need to repeatedly "touch" potential participants.
- Programs should take steps to ensure residents are receiving consistent and/or coordinated messages, especially if there are multiple program messengers.

Design and Evaluate Programs to Learn What Works

- Collect data on the effectiveness of different marketing and outreach approaches. Incorporate processes for evaluating these metrics into program design, and use this information as feedback to adjust program delivery.
- Integrate experimental design into programs to test different strategies.
- Look at the **all in** costs of the program – including all direct and indirect staff time, incentives, marketing materials, etc – and come up with a cost per home upgraded. How does this return on investment compare to other strategies and program models available for delivering energy improvements?

Success Requires a Holistic Approach

- A comprehensive approach to energy efficiency market development is required. This will require the long-term commitment of funding and effort by program funders and implementers.

These key lessons are part of a larger report available here: http://drivingdemand.lbl.gov

Start With the Basics

Encourage the basics today and incorporate efficiency into future home improvement spending.

Instead of pursuing a "comprehensive" upgrade in a single interaction with the homeowner, one strategy for reducing costs is to encourage homeowners to do the "basics" today (e.g., air sealing, duct sealing, and climate-appropriate insulation) and then in the future when they need to purchase replacements (e.g., furnace, water heater, air conditioner, windows) or remodel, encourage or require the most efficient choices. Although not targeted exclusively at middle income households, the Arizona Public Service (APS) / Salt River Project (SRP) coordinated Home Performance with ENERGY STAR® program has seen primarily basic improvements since launching in 2010. Around 4,000 upgrades are expected to be completed through the program in 2011 (the program has a conversion rate from assessments to upgrades of approximately 40 percent), with an average project cost of about $3,000. These projects, which yield an average of about 10 percent electricity savings per home, are primarily duct sealing, air sealing, insulation, and shade screens. Contractors give the customer a comprehensive energy upgrade

plan up front, and most contractors anticipate maintaining the customer relationship over time as households need and can afford additional work.

Another example is Energy Efficient Cities, a program run by Minnesota's Center for Energy and Environment (MNCEE) and its many program partners. This program provides education and basic direct-install measures[54] to all participants during a home visit, and then highlights the two or three additional measures that will yield the biggest savings – usually insulation and air sealing. The program negotiated the costs for these additional measures with contractors in advance to ensure fair pricing and to allow program staff to give quotes upfront (usually within +/- 25%). In the first two years of program operation, MNCEE and its partners have done home energy visits including the basic direct-install measures in almost 7,000 homes. Of these, almost 1,500 homes (a 21% conversation rate) have completed upgrades such as insulation and air sealing. The average household cost for the visit is $35, and the average upgrade project cost is $3,000. Total program costs have been $500 - $700 per home visited, including some startup expenses. This program is also noteworthy in its creative and cost effective approach to community-based outreach.[55]

It is important to note that this alternative approach should be seen as a complementary pathway for pursuing comprehensive upgrades – for a portion of the population, comprehensive upgrades may be attractive today, for others it may be a longer process.[56] Program managers and policymakers should consider encouraging multiple pathways to achieving their residential energy efficiency targets.

Pre-packaged Improvements

Many energy efficiency programs rely on energy assessments that can cost $100 to $600 to identify the energy saving improvements for each participating household. Another option is to forego the assessment, and use prescriptive approaches – offering a standard set of measures that are expected to save energy across a range of properties or within a specific type of targeted housing. By eliminating the full energy assessment and hours spent on designing a tailored proposal, a program can reduce the amount of time and money a household must invest. In Eagle County, Colorado, the Better Buildings-funded Energy Smart initiative is offering a prescriptive package of energy improvements designed by the National Renewable Energy Laboratory (NREL) that is tailored to Colorado's climate and is expected to deliver energy savings across a wide variety of the county's housing stock.[57,58] One tradeoff – and an important consideration for policymakers – is that in order to increase confidence that measures will save money across a wide range

> Prescriptive improvements expected to save energy across a range of properties can reduce transaction costs.

[54] Direct install measures vary by city, but usually include CFLs, low-flow showerheads, low-flow faucet aerators, programmable therostats, hot water heater wraps, and weather striping.

[55] The Energy Efficient Cities program report is available here for more information: http://www.mncee.org/Innovation-Exchange/Reports-and-Technical-Documents/Energy-Efficient-Cities--Using-a-Community-Based-A/

[56] Basic improvements tend to have relatively quick paybacks. One open question that the basic approach raises is whether households will make enough energy improvements in the future to achieve the deep energy savings relevant to public policy goals like reducing greenhouse gas emissions—particularly improvements that are not necessary to the functioning of a house and may not have attractive paybacks.

[57] 146 households completed energy improvements improvements through the Energy Smart program from Fall 2010 to September 30, 2011.

[58] DOE's Better Buildings program awarded 40 competitive grants to state and local governments for energy efficiency programs. For more information, visit: http://www1.eere.energy.gov/buildings/betterbuildings/neighborhoods/

of households, prescriptive paths typically involve less comprehensive energy upgrades, and thus less depth of energy reductions than assessment-based programs.

Do-It-Yourself (DIY) Improvements

About one third of all home improvements and one third of energy-related home improvements done by middle income households are DIY projects.[59] Programs in Vermont and Wisconsin have supported DIY energy upgrades. In a 2010 six month pilot run by the Central Vermont Community Action Council (CVCAC), the program provided participants with training, professional guidance, and financial incentives. Before this program, homeowners making their own energy improvements did not qualify for state efficiency rebates. But if homeowners attended a training session, and worked closely with a Buildings Performance Institute (BPI)-certified auditor who would direct, inspect, and certify the homeowner's work, they could claim the incentive and save money on labor costs.[60] It was a small pilot with 78 people attending the training workshop, and some participants quickly realized they did not have the skills to do the work. The 24 participants who made improvements themselves were satisfied with the program and able to get energy upgrades at a reduced cost.[61]

> 1/3 of home improvement spending is DIY—programs are experimenting with DIY energy efficiency.

Volunteer Outreach[62]

Because of the intensive outreach necessary to motivate and deliver energy improvements to middle income households, programs – particularly utility customer-funded initiatives with limited budgets and strict cost effectiveness requirements – may not have sufficient funds for outreach. A number of efforts are underway to use volunteers to conduct outreach to reduce costs. In Buffalo, New York's Green & Healthy Homes Initiative (GHHI) community pilot, volunteers will use a whole neighborhood approach to conduct initial home inspections to evaluate energy efficiency opportunities and assess homes for health and safety issues. In both Cincinnati, Ohio, and Charlottesville, Virginia the local programs are engaging teams of AmeriCorps volunteers to conduct their door-to-door neighborhood sweeps. In Washington DC, the DC Project has adapted political campaign volunteer management technology for use in outreach to promote energy efficiency. The program has data systems for managing neighborhood sweeps, house parties, and phone banking that it will make available to other organizations around the country that want to manage volunteers.

The Better Buildings for Michigan program has taken this concept one step further and is recruiting homeowners within target neighborhoods to do outreach either as volunteers or with a small salary.[63] After these homeowners have an energy assessment on their own home, they are trained by program staff to go door-to-door and engage their neighbors as trusted messengers, or spokespeople, for the program. For one homeowner, winters are miserable because the snow melts off her roof and drains onto her driveway, creating an icy, dangerous trek from her car to her home. The realization that

---

[59] U.S. Census Bureau, 2005 American Housing Survey. "Energy related" home improvements refer to projects involving installation, replacement or repairs to insulation; roofing; central heating; or central air conditioning systems.
[60] The Building Performance Institute, Inc. (BPI) is a national standards development and credentialing organization for residential energy efficiency retrofit work. For more information, visit http://ww.bpi.org
[61] It will be important to evaluate energy savings data from DIY programs to assess potential trade-offs between reduced costs and potential impact on energy savings compared to contractor-installed projects with similar measures.
[62] Volunteer outreach can reduce program administration costs, freeing up public monies for allocation to customer incentives.
[63] BetterBuildings for Michigan is a targeted neighborhood sweep program testing a number of different marketing approaches, incentives, and financial packages.

installing insulation in her attic could help solve the problem was something she was eager to share with her neighbors who had similar problems. Program managers believe that the ability of neighbors to relate their personal experience with solutions to common problems will lead to increased program participation. In its first nine months, almost 650 energy upgrades were completed through the program, and many more neighborhood campaigns are planned.

Demand Aggregation

Focusing on a single geographic area can cut marketing costs. One way to do this is to pre-qualify all households in a neighborhood for a set of program incentives.

By focusing on a targeted geographic area, some programs have reduced costs by negotiating discounts, organizing bulk purchasing, and tapping into local outreach channels and word of mouth. One example is the Columbia Gas Home Performance Solutions Program in Ohio. The "assisted" version of this program serves families earning between 150 percent of the federal poverty line (FPL) and 80 percent of the area median income (AMI). Participants pay just $25 for an energy assessment, and the program covers 90 percent of the cost of insulation (including wall insulation) and air sealing, which averages about $2,100. If the furnace needs to be replaced, the residents also receive a $1,000 rebate towards the cost of replacement. In order to cut marketing and administrative costs, the program has experimented with "pre-qualifying" a whole town or neighborhood. The neighborhood is selected based on generally high energy use and low incomes – but not everyone has to fit the target income range once the area has been pre-qualified, everyone can participate. This allows the program and – perhaps more importantly – local leaders, organizations and contractors to blanket whole neighborhoods with information about the program. Jack Laverty, manager of Demand Side Management at Columbia Gas of Ohio, reports that they have spent almost nothing for marketing in these neighborhoods due to the organic word of mouth "buzz" that results. They have also been able to negotiate standard prices for insulation and air sealing with local contractors, so that homeowners don't have to get multiple bids or worry about unfair pricing. Demand for this program far outstrips the available funding – in Lorain, Ohio where the whole town was pre-qualified, annual program funding was exhausted in the first few months of the initiative.

Reduce Participant Risks

Another way to increase demand for efficiency is to reduce participant risks. Program managers stress that many middle income households *need* to save money, or at least save enough money to offset investment costs over the expected lifetime of the installed measures. Products and financial incentives that increase the likelihood that energy bill savings over the measures expected lifetime will be larger than energy improvement investment costs can be effective in attracting the middle income population segment.

Increase and Appropriately Market Financial Incentives

Programs should consider tiered financial incentives based on household income and expected energy savings.

It is clear that rebates work – for example, Austin Energy recently used ARRA funds to double its typical incentive offering for a limited time and experienced a large, temporary spike in demand (Better Buildings 2011). Some programs tier financial incentives based on household income and expected project savings. In New York, middle income households are offered a 50 percent rebate on project costs through the state's Assisted Home Performance with ENERGY STAR® (AHPwES) program, while higher income households qualify for a 25 percent rebate through the state's Home Performance

with ENERGY STAR® (HPwES) program. Rather than award incentives strictly by project cost, Clean Energy Works Oregon (CEWO) is considering financial incentives structured to reduce loan payments to a certain percentage of expected energy savings. For example, households earning 60 to 80 percent of AMI might qualify for a financial incentive that reduces monthly loan payments to 70 percent of expected energy savings while households earning 100 to 120 percent of AMI might qualify for a financial incentive that reduces monthly loan payments to 90 percent of expected energy savings.

One challenge that several program managers mentioned is finding the "sweet spot" where incentives reduce a household's financial contribution *just enough* to motivate action, but avoid paying more than needed or discouraging households to invest in improvements beyond the basics.[64] Wisconsin's Targeted HPwES initiative, where at least 90 percent of the cost of basic weatherization improvements for qualifying households have historically been covered, has had little success motivating additional energy efficiency investments beyond the basic improvements.

Some program managers also cautioned that appropriately framing incentives matters to middle income households. New York's AHPwES program has met some reluctance from qualifying households who take pride in their hard-earned self sufficiency. Having program representatives and contractors emphasize to a household that this incentive is not a "hand out" – that they pay into the system via their utility bills and are entitled to benefit from it – has been important in overcoming household resistance to public support.[65] Further, program managers and contractors emphasized that communicating both the significant public benefits and the private benefits from energy efficiency – and stressing that the public benefits are part of the motivation for the rebate has helped to overcome household discomfort.

Rather than trying to motivate customer cost-sharing, some programs are making existing public investments go further. In California, the cities of Richmond and Berkeley are using publicly-funded workforce training programs to deliver free or deeply discounted energy improvements to middle income households. The Green Energy Training Services (GETS) program uses recent graduates of a local workforce training program to complete energy improvements for middle income households who do not qualify for WAP.[66] In Richmond, energy upgrades are provided for free (up to a $5,000 value). In Berkeley the program requires a security deposit of $200 and provides up to 75 percent off the total cost of the work, with higher incentives given for deeper savings.[67] The cities get two benefits for each public dollar spent – hands on experience for newly-trained workers and low- or no-cost energy improvements for middle income residents.

Performance Guarantees

In theory, the residential energy efficiency market – where savings in excess of investment costs over the expected useful lifetime of the improvements are often expected on average across the housing stock

[64] Several experts and program administrators noted that this "sweet spot" for higher income households appears to be an incentive of approximately 25 percent of job cost. There is little data available for the "sweet spot" for middle income households, although several programs have tested a 50 percent incentive. In some cases, the middle income "sweet spot" may be less a function of the percentage of job cost covered and more a function of the absolute level of cost contribution a household makes. Program experimentation is needed.
[65] New York's HPwES and AHPwES incentives are funded, in part, by a system benefit charge.
[66] Qualifying households have incomes of $44,000 to $107,000 for a family of four. The cost of living in the Bay Area is significantly higher than the national average – for example, in Berkeley, the Area Median Income (AMI) is $92,300 for a family of four.
[67] The $200 security deposit is applied to the total cost of the work.

(though savings variance exists at the household level) – is a potential market for insurance-type products like performance guarantees.[68] Today, however, performance guarantees are expensive to offer to individual homes – the process of monitoring and responding to claims is costly, and there is plenty of room for debate about why any specific energy upgrade did not deliver predicted savings (e.g., changes in behavior, new plug loads, changes in occupancy, weather patterns). Only a small number of the largest home performance contractors offer some form of a "savings guarantee" – though these offers tend to be short-term and have a host of caveats and exceptions that render them more of a marketing tool than a true guarantee of long-term savings. It is possible that better data on the performance of energy improvements may, over time, prove effective at mitigating or at least identifying the various behavioral changes and other risks that make residential energy performance guarantees so challenging.[69] Programs should consider piloting guarantees to assess the cost of offering them, their value in driving demand for home energy improvements and their impacts on household behavior.

Flexible Loan Terms

Another approach to reducing customer risk, used by Long Island Green Homes (LIGH), is to provide flexible loan terms to ensure that energy savings exceed loan payments. The term might be set at five years based on expected savings to ensure that monthly energy bill savings exceed improvement financing costs, but if the savings are less than estimated, program managers have the flexibility to reduce monthly payments by extending the loan repayment period to ensure that savings are greater than loan payments.[70] LIGH loans are funded with public monies and managed by the local government; convincing private lenders to alter loan terms once they are originated may be difficult and expensive.[71]

Use Trusted Messengers

Regardless of improvement types and incentive levels, tapping trusted sources of information, such as local leaders, local organizations, and peers, can get customer attention and overcome uncertainty by building upon existing relationships and networks. These trusted parties may differ across income groups and even within middle income households in a region. The following programs have successfully used local trusted information sources to reach middle income households:

> Leverage existing social networks and trusted sources of information to overcome uncertainty about efficiency.

- **NeighborWorks of Western Vermont (NWWVT).** In Rutland County, Vermont, NeighborWorks of Western Vermont (NWWVT) program managers recognized that few low and middle income households were taking advantage of Efficiency Vermont's existing energy efficiency incentive programs.[72] NWWVT is a trusted local nonprofit that has supported affordable home ownership in the region since 1986. With Better Buildings funding from the DOE, NWWVT worked with staff and volunteers who are well-known and

[68] Permance guarantees, in general, asure a household that it will receive a specified level of energy savings. If transaction costs of monitoring energy use are low enough, in situations where savings are expected, on average, individual customer risk can be pooled such that, for a fee, all customers can be promised savings.
[69] In the commercial sector, firms like Energi are now offering energy performance insurance products.
[70] When a loan term is extended, the overall loan amount is not changed, but monthly payments are reduced. While a longer term may ensure that a customer's monthly energy savings exceed monthly loan payments, extending the loan term also means that the borrower pays interest for a longer period of time, thus incrementally increasing the cost of the investment..
[71] LIGH is funded by the City of Bablyon, NY's municipal solid waste cleanup fund. The city changed the definition of waste to include CO_2.
[72] Efficiency Vermont is Vermont's utility customer-funded energy efficiency utility.

trusted in the community to conduct phone-a-thons, direct outreach, and personalized home visits to develop interest in energy efficiency. From November 2010 to October 2011, over 800 homes underwent energy assessments and 158 homes have been upgraded – with at least 200 more in the pipeline – in a region that has seen little participation in existing programs.[73]

- **Indianapolis EcoHouse Project.** In Indianapolis, Indiana, the DOE Better Buildings-funded EcoHouse Project partnered with the Indianapolis Neighborhood Housing Partnership (INHP), a well-respected local non-profit institution with deep roots in the community. Since 2000, INHP has facilitated the delivery of $220 million of financing for mortgages and home improvements to Indianapolis homeowners. INHP has also provided home ownership assistance, including lending and education programs to over 17,500 residents. EcoHouse messaging focuses on improving a home's comfort and value while saving money, but City of Indianapolis staffers emphasized that working through INHP – rather than any specific marketing messages – has been a key driver of middle income household interest in the first few months of the program. The EcoHouse Project has also engaged the community center in one of its target neighborhoods, Indianapolis' Near Eastside. Indianapolis Office of Sustainability Director John Hazlett pointed out that representatives from the community center have been working in the Near Eastside for years delivering services, and that some low and middle income residents distrust local government, "Having a physical presence in the neighborhood is important. Everyone knows INHP and the community center – the trust and name recognition associated with it has helped to drive interest." Neighborhood associations have also been a major driver of program interest – more so than in suburban neighborhoods, Indianapolis's neighborhood associations are very well-organized and INHP has worked hard to get association leaders connected to the EcoHouse Project so that they can communicate the benefits to their members (see a case study of INHP's EcoHouse Project in the Appendix).

- **Wisconsin Targeted HPwES.**[74] In Wisconsin, middle income participants in the state's utility-customer funded Targeted HPwES program most commonly first heard about the initiative through word of mouth communications from friends, neighbors, or relatives (see Table 2).

Initial Source of Information	Percentage of Respondents
A friend, neighbor or relative (word of mouth)	25%
Newspaper media	14%
Bill insert	10%
Program/Focus on Energy (program sponsor) website	9%
WHEAP program staff (WAP program)	8%
Community/agency/social services	7%
Direct mail/letter/brochure from Focus on Energy	6%
Utility representative	5%
Press releases	3%
Other	8%

[73] 910 households expressed interest in a home energy checkup and were added to NWWVT's systems. 804 households (88 percent) completed home energy checkups, and 46 percent of those households have either completed or are in the process of completing upgrades.

[74] The program is currently being redesigned, but has historically been structured such that households earning between 60 percent and 80 percent of State Median Income (SMI) are eligible to receive up to a 90 percent rebate (depending on the measures installed) for energy improvements. 435 projects were completed in 2009 (the last year for which data is available). While multifamily buildings and renters are eligible, over 95 percent of participants in 2009 were single family, duplex or mobile homeowners.

Table 2. How Wisconsin's Targeted HPwES 2009 participants first heard about the program (based on 200 interviews).[75] (Source: Duerst et al 2010-1)

- **Local Energy Alliance Program (LEAP) AHPwES.**[76] In Virginia, LEAP managers used the City of Charlottesville's existing network of social service providers to spark interest in the ARRA-funded AHPwES initiative.[77] As a result, program demand has come primarily from these social service networks, friends and neighbors of participants, and income-qualified households who apply to the city's market-rate energy efficiency program. For example, the program reached out to a list of homeowners who participated in another city-funded program that offers free paint to improve the exterior appearance of homes, and these households have been a driver of recent program demand.

Solve a Problem That Households Recognize

It is also important to sell energy upgrades in ways that most appeal to the target audience. Motivators for investing in energy efficiency are likely to vary across income groups. Below we include some messages that may resonate with the middle income market.

"Maintain the Value of Your Home"

Owning a home is the primary means of wealth creation for most middle income families, and middle income households have historically made significant home improvement investments – many of which have no short term impact on household cash flows. These investments are often seen as part of the ongoing cost of owning and maintaining one's home. Framing energy improvements as investments in maintaining and increasing the value of their largest asset may be a powerful motivator.

> Frame energy efficiency as a tool for addressing problems that households already recognize.

"Replace Aging/Broken Equipment"

A quarter of participants in Pennsylvania's Keystone Home Energy Loan Program (Keystone HELP) program earn less than 80 percent of Area Median Income (AMI) and 90 percent of participants use the program to make "reactive" improvements.[78,79] Reactive improvements are those for which a household is "reacting" to a problem – often an equipment failure. Many middle income households have aging or broken equipment that they know needs to be replaced – and offering them financing for investing in more efficient equipment can be a powerful motivator. Despite offering more attractive interest rates for more comprehensive efficiency approaches, Keystone HELP has not had significant success in motivating 'reactive' households to make additional investments in efficiency measures like insulation and

[75] In 2009, 435 projects were completed through Wisconsin's Targeted HPwES program (Duerst et al 2010-2).
[76] LEAP is a community-based Virginia nonprofit serving Albemarle, Fluvanna, Greene, Louisa and Nelson counties, and the City of Charlottesville. Its AHPwES initiative offers households earning less than $61,350 (family of four), $5,000 for energy improvements.
[77] Since its launch in fall 2010, 288 energy upgrades have been completed through LEAP programs of which 35 have been AHPwES projects (as of November 31, 2011).
[78] 90 percent of program participants across income groups use the program for reactive improvements. For more information on Keystone HELP, visit: www.KeystoneHELP.com
[79] 80 percent of State Median Income (SMI) in PA is $52,550 (HUD 2011 Median Family Income Estimates) – suggesting that despite variance of median income across regions, many households who apply for Keystone HELP meet our middle income definition.

air sealing. Requiring participants to make minimal weatherization investments in conjunction with these equipment replacements and providing contractor sales training may increase program effectiveness in incentivizing comprehensive improvements.[80]

Crystal Purcell, Deputy Director at Home HeadQuarters (HHQ), a New York community development financial institution (CDFI) said that the majority of households financing energy upgrades through HHQ are motivated to participate in New York's AHPwES program by the need to address a necessary equipment or structural repair or replacement. She noted that as a result of the difficult economy, many middle income households are deferring basic investments in maintaining their homes – notably in addressing roofing issues – and, over the past several years, HHQ has seen its home improvement loan portfolio shift away from investments in preventative maintenance and towards investments in emergency interventions. HHQ has more demand for financing emergency repairs than it can meet, and addressing these problems in conjunction with energy improvements may motivate households to participate (see Appendix for a case study on New York's energy efficiency program offerings).

"Solve Health, Safety and Structural Issues"

Ruth Ann Norton, National Director of the Coalition to End Childhood Lead Poisoning and the national Green & Healthy Homes Initiative (GHHI) program, suggests that specific health-related triggers can open significant markets for energy improvements among low and middle income families. For example, she suggests focusing on households with asthmatic children where unhealthy home air quality is a trigger for asthma attacks (see *Chapter 4: Building Structure Issues* for more information on mitigating health and safety issues in conjunction with energy improvements).[81] In Minnesota, the Center for Energy and the Environment (CEE) has used creative messaging on preventing ice dams to create demand for its energy efficiency offerings (See Figure 9).[82]

[80] However, these requirements may come at a cost as some potential borrowers may not participate in a program that includes minimum requirements beyond efficient equipment purchases.
[81] There are options to simultaneously improve indoor air quality (IAQ) and improve energy efficiency. However, IAQ can be improved or degraded by energy upgrades. It is important that energy improvements include adequate ventilation to mitigate any potential air quality risks caused by reducing air leakage from homes.
[82] Ice dams may result when inadequate roof insulation causes accumulated snow to melt then freeze in gutters. This ice then prevents gutters from properly draining additional meltwater, which may then leak into the home and cause structural damage.

Figure 9. Ice dam prevention postcards mailed to households by Minnesota's Center for Energy and Environment (Source: MNCEE)

"Save Money by Reducing Energy Bills"

Many middle income households face significant housing affordability challenges, and reducing their energy bills may help to increase their financial stability (EPC 2007). Recent evaluations of household motivations for participating in Wisconsin's Targeted HPwES program and the perceived benefits of energy upgrades among middle income participants provide valuable insight into the power of framing energy efficiency as an opportunity to save money and solve existing problems (Duerst et al 2010-1). Participants were primarily attracted to the program for one of two reasons – 1) It provided them an opportunity to make home improvements they knew they needed (40 percent of respondents) or 2) It offered a way to reduce their energy bills or save energy (40 percent of respondents). After participating in the program, almost two thirds of respondents noted that the primary program benefit was a reduction in their utility costs which made it easier for them to save money or pay bills. The other third of participants said a healthier and more comfortable home was the primary energy efficiency benefit.

Make it Easy (But Not Too Easy)

Offering simple, seamless, streamlined services is particularly important for middle income households. Packaging financial incentives, minimizing paperwork, and pre-approving contractors gives people fewer reasons to decide against or delay energy upgrades. In Maryland, the state's AHPwES pilot program contractors reported difficulty scheduling assessments, primarily because many middle income homeowners could not afford to take off work during business hours, and frequently could only schedule assessments for nights or weekends. This suggests that one way to make energy improvements more attractive to middle income households is for contractors to offer services on evenings and weekends. However, while an easy process is vital, making program elements free (such as the initial energy assessment) may attract "tire kickers" who do an initial first step, but never follow through.

INHP Vice President Joe Huntzinger acknowledged the challenges in delivering efficiency in this sector, arguing that, "You have to make programs extremely attractive, so that it's hard to say no in a weak economy. Today, there is tremendous debt aversion and people generally want to deleverage, not add leverage." To make the EcoHouse Project loan program palatable, INHP is delivering low interest rate loans and eliminating fees for energy assessments, title searches, and lien recordings. The program's nominal $50 fee is primarily intended to weed out "tire kickers". And INHPs experience to date suggests that there are a lot of "tire kickers" – just 25 quality applicants resulted from almost 200 household inquiries in the first few months of the program: "We have to go through a lot of leads to identify someone who is both interested and qualified so that when we do an assessment it's for a homeowner that is very likely to act." To further simplify the customer experience, INHP has, with its subcontractor WECC, selected qualified contractors who have agreed to offer fixed pricing for energy improvement measures. While the homeowner is free to select an eligible contractor, INHP plays a very active role in facilitating this process. INHP's Program Manager Becca Murphy emphasized that program staff must be hands-on throughout the process, "In INHP's target income range, households can become passive very quickly."

Energy advisors can shepherd households through the upgrade process, but can be expensive.

Some programs are using energy advisors to guide homeowners through the upgrade process. The role of the advisor varies depending on the needs of the target market, but the advisor's primary job is to streamline the participation process and act as a trusted source of information to households. Some programs rely heavily on energy advisors to schedule the initial assessment, complete a walkthrough of the home, directly install some energy saving measures, review contractor bids, and perform quality assurance after the work has been completed. Others use a less intensive (and less costly) approach by having dedicated energy advisors available to answer questions by phone or email. Programs focusing on low and middle income households, like NeighborWorks of Western Vermont, will often go the extra mile and supervise contractors when a homeowner can't be home, alleviating the need for homeowners to miss work.[83]

The key to the success of the advisors is that they provide a trusted third party perspective to the homeowner. Although the qualifications for the positions vary, they are typically filled by someone with experience in the home performance industry and they are frequently BPI-certified contractors. Having an experienced adviser on the other end of the phone to answer questions and review bids often frees homeowners of the fear that they are being taken advantage of by the contractors performing the work, especially when the terminology and recommended measures are outside of the homeowners' experience. Homeowners have responded positively to assistance from energy advisors. Tom Bregman, the director of Energize Bedford in New York, says homeowners have had such a positive experience with their Energy Coach that word of mouth promotion has made the Energy Coach a "superstar" around town and he is frequently overbooked with requests from homeowners seeking a conversation about their particular situation.

However, active hand holding can come with a hefty price tag, and programs will need to carefully balance the cost of these services with the results. Many programs are currently experimenting with

[83] Several program administrators noted that inability to miss work is a significant barrier for middle income households and that convincing contractors to schedule work for evenings and weekends is important.

energy advisors using ARRA funding, so there will be results to share in the next year or two about which energy advisor models seem to be most effective.[84]

Key Takeaways

- A bad economy and uncertain benefits (e.g. energy savings, home values) make energy efficiency a difficult sell.
- Encourage multiple pathways to energy efficiency. Reducing the cost of upgrades with basic, prescriptive, or do-it-yourself improvement packages may make energy efficiency more appealing to middle income households.
- Households are risk averse – incentives, guarantees, and flexible loans can reduce their risk.
- Middle income households know their homes have problems — energy efficiency can help solve them.

[84] Programs in Rutland,Vermont, Boulder,Colorado, Portland,Oregon, University Park, Maryland, Bedford, New York, Lincoln-Omaha, Nebraska, Wisconsin, and Bainbridge, Washington, are all using some form of energy advisor.

Weatherization Innovation Pilot Program

In 2010, the Department of Energy's ARRA-funded Weatherization Innovation Pilot Program (WIPP), awarded $30 million to 16 competitively chosen pilot projects intended to demonstrate innovative approaches to weatherizing low income households around the country. The WIPP initiatives seek to overcome a variety of barriers to delivering weatherization services to qualifying households, including:

- Insufficient public monies to deliver free services to all eligible households
- Health and safety issues in eligible properties
- Cost effectiveness concerns given uncertainty of energy savings

Many of the same issues that affect weatherization in low income households are also barriers to delivering energy efficiency to middle income households. While some WIPP initiatives are still in planning stages, several innovative solutions that may be applicable to middle income program design will be tested and are worth highlighting.

Barrier: Insufficient Public Monies

Provide Financing to Expand Household Access to Weatherization

Several WIPP pilots are using their grants to increase financing accessibility for eligible households or affordable housing building owners. WAP has historically been a free direct install program, so including a customer cost-sharing component, particularly in single family households, is controversial as it is not clear that these households can afford any level of cost sharing. However, annual federal WAP appropriations are insufficient to serve most eligible households. If financing can be done responsibly, it may prove to be an effective approach for leveraging limited public funds to reach more households in need. Financing appears to be particularly promising in the multifamily sector, where WIPP pilots are being designed to deliver loan capital to non-government affordable housing building owners – not WAP-eligible tenants – while overcoming split incentive challenges.[85] For example, Stewards of Affordable Housing for the Future (SAHF) is piloting the delivery of Energy Service Company (ESCO) performance contracting models to owners of affordable multifamily housing. A $1.25 million loan loss reserve will support nearly $8 million in financing for energy upgrades for 2,500 housing units in 40 to 50 eligible properties.

Supplement WAP Funds with Carbon Credits

A number of WIPP pilots are seeking to increase weatherization funding by monetizing the public benefits that accrue from weatherization measures that decrease greenhouse gas pollution. The Local Energy Alliance Program (LEAP) in Charlottesville, Virginia is planning to sell carbon credits through the Maine State Housing Authority, which has pioneered a standardized methodology to quantify savings from residential energy improvements. Programs may sell energy savings informally – for example, the Maine State Housing Authority has structured a partnership with Chevrolet, selling the company voluntary carbon credits to increase funds available for weatherization.

[85] Because renter households don't own the property in which they live, they are usually not authorized or not incentivized to invest in energy efficiency improvements. Tenants are typically responsible for paying utility costs, so rental property owners don't have a way to recoup their investment costs through lower utility bills.

Use Volunteers and Partners to Reduce WAP Costs

Some WIPP grantees are seeking innovative ways to take advantage of existing community resources to lower their costs with volunteer labor and outreach. Several Habitat for Humanity International (HFHI) chapters around the United States are planning to deliver weatherization to over 1,700 low income households using HFHI's network of volunteers.

Barrier: Health & Safety Issues

Coordinate Public Funding Sources and Streamline Service Delivery

Several grantees are trying to streamline and integrate the weatherization process by simplifying participation or integrating it with other federally-funded programs. Streamlining and bundling programs can reduce delivery costs and participant barriers. The Green & Healthy Homes Initiative (GHHI) is bundling weatherization services with home health services (such as lead hazard reduction and indoor allergen reduction) to implement a comprehensive assessment, intervention, and education program that improves health, economic and social outcomes for low income families.[86] By leveraging public and private housing intervention resources, the Green & Healthy Homes Initiative approach may be effective in overcoming the barrier faced by traditional WAP programs of having limited health and safety budgets while also producing a more comprehensive intervention that can result in wealth retention and increased property values for owners

Barrier: Uncertainty of Energy Savings & Cost Effectiveness

Use Technology and Education to Increase Depth and Persistence of Savings

The variance and persistence of energy savings can be problematic when trying to deliver long term benefits to households and to assess the cost effectiveness of weatherization programs. Several WIPP grantees are trying to find ways to maintain or even increase the energy savings from weatherization over time. One approach is to provide education programs that help homeowners or tenants identify ways to achieve and maintain energy savings. Another approach uses technology; some projects are installing home energy monitoring devices to provide feedback to homes that have had weatherization measures installed to help them gauge energy costs and prevent savings from falling off over time. The Commission on Economic Opportunity in Wilkes-Barre, Pennsylvania is deploying in-home display devices to help households manage their energy use and achieve the long-term energy savings goals developed for each homeowner with support from AmeriCorps volunteers.

Next Steps

Most of these projects will be launched by late 2011. Early evaluations will be completed after 6 months and include examination of energy bill data, interviews, and comparisons across projects. For more information on these projects, visit: http://www1.eere.energy.gov/wip/wipp_projects.html

[86] See *Chapter 4: Building Structure Issues* for more information on GHHI.

Chapter 4: Building Structure Issues

On average, the homes of middle income households are older than those of their wealthier peers. Some of these houses have building structure and maintenance issues that reduce their value, and can adversely affect the health and safety of their occupants. Households are often aware that these problems need to be addressed, but in an uncertain economy, they are reluctant or unable to invest scarce resources in correcting them before they turn into emergencies. Frequently, these problems must be addressed before – or in conjunction with – the installation of energy improvements. Those issues that go unresolved can degrade the performance of energy upgrades (such as a roof leaking on new insulation) or create hazardous conditions (such as incomplete combustion in a stove or water heater if the home is made airtight or knob and tube wiring, which may be a fire hazard if covered in insulation). Correcting these problems, however, can be expensive and may not deliver lifetime energy savings to the homeowner in excess of investment costs. While more expensive in the short run, addressing non-energy issues as part of energy efficiency program delivery may attract participants, and address important health and safety hazards.

Prevalence of Health, Safety, and Maintenance Issues

Nationally, about 10 to 15 percent of income-qualified households are rejected from the Weatherization Assistance Program (WAP) due to the presence of serious and unresolved health, safety, or maintenance issues that would threaten the efficacy of weatherization or the welfare of building occupants if efficiency measures were installed (Wilson 2011). These issues are likely present in about a third of WAP-eligible households nationwide, but the rejection rate is lower because WAP providers are able to address many of these issues with WAP funding or by leveraging outside sources of funding and/or expertise in conjunction with weatherization.[87,88]

> Some middle income households have non-energy health, safety, and maintenance issues.

The rejection rate varies widely across the country, owing to both differences in housing stock and different WAP provider willingness and ability to leverage outside funding sources and delivery channels to address these issues. For example, across 12 cities participating in the Green & Healthy Homes Initiative (GHHI) that reported data, about 13 percent of households were rejected on health and safety grounds (i.e. they made upgrades impossible or unsafe, and could not be addressed by the program), but this rejection rate varied from zero percent to over 60

[87] Our estimate of the overall presence of healthy, safety, or structural issues is based on discussions with WAP administrators, service providers, and advocates.
[88] The Department of Energy allows states to determine and request in their respective state plans what portion of WAP funds they feel are reasonable for spending on health and safety measures.

percent across the pilots (NCECLP 2010).[89] GHHI inspections found that the most common hazards that lead to rejection are structural defects, ventilation issues, and moisture, mold and mildew (See Figure 10).

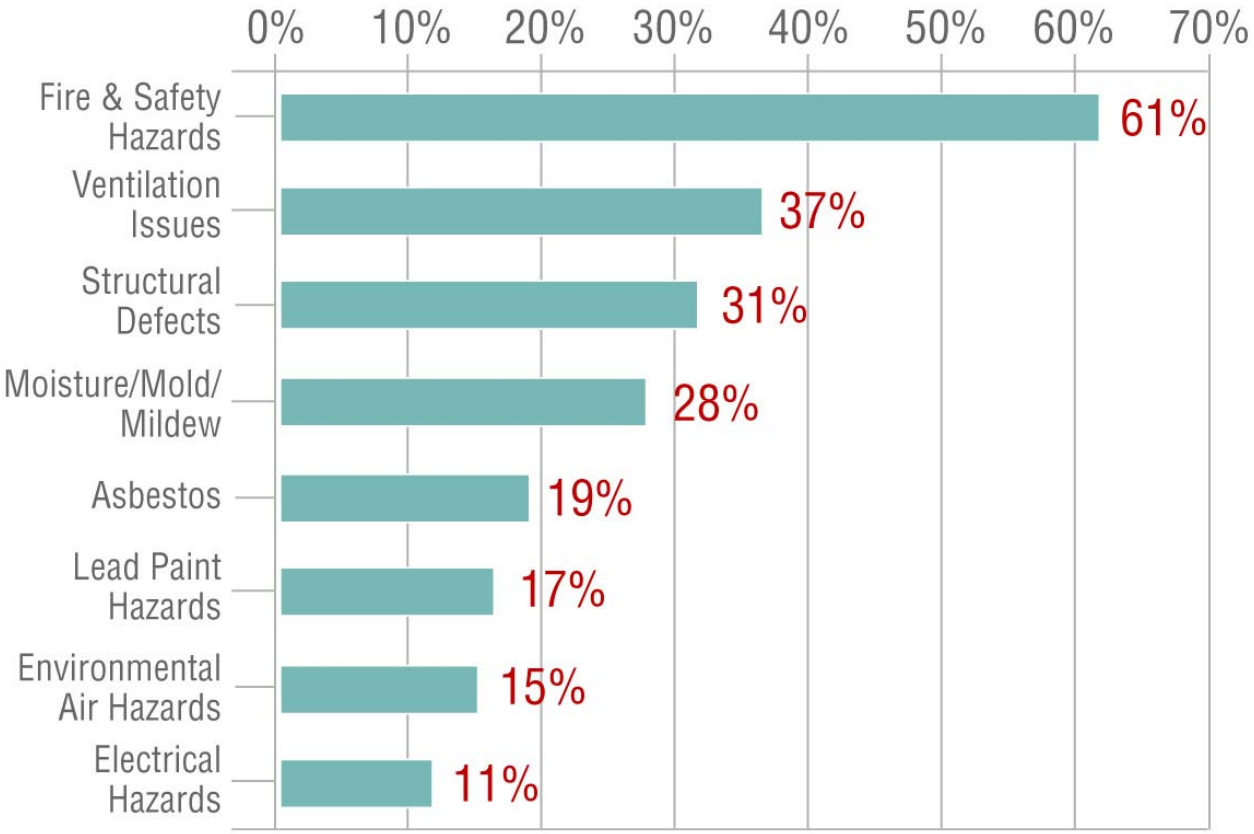


Figure 10. The prevalence of selected health and safety issues in homes inspected in 12 GHHI pilot cities[90] (NCECLP 2010)

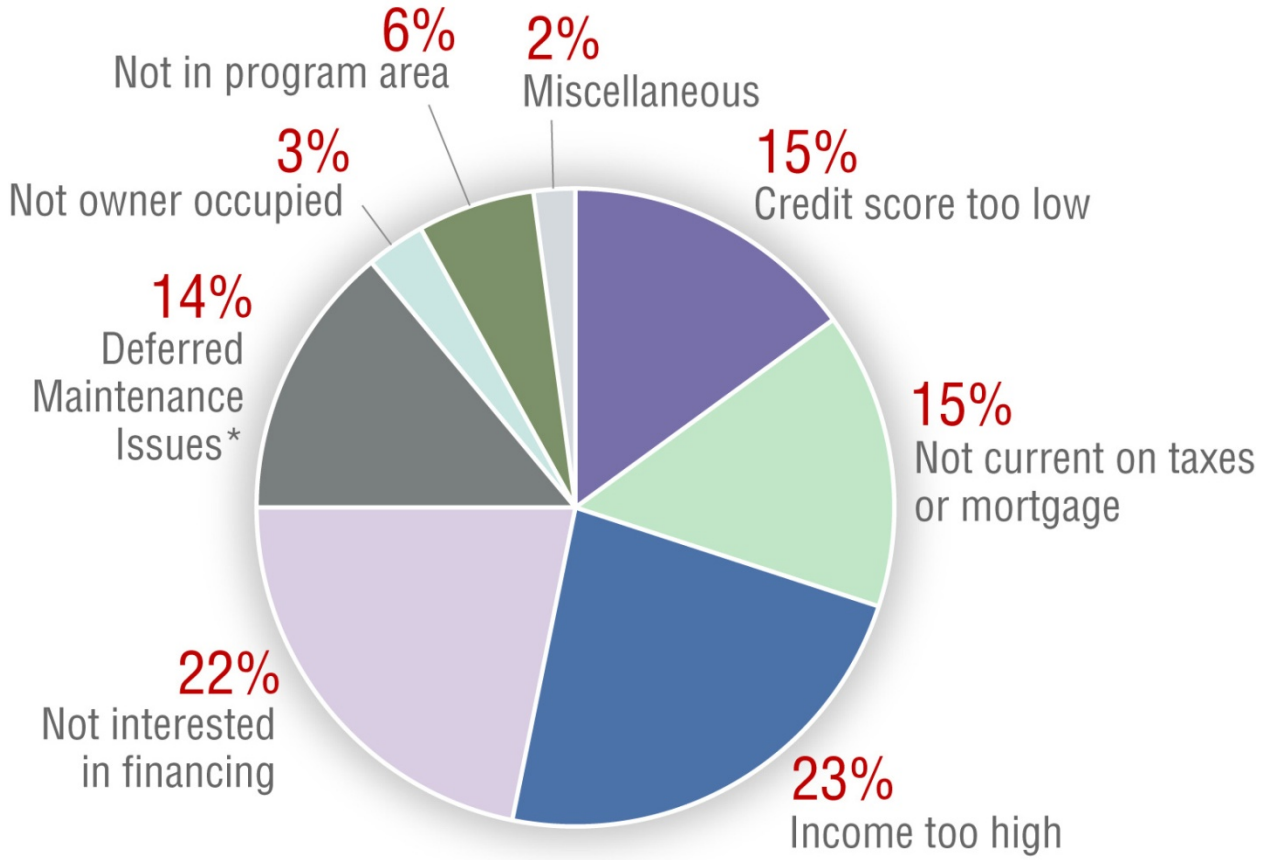
It is reasonable to expect that some of the same patterns of maintenance, health and safety problems are also present in middle income homes – particularly those households on the lower end of this income range. Ruth Ann Norton, executive director of the Coalition to End Childhood Lead Poisoning, noted that based on the Coalition's experience in assessing and completing housing interventions in over 2,700 homes since 1997, while these issues are present among middle income households in roughly the same density, they often tend to be less severe (e.g., requiring a $1,000 roof repair rather than a $10,000 roof replacement). Intuitively, this makes sense as these households are financially better able to meet the ongoing costs of maintaining their homes than their lower income peers.

In Indianapolis, the INHP EcoHouse Project loan program reports that 14 percent of interested households are turned away or referred to other INHP programs due to deferred maintenance issues (See Figure 11), including issues like plumbing and roof repair or replacement. In addition to deferred

[89] Launched in 2009 with 14 participating pilot sites, GHHI is a public-private partnership between the federal government, national and local philanthropy, the National Coalition to End Childhood Lead Poisoning and local partners. GHHI uses a single comprehensive assessment to review household needs and to deliver appropriate social services, including weatherization through the WAP program. .

[90] Many GHHI households had multiple health, safety, or structural issues. Some health and safety issues were addressed by the program, and others were not serious enough to require remediation – resulting in a rejection rate of 13 percent due to these issues.

maintenance issues, INHP regularly encounters health and safety issues like improper venting of combustion appliances and exhaust fans, and the presence of mold, which can be remediated as part of the EcoHouse project scope so long as they do not exceed 25 percent of total project costs (see INHP case study in the Appendix).



*For the 14 percent of interested households with significant deferred maintenance or health and safety issues, INHP refers them to another program within the organization.

Figure 11. Reason for INHP EcoHouse Loan Project non-participation (n=200).

In Idaho, Home Energy Management (HEM), the for-profit arm of a community action agency, has found that approximately one in four homes with incomes 175 to 250 percent of the FPL have serious problems with the heating system, electrical system, or roof.[91] These issues typically cost $2,500 to $3,000 to resolve, which HEM often does using utility funds (see breakout box on page X). Based on data from WAP and these programmatic experiences, we expect that a portion of middle income homes have maintenance or health and safety issues that need to be addressed before, or in conjunction with, energy upgrades – with higher concentrations of problems in the lower middle income population.

Paying for Deferred Maintenance

[91] Households earning 175-250 percent of FPL in Idaho are within our middle income definition.

Deferred maintenance issues can be expensive to address – after all, part of the reason these issues exist is that households lack access to capital to remediate them. It is important that energy efficiency programs are designed to accommodate this issue for middle income households. The WAP program, for example, permits providers to use a "reasonable" portion of grant funds to address health and safety issues, and does not include health and safety measures in cost-effectiveness calculations.[92] Some energy efficiency programs allow participants to address these issues with a portion of the program-sponsored loan they take out to pay for energy improvements. This suggests that many of the financing opportunities discussed in *Chapter 5: Access to Capital* may also be effective in overcoming cost barriers to home repair investments. Other programs direct participants to complementary public or non-profit programs that offer loans and/or grants to reduce the up-front cost of these improvements.

> Clean Energy Works Oregon permits households to use up to 20 percent of the energy improvement loan as a "contingency allowance" for non-energy improvements.

Clean Energy Works Oregon (CEWO) permits households to use up to 20 percent of the energy improvement loan as a "contingency allowance" for non-energy improvements such as water damage repair, ventilation improvements, dealing with old knob and tubing wiring, etc. In addition, in areas of the City of Portland targeted for urban renewal – often those neighborhoods with low and middle income families – the Portland Development Commission provides additional loan capital to increase the contingency allowance to 40 percent of the total project cost up to $10,000. This funding is provided seamlessly within CEWO's existing on-bill financing program, and does not require a separate application (See Appendix for a case study of CEWO).

Allowing participating households to use a portion of their energy efficiency loan for non-energy measures raises important questions about both the appropriateness of using bill payer funds to finance non-energy related home improvements and cost effectiveness. While utility customer-funded programs must pass cost effectiveness tests and many stakeholders suggest that middle income households *need* to save money when they invest in energy efficiency, these same households have historically invested in improvements to maintain the value of their homes even where those investments yield no immediate financial return – and in many cases these improvements are required to enable the efficiency work. In order to address cost-effectiveness constraints, some programs simply limit the amount of loan capital that can be allocated to non-energy measures. Those that require customers to invest in energy improvements expected to deliver net financial savings address cost effectiveness issues in several ways – some simply exclude non-energy measures from Savings to Investment Ratio (SIR)[93] calculations, while others include these measures and require that savings from energy efficiency measures are sufficient to offset the costs of the overall package of energy saving and non-energy measures installed. Requiring that savings from energy measures offset the cost of the overall package of installed measures can be a significant barrier to doing this work.

Coordinated Service Delivery to Improve Household Outcomes

[92] Reasonable cost is defined on a state-by-state basis—typically a maximum of 10-15% of overall grant funds. WAP-funded improvements must have a SIR>1 and a grantee's average per unit cost (including weatherization and health & safety remediation may not exceed $6,500.

[93] Savings to Investment Ratio (SIR) is a crude measure used by several energy efficiency programs to evaluate the cost effectiveness of energy upgrade projects. The expected lifetime savings of an energy upgrade are divided by its investment cost. If the SIR>1, savings are expected to exceed investment costs. SIR calculations may also account for the time value of money, inflation, and/or maintenance costs.

Many of the barriers to energy savings and potential public benefits raised in this report – health and safety issues, housing quality, preservation of tax base, and economic development – are the targets of assorted other programs and funding sources. For example, a local or state entity might offer housing finance, a state or federal agency might offer help with lead abatement, a housing non-profit might provide an economic development grant to stabilize neighborhoods. Middle income households often face a bewildering array of agencies, applications, and qualification tests before they can – piecemeal – take advantage of the offerings.

The goal of these approaches is to deliver a range of complementary social services, sometimes with different funding sources, in a coordinated manner.

Several initiatives have been piloted to coordinate the funding and streamline the delivery of energy efficiency services with health, safety and housing rehabilitation services for low and middle income households. The goal of these approaches is to leverage existing community resources to reduce intervention costs, eliminate excessive customer hassle and enhance household outcomes by delivering a range of complementary social services, sometimes with different funding sources, in a coordinated manner. Two recent pilots highlight the opportunities – and challenges – to this coordinated approach.

Weatherization Rehabilitation and Asset Preservation (WRAP)

The WRAP Project, a pilot led by the Energy Programs Consortium[94], attempted to coordinate the delivery of WAP and housing rehabilitation services for low and middle income homeowners in 11 U.S. communities. Over three years, more than 600 households received improvements through the initiative, 25 percent of whom earned between 50 and 80 percent of AMI. The participating organizations found a range of barriers to coordinated delivery and funding of energy efficiency and deferred maintenance improvements (Rohe et al 2009):

- **Varying program delivery procedures and standards**. Programs often have different procedures for inspecting homes, certifying inspectors, data collection and reporting – most WRAP pilots were unable to arrange for a single coordinated home inspection to assess both energy efficiency and rehabilitation needs. Multiple inspections reduced the cost effectiveness of streamlined service delivery and increased the hassle for participating homeowners.

- **Varying eligibility criteria.** Federal, state and local social service programs often have different income eligibility criteria and income verification procedures. For example, at the time, DOE's WAP program allowed states to use a maximum household income of 65 percent of State Median Income (SMI) or 150 percent of FPL[95], while HUD's HOME program requires that household income not exceed 80 percent of AMI.

- **Varying expenditure deadlines.** Social services program funding expenditure deadlines vary, which left some pilot organizations unable to line up housing rehabilitation financing in time for eligible households to access expiring funding for WAP services.

- **Turf Wars.** Conflicts between agencies and staff – typically over who got credit for work done – were common, suggesting that lines of authority between delivery agencies need to be very clear.

[94] For more information on the Energy Programs Consortium, visit: http://www.energyprograms.org/
[95] This income limit has since been raised to 200 percent of the FPL.

The pilot results suggest that low and middle income households may, indeed, be willing and able to cost-share for home improvements. Over 60 percent of participating households got a blend of free WAP improvements and rehab measures (for which they had to pay) – and approximately 50 percent of overall project funding came from loans taken by program participants.

Green & Healthy Homes Initiative (GHHI)

Launched in 2009 with 17 participating pilot sites, GHHI uses a single comprehensive assessment to review household needs and to deliver appropriate housing intervention services – it is particularly focused on addressing the household defects that contribute to health issues like asthma and lead poisoning. The comprehensive assessment helps local governments and community organizations understand existing health and safety hazards and energy efficiency opportunities and prioritize funding and programs to maximize social impact without the need for multiple applications and interventions. 1,245 coordinated home upgrades have been completed through the initiative so far with approximately 5,000 more in process.[96] While the program is specifically targeted at WAP-eligible populations, one pilot targets middle income households with a WAP fee-for-service model and is delivering micro-loans to help overcome up-front investment costs.

It is too early to draw conclusions about the initiative's efficacy but the idea behind this approach – streamlining social services provision and leveraging multiple pools of public funds to address health, safety, and building structure defects as part of the energy upgrade process – is promising. Households get safer, lower cost, more comfortable living spaces and are able to address issues that threaten to deteriorate their home value, while the public benefits from reduced medical costs through the elimination of health and safety issues, avoided neighborhood blight from stabilized home ownership, and reduced pollution from energy consumption.

On the health front, 40 percent of U.S. asthma episodes are caused by triggers in homes, representing $5 billion lost annually in preventable medical costs (RWJF 2009). While GHHI is still in its pilot stage nationwide, in Baltimore, over 80 percent of children with moderate to severe asthma – averaging 3 emergency room visits or hospitalizations annually – did not make any visits in the first 12 months after GHHI intervened in the homes.[97] Individuals from middle income households account for roughly 49 percent of the 49.9 million uninsured Americans (See Figure 12) (DeNavas-Walt 2011).[98] Many uninsured individuals are unable to meet their financial obligations for health care provided to them, which is eventually passed on to the public via higher medical care provider rates or direct use of tax dollars in the case of public healthcare facilities (Hadley and Holahan 2004).

[96] Numbers current as of September 30, 2011.
[97] The State of Maryland's Weatherization Assistance Program Office in the City of Baltimore initiated much of this work in Baltimore, working to leverage a multitude of resources. This effort served as a key building block for GHHI.
[98] Owing to data limitations, we use household income of $25,000 - $75,000 to approximate middle income for this health insurance coverage analysis.

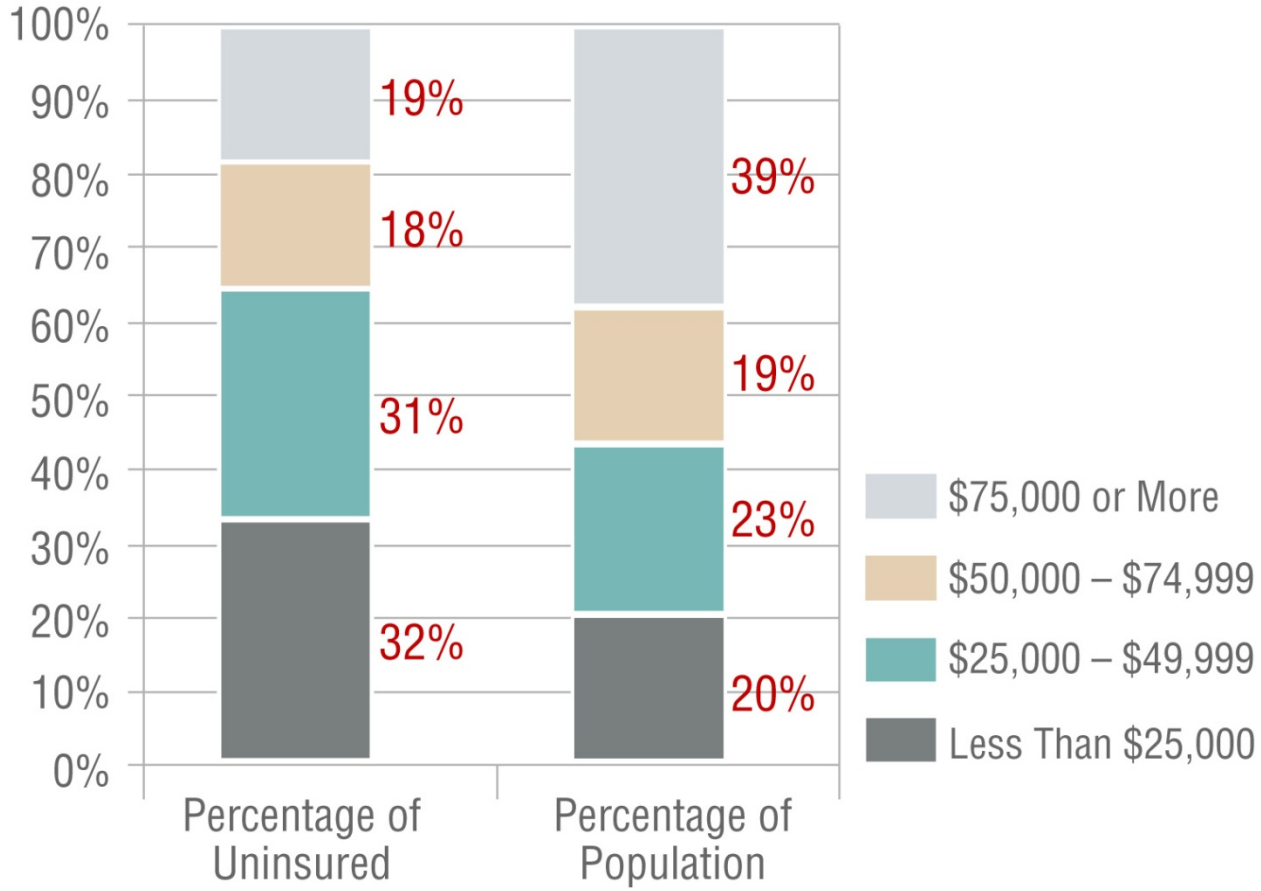


Figure 12. America's uninsured individuals by income and percentage of population[99] (DeNavas-Walt 2011)

The GHHI and WRAP experiences suggest that coordinated multi-agency approaches to social service and energy efficiency delivery can be effective. But, these efforts face institutional challenges and require significant local capacity, commitment and coordination to overcome these barriers. Policy adjustments are necessary to collapse stovepipes among government and non-governmental entities so that energy and non-energy services can be offered in a seamless fashion that maximizes benefits for households most in need. This melding of public and private resources into a single package for households to consider may be more challenging for administrators of utility customer-funded programs (because of regulatory requirements) compared to other types of program administrators (e.g., not-for-profit or governmental entities). By tapping other sources of funding for health, safety and other home rehabilitation measures, these models show promise and if proven to cost-effectively enhance household outcomes, should be mainstreamed and scaled.

Potential Contractor Challenges to Serving Middle Income Households

Beyond funding challenges, deferred maintenance issues may pose additional challenges for some energy upgrade programs focusing on middle income households as some home performance contractors may lack the technical skills, or be unwilling, to both deliver energy efficiency and address

[99] In 2010, the United States Congress passed the Patient Protection and Affordable Care Act, which the Congressional Budget Office estimates may reduce the number of uninsured Americans by 31 million. It will do so by expanding Medicaid eligibility to those earning less than 133 percent of FPL and, for those earning 134 to 400 percent of FPL, by introducing a sliding scale subsidy to purchase private insurance.

maintenance problems. For example, in Virginia, LEAP program managers noted that many of Charlottesville's contractors are either only qualified or prefer to do "high end" energy upgrade work rather than limited energy efficiency improvements coupled with housing rehab or repair.

Existing WAP providers may have appropriate skills and delivery models for fee-for-service energy efficiency and non-energy improvements.

The existing network of over 1,000 WAP providers has been actively dealing with these issues for over 30 years in WAP-eligible households, and these contractors may have appropriate delivery models for delivering fee-for-service energy improvements to middle income households with energy and non-energy housing issues. In addition, many face the likelihood of significant layoffs without additional income streams as Recovery Act funding winds down. In New York, the New York State Energy Research and Development Authority (NYSERDA) has found that while some WAP providers have embraced fee-for-service business, many WAP delivery agencies historically have not had the resources or need to initiate fee-for-service arms of their operation. While some providers are hesitant to diversify in such a way — to avoid detracting from their mission-oriented work of serving low income households — some providers are embracing broader business models, especially as ARRA funding draws to a close and their organizations cannot sustain existing staffing levels.

A range of fee-for-service models can be developed to target different markets, from comprehensive energy improvements to lighter weatherization measures that provide a low-cost option for middle income households. While WAP delivery agents are experienced in home performance, many may lack the complementary skills necessary to *sell* energy improvements. However, there are a few examples of this new model working, including Idaho's South Central Community Action Partnership which has demonstrated that fee-for-service offerings can complement – and support – a Community Action Agency's low income offerings (see breakout box on page X).

In Twin Falls, Idaho, the non-profit South Central Community Action Partnership (SCCAP) has pioneered a fee-for-service energy efficiency model that helps keep its weatherization crews and contractors employed and brings in funds to support the mission. A for-profit entity founded by SCCAP, called Home Energy Management (HEM), offers the fee-for-service improvements. All profits from HEM are returned to help fund SCCAP's services targeted at helping individuals and families become self sufficient. HEM uses the same workers employed by SCCAP for weatherization work through WAP.[100]

Like other for-profit home performance contractors, HEM targets its fee-for-service comprehensive energy upgrades to upper-middle and upper income households. However, HEM has also contracted with a local utility, Idaho Power, to install free energy improvements (funded by the utility) for (lower) middle income households who live in electrically heated homes and earn between 175 and 250 percent of FPL.[101] The utility gave HEM the same guidelines for the middle income work as it did for WAP work – the average upgrade cost needed to be no greater than $6,500 and HEM completes about 30 to 40 homes per year. HEM has served a large number of seniors in double-wide manufactured homes and has found significant structural and deferred maintenance issues in these properties. SCCAP executive director Ken Robinette noted that approximately one in four homes has major problems with their heating

[100] SCCAP has been doing WAP work since 1979, long before the complementary fee-for-service model was launched six years ago.

[101] Households earning up to 175 percent of FPL are eligible for WAP and, through a separate contract, the utility funds SCCAP to do WAP work on income-eligible electrically heated homes

system, electrical system, or roof. These issues typically cost $2,500 to $3,000 to resolve, which HEM does using utility funds under the health & safety category which average about 15% of the contract.[102] HEM's utility- and homeowner-driven energy upgrade business has allowed the company to keep some weatherization workers employed who would otherwise have been laid off in the wake of the state of Idaho exhausting its ARRA WAP funds.[103] HEM has also generated over $80,000 in net income over the last two years that has been channeled to supporting SCCAP's core mission.

Key Takeaways

- Middle income homes are older than those of their wealthier peers. Some homes have health, safety, and/or maintenance issues that need to be addressed before, or in conjunction with, energy upgrades.
- Some energy efficiency programs allow participants to address existing hazards with a portion of the program-sponsored financing.
- Coordinated delivery of energy improvements, hazard reduction, and housing rehab can reduce costs, streamline the participation process and enhance the public and private benefits of energy upgrades.
- In certain markets, existing WAP contractors may have appropriate skills and delivery models for serving middle income households with non-energy barrier issues.

[102] The program's cost maximums are based on average cost across all residences served, so HEM is able to spend more than $6,500 on some homes as long as the average cost per home is less than $6,500.
[103] A number of SCCAP weatherization workers were laid off nonetheless.

Chapter 5: Access to Capital

While middle income Americans have historically invested in improvements that maintain and increase the value of their homes, they have seen an important source of financing — the equity in their properties —evaporate at the same time that their access to other loan products has been restricted. A number of energy efficiency programs are deploying credit enhancements, novel underwriting criteria, and innovative financing tools to reduce risks for both financiers and borrowers in an effort to increase the availability of energy efficiency financing for middle income households. This chapter covers the challenges, opportunities, and emerging models for providing access to capital for middle income households.

Challenges to Accessing Capital

The upfront cost of comprehensive home energy improvements is a significant barrier to investment. Many middle income households need financing to overcome this barrier – and capital access has plummeted in the wake of the recession.

Using Home Equity to Finance Home Improvements

Middle income homeowners have historically invested in improving their homes. In 2001, these households accounted for almost a third of all home improvements made in the U.S., and they financed more than 35 percent of their home improvement investments (Guerrero 2003).[104] Compared to other households that financed improvements, middle income households were more inclined than other income groups to finance home improvements by borrowing against housing equity – two thirds of their financing was home-secured (See Figure 13).[105]

> The recession has eroded household savings at the same time that housing wealth, the primary asset against which middle income households borrow, has declined.

This is both good and bad news. The good news is that middle income households have historically invested in home improvements, and many (57 percent) have not needed financing to do so. The bad news is that the recession has eroded household savings – suggesting that more households will need financing to make improvements – at the same time that housing wealth, the primary asset against which middle income households borrow, has declined.

[104] In 2001, middle income households spent an average of $8,700 when using home-secured financing to pay for home improvements (Guerrero 2003). The level of home improvement spending impacted homeowner financing patterns. For improvements of $5,000 to $20,000, middle income households used home secured financing for 22% of expenditures, less than their overall average, but 10% more than their wealthier peers for the same expenditure range (Guerrero 2003).

[105] Home-secured financing includes home equity loans, home equity lines of credit and cash out refinancing. Unsecured financing includes unsecured loans and credit cards.

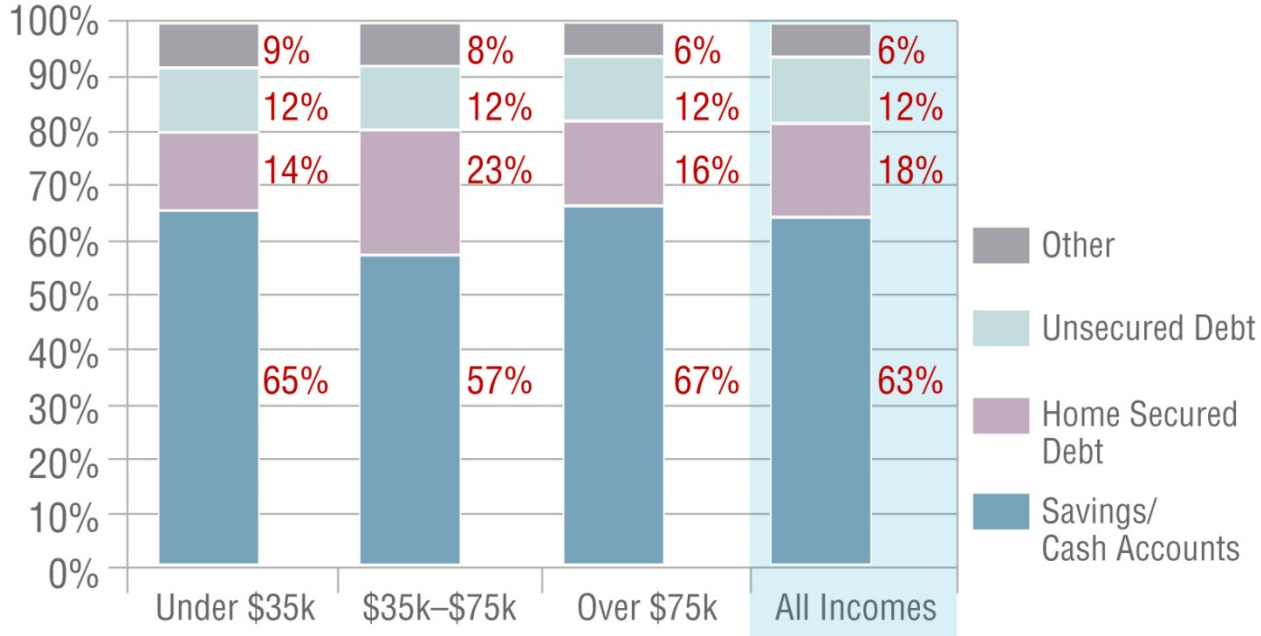


Figure 13. Home improvement financing patterns by income in 2001 (Guerrero 2003)

The Housing Collapse

A number of factors contributed to the enormous speculative housing bubble in the mid-2000s (Lansing 2011). By 2007, primary residences accounted for approximately one third of U.S. household assets. For middle income households, these primary residences represented an even greater share of their assets – almost 50 percent (Bucks 2009).[106] The financial crisis and ensuing recession have since caused a sharp decline in housing values across the United States. Single family home prices have declined by 32 percent from the housing market's 2006 peak and carried household wealth down as well (See Figure 14) (S&P 2011).

> Middle income households had more of their wealth invested in their primary residences, and their home values have fared worse than those of higher income households.

This data masks more dramatic regional declines in housing values and the concentration of these price declines in low and middle value properties – those most likely to be owned by middle income Americans.[107] For example, the Case-Shiller Home Price Index indicates that low tier properties in Atlanta have lost 55 percent of their value since peaking at the end of 2006 – almost double the average 23 percent property value decline in the city over that time (See Figure 14).[108,109] In other words, not only did middle income households have more of their wealth invested in their primary residences

[106] The Federal Reserve Board data uses percentile of income. We use the 40th-70th percentiles ($29,680 to $79,100) to approximate middle income. In 2007, the overall average primary residence asset value as a percentage of wealth was 31.8 percent across all income groups, versus 48.4 percent for middle income households.
[107] The median middle income home value in 2007 was $150,000 (U.S. Census). Assuming a value decline of approximately one third, this median value is likely to be approximately $100,000 today. This value falls into the low tier of the 3-tiered Case-Schiller housing value pricing index across all of the index's 20 major metropolitan statistical areas (MSAs) except for Phoenix (where properties under $95,901 are in the low tier).
[108] In Atlanta, as of June 2011, low tier properties are those valued under $130,356, middle tier are those valued $130,357-$241,832 and high tier are those valued over $241,832.
[109] Case-Shiller Seasonally-Adjusted Home Price Tiered Index Data. June 2011

heading into the recession, but their primary residences have lost a greater percentage of their value than those of their wealthier peers.

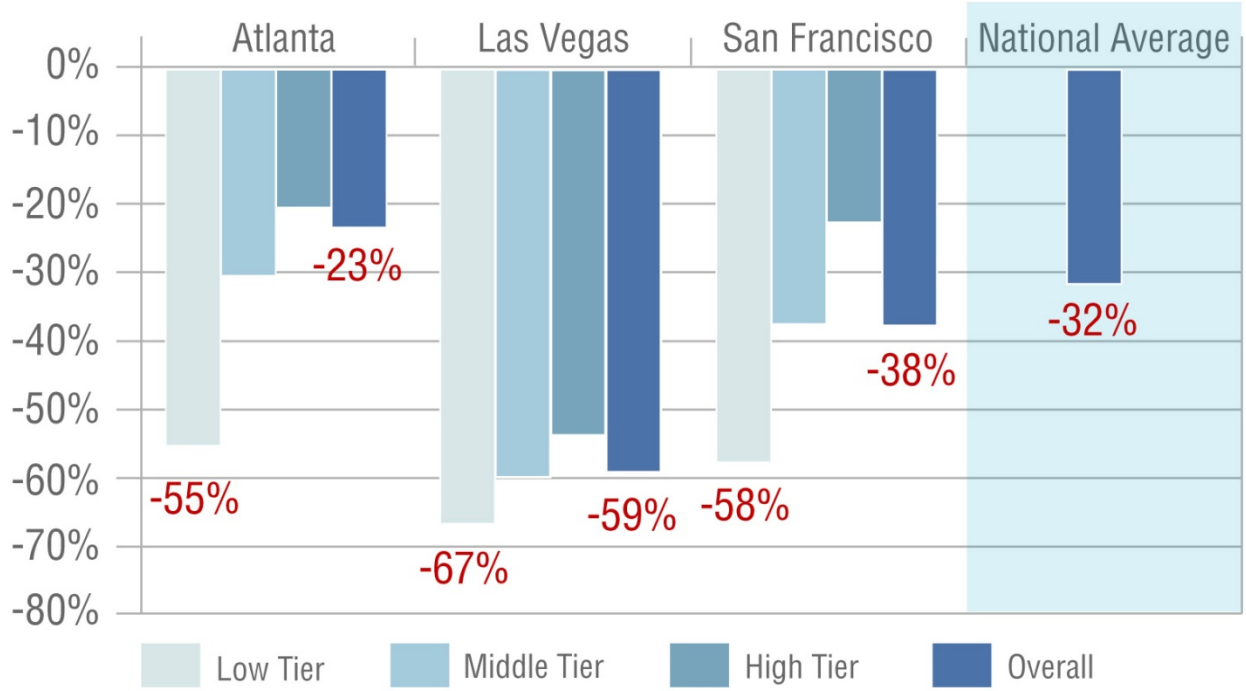


Figure 14. Case-Shiller 20-City Composite Home Price Index of single family home values January 2007 to June 2011 in 3 major U.S. cities, tiered by initial property value[110] (S&P 2011)

While property values (across tiers) nationally have returned to 2003 levels,[111] it would be incorrect to assume that the housing decline has only set middle income families back eight years. Many homeowners took advantage of rising property values by borrowing aggressively against their growing equity – leaving them with significant debt burdens that are, for some, larger than their home values. In fact, over a quarter of all single family residential properties (13.3 million households) are now underwater or have near negative equity (<5% equity) (Corelogic 2011). This negative equity is concentrated regionally – the top five states have 38 percent of all negative equity properties.[112] It is reasonable to assume that many of these underwater properties are owned by middle income Americans – these households took on significant debt to purchase and improve properties, are more vulnerable to financial stress during a recession, and lost more of their home's value than their wealthier peers. These underwater households are more likely to behave like renters; under-investing in improving and maintaining their homes.

The news is not all bad though. While a majority of families across income groups have recently experienced declines in income and wealth – and middle income households have been hit harder than their wealthier peers – a large minority of the middle income population has maintained or increased their

[110] *Ibid.* In Las Vegas, Low Tier properties are those valued under 118,226, Middle Tier are $118,226- $178,664 and High Tier are those valued over $178,664). In San Francisco, Low Tier properties are those valued under $325,457, Middle Tier are $325,457-$601,276 and High Tier are those valued over $601,276.
[111] *Ibid*
[112] *Ibid.* The top 5 states are Nevada (60 percent underwater), Arizona (49 percent underwater), Florida (45 percent underwater), Michigan (36 percent underwater) and California (30 percent underwater).

levels of wealth. From 2007 to 2009, most families (63 percent) experienced wealth declines – for those whose wealth declined, the median loss was substantial, 45 percent (Bricker 2011). However, more than a third of households (37 percent) have not experienced wealth declines or have seen only small changes in wealth. This makes it difficult to make universal conclusions about the state of middle income household finances. While many households are unquestionably suffering – and are likely unwilling or unable to make significant investments in energy efficiency without substantial financial incentives – a large minority of middle income households may be in a position to invest.

Household Savings & Employment

In general, American households appear to feel insecure about their economic futures. Uncertainty about future earnings is high – in 2007, 31.4 percent of all families (across income groups) reported that they did not have a good idea of what their income would be for the next year (Bucks 2009). This uncertainty may well be even higher today as the U.S. unemployment rate has almost doubled since mid-2007. In 2009, almost nine percent of middle income households were unemployed while another 5.5 percent were underemployed (workers that take part-time jobs due to lack of available of full-time jobs) (Sum and Khatiwada 2010).[113]

For those households who have a reasonable expectation of future earnings, the recession has decreased their expectations of annual income growth from around two to three percent before the recession to less than half a percent in its wake – the lowest level in over 30 years (Dunne and Fee 2011). Lower future earnings expectations are a function of both the recession and longer term trends – over the last 30 years, wages have not kept up with worker productivity gains.[114] Uncertainty and pessimism about future earnings are making households increasingly cautious with their finances as many households report higher levels of desired savings to buffer themselves from economic and other emergencies (Bricker 2011). These homeowners are likely to make fewer proactive home improvements, like energy upgrades, in favor of preserving limited savings and access to credit for unforeseen hardships.

Qualifying for Credit

Middle income households are rejected from EE financing programs at higher rates than higher income households – many programs reject 20-50% of applicants.

For those middle income households motivated to pursue energy efficiency, access to low-cost capital is often a significant barrier to investment. Many of the largest energy efficiency loan programs have application decline rates in the 20 to 50 percent range. Household ability to obtain secured financing has declined as housing prices have eroded and lenders have tightened underwriting standards and credit limits (NAR 2011).[115] Similar tightening trends are occurring in unsecured lending as personal creditworthiness has weakened and lenders have responded by increasing the minimum credit scores required to qualify for financing products and reducing the amount of overall credit available to each qualified borrower. Many households turn to high interest credit

[113] As of Q2 2011, the unemployment and underemployment rates have dropped by approximately 0.5 percent across income groups.
[114] For a detailed discussion on wage stagnation, visit the Employment Policy Research Network: http://www.employmentpolicy.org/sites/www.employmentpolicy.org/files/field-content-file/pdf/Mike%20Lillich/EPRN%20WagesMay%2020%20-%20FL%20Edits_0.pdf
[115] Requirements to obtain conventional mortgages have been tightened, with the average credit score rising to about 760 in the current market from nearly 720 in 2007; for FHA loans the average credit score is around 700, up from just over 630 in 2007.

cards to finance expenditures as their options dwindle. These high-cost financing products are ill-suited to energy improvements — particularly those for which the motivation is to save money — as they worsen the payback period of these investments.

Since 2009, approximately 10,000 households have applied for financing through Pennsylvania's Keystone Home Energy Loan Program (HELP)[116]. About 40 percent of these households earn 80 percent of AMI or less, suggesting that many middle income households are attracted to the program.[117] However, the program's early experience shows that middle income households are more difficult to serve – 57 percent of households earning ≤ 80 percent AMI do not meet the program's underwriting standards compared to 31 percent for households earning >80 percent AMI (see Table 3).[118]

In addition to this higher rejection rate, fewer lower income households move forward with financing than their wealthier peers (58 percent of approved households earning ≤ 80 percent AMI fund loans compared to 73 percent of higher income households) – supporting the idea that, for many reasons, even when financing is available, it is more difficult to motivate middle income households to invest. Still, this data shows some promise as these middle income households account for about a quarter of all Keystone HELP loan volume.

Household Income	# Applications (% of Total Applications)	Applications Approved (Approval Rate %)	Loans Funded (Approval→Loan Conversion Rate %)	Average Loan Size
<80% AMI	~4,000 (40%)	~1,720 (43%)	~1,000 (58%)	~$7,500
≥80%AMI	~6,000 (60%)	~4,140 (69%)	~3,000 (73%)	~$9,500

Table 3. Keystone HELP loan application, approval, and loan size rates (by income) – January 2010-August 2011. (AFC First)

According to the Indianapolis Neighborhood Housing Partnership (INHP), the homeowners that they serve typically have little access to anything but credit card financing – often at annual rates from 15-25 percent, so INHP's new EcoHouse Project's mid-single digit fixed-interest rate loans[119] are an attractive tool for enabling energy improvements among households who are otherwise unlikely to be able to access affordable financing. With relatively lenient underwriting standards including credit scores as low as 580,[120] INHP is able to accommodate a wider range of applicants (see case study on Indianapolis's EcoHouse Project in Appendix).

[116] Keystone HELP offers unsecured loans and loans secured by a subordinate lien mortgage at various interest rates. The specific offering depends on the measures financed and loan size. Underwriting includes a minimum credit score of 640, no bankruptcy, foreclosure or repossession in the last seven years, no outstanding collections, judgements or tax liens exceeding $2,500 and a 50 percent maximum DTI.

[117] 80 percent State Median Income (SMI) in PA is $39,600 – suggesting that despite variance of AMI across regions in the U.S., many households who apply for Keystone HELP meet our middle income definition.

[118] Program underwriting is based on these criteria: Minimum FICO Score 640; no Bankruptcy, Foreclosure, Repossession in past 7 years; no Unpaid Collection Accounts, Judgments, Tax Liens >$2,500

[119] Loan interest rates are based on U.S. Treasuries. In July 2011, interest rates on secured loans were 5.97 percent and on unsecured loans were 6.66 percent.

[120] Households with credit scores as low as 580 can qualify for secured financing through INHP's EcoHouse Project loan program. Most national lending products require a minimum credit score of 640 to 680.

Credit scores estimate an individual's likelihood of repaying certain types of debt relative to one's peers. Credit scores are a key metric for most lenders in evaluating consumer creditworthiness. Because credit scores are relative measures, a large shift in bill payment trends, like that caused by the recession, has triggered an increased likelihood of loan default for each "band" or range of credit scores. In other words, a credit score of 720 today reflects a higher estimated risk of loan non-payment than a credit score of 720 in 2005. For example, in the case of VantageScore[121], the delinquency rate on a new loan issued to a person with a 720 score between 2008 and 2010 is expected to be twice as high as on a new loan issued between 2003 and 2005 (see Table 4).

VantageScore	Loan Delinquency Rate		Delinquency Rate Increase
	2003-2005	2008-2010 (Anticipated)	% increase in rates btw 2003-2005 and 2008-2010
591-610	21.50%	25.44%	***3.9%***
611-630	17.11%	21.18%	***4.1%***
631-650	13.63%	17.81%	***4.2%***
651-670	10.90%	14.62%	***3.7%***
671-690	8.24%	11.74%	***3.5%***
691-710	5.99%	9.74%	***3.8%***
711-730	4.27%	8.11%	***3.8%***
731-750	3.21%	6.64%	***3.4%***
751-770	2.22%	5.28%	***3.1%***
771-790	1.67%	4.29%	***2.6%***
791-810	1.15%	3.33%	***2.2%***
811-830	0.80%	2.57%	***1.8%***
831-850	0.49%	1.78%	***1.3%***
851-870	0.38%	1.40%	***1.0%***
871-890	0.24%	0.90%	***0.7%***
891-910	0.19%	0.63%	***0.4%***
911-930	0.19%	0.53%	***0.3%***

Table 4. Changes in VantageScore loan delinquency rates for new loans originated from 2003-2005 compared to loans originated from 2008-2010 (anticipated).[122] (VantageScore)

Although credit scores do not explicitly take income into account, middle income households are likely to have lower credit scores than their wealthier peers (See Figure 15).

[121] VantageScore is a one of a number of consumer credit risk scores that use credit data and analytics as one measure of consumer creditworthiness. Many score models exist in the marketplace (others, like Fair Isaac (FICO) are mentioned elsewhere in this report). However the score values from one model are not comparable to the values of other score models – that is, a 650 score from one model is not comparable to a score value of 650 from a different model.

[122] Credit score models, including the VantageScore model, do not predict absolute delinquency rates. Rather, these models predict the "likelihood" of default for each consumer whose score falls within the indicated range.

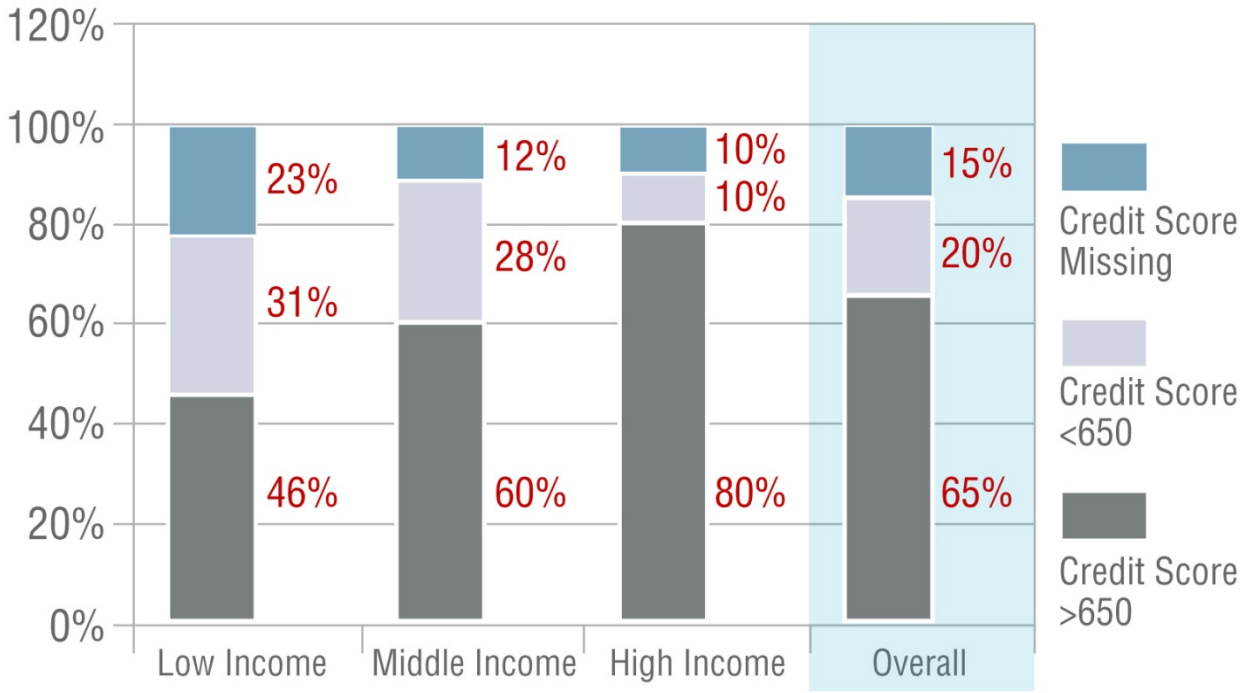


Figure 15. Homeowner credit scores above and below 650 by income in Q4 2010[123] (Energy Programs Consortium)

These lower scores may be in part due to creditworthiness and in part due to the way in which scores are calculated, notwithstanding issues about how middle income households manage their credit. For example, a key factor in calculating credit scores is one's ratio of credit utilization to credit availability – many middle income households have less overall credit availability than their wealthier peers, often causing their credit utilization rate to be higher and their credit scores to be lower. This lower credit access may be a function of many things, including lower absolute levels of home equity and post-recession reductions in the maximum loan sizes lenders offer to customers. In other words, income implicitly impacts some credit scores – even in cases of identical loan repayment histories, middle income households may be assigned lower credit scores than their wealthier peers.

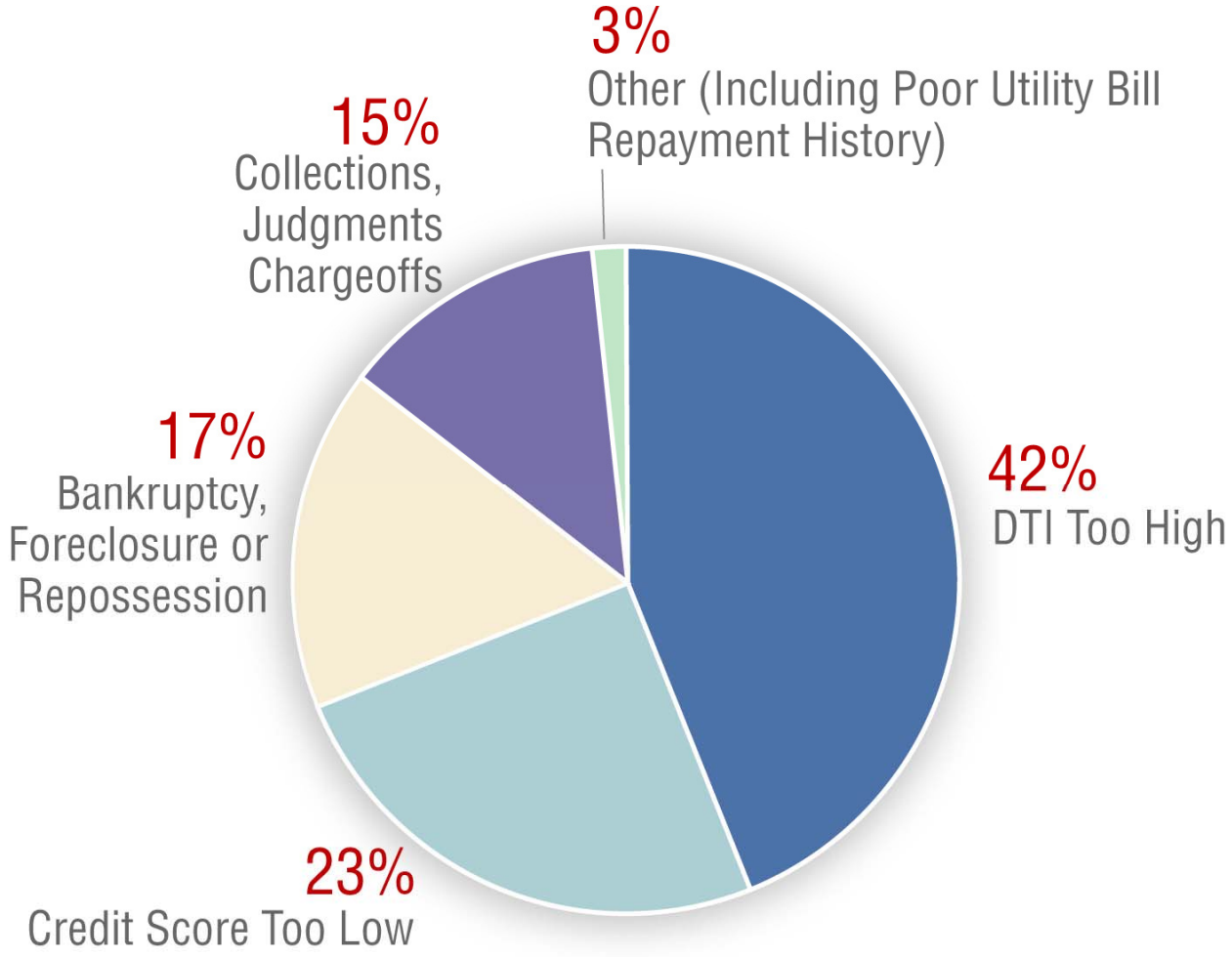
Most lenders use credit scores as just one of several metrics for evaluating consumer creditworthiness. Underwriting standards for loan products, including those for home improvements, frequently include both a minimum credit score and a maximum debt-to-income (DTI) ratio.[124] In 2007, over 20 percent of all households with home-secured debt had DTI ratios higher than 40 percent, suggesting that as many as one in five households may not qualify for financing programs that include a maximum DTI underwriting

[123] Due to data limitations, for the purposes of the credit score analysis we use household income of $30,000 to $70,000 to define middle income. Credit score data from Energy Programs Consortium; based on analysis of TransUnion credit data from Intellidyn.

[124] The debt-to-income (DTI) ratio is a measure that reflects a household's ability to service its existing debt with current gross income. A household with a DTI ratio of 50 percent has annual debt service payments that equal 50 percent of the household's annual gross income. A maximum DTI is intended to ensure that borrowers have sufficient cash flow to make loan interest and principal payments.

requirement (Bucks 2009).[125] These numbers are worse among middle income households – more than one in three middle income households (35 percent) have DTIs exceeding 40 percent.[126]

Program experiences to date suggest that maximum DTI underwriting requirements are significant barriers to capital access. For example, NYSERDA has declined more loan applications because household DTI ratios exceed the allowable limit than for any other reason. Forty-three percent of NSYERDA's loan application declines (17 percent of loan applicants) have been caused by excessive DTI ratios while just 23 percent of declines were triggered by low household credit scores (See Figure 16). Major credit events like bankruptcy, foreclosure, repossession and outstanding collections account for more loan denials (33 percent) than low credit scores – these loan applicants will be very difficult to serve moving forward.



[125] Our DTI ratio calculation is not directly comparable to the way in which energy loan programs calculate DTIs. This calculation considered income net of taxes while loan underwriters use gross (e.g. before tax) income. These numbers may, therefore, overstate the problem. However, middle income households typically face lower effective tax rates than their higher income peers, suggesting that the gap between middle and higher income households with excessive DTI ratios may be larger than these numbers show. [MARK – do you want to explain why you used income NET of Taxes – e.g. data issues, other reasons]

[126] This includes both owners and renters.

Figure 16. Reasons for application rejection in NYSERDA's residential energy efficiency loan program November 2010-October 30, 2011 (NYSERDA)

Opportunities for Increasing Access to Capital

Middle income households clearly need new ways of accessing affordable credit if they are to make home energy upgrades. However, it is important to acknowledge that there can be negative consequences to promoting loans and other products to particularly vulnerable segments of the population. Especially if programs are not ensuring savings, care needs to taken with regard to who is given access to credit and what claims are being made about the benefits of energy improvements.

Underwriting criteria exist for a reason – to ensure that those that get access to financing are willing and able to make required monthly payments. For credit scores, the majority of middle income homeowners (60 percent) have scores of 650 or higher. For those with scores below 650, default risk skyrockets – the projected delinquency rate on unsecured loans more than doubles from 15 to 31 percent for individuals with FICO scores from 600-650 compared to their peers in the 650-700 score band (see Table 5).[127] This raises important questions about how to expand energy efficiency financing – particularly in the absence of certainty that the dollar value of energy savings will be sufficient to cover the full cost of the improvements over the measure's expected lifetime. Debt to income constraints raise similar issues – households with high DTIs are unlikely to have significant cash flow buffers at their disposal should energy improvements not deliver sufficient energy bill reductions to offset financing costs.

FICO Score Range[128]	Delinquency Projection (% Likelihood)
300-499	87
500-549	71
550-599	51
600-649	31
650-699	15
700-749	5
750-799	2
800-850	1

Table 5. Credit score and corresponding delinquency projections. (Transunion 2011 *in* SEE Action Financing WG).

With those precautions acknowledged, there are ways that capital can be made more accessible and affordable in appropriate ways, and with prudent safeguards. This section describes options for using credit enhancements, alternative underwriting criteria, and other financing mechanisms that might better serve middle income households.

Credit enhancements can be used to incentivize lenders to expand the inclusivity of underwriting practices.

Credit Enhancements

[127] One reason for this significantly higher default rate among lower credit score customers may not be lack of creditworthiness, but instead that these households are only offered high interest rate loan products that are more difficult to pay off.
[128] These scores are not directly comparable to the VantageScore scores previously referenced, due to different credit calculation methodologies.

By reducing lender risk, publicly-supported credit enhancements can leverage these limited public monies and attract additional capital for residential loans.[129] Credit enhancements are used to reduce a lender's risk by sharing in the cost of losses in the event that loans default. These enhancements can take the form of loan loss reserves (LLRs), subordinated debt, and guarantees.[130] LLRs, often funded with ARRA or utility-customer funds, are the most commonly used credit enhancement, and they are frequently deployed to reduce borrowing costs or extend borrowing terms for program participants that would likely qualify for other (more expensive) loan products. Rather than simply lowering interest rates, a few innovative programs are using credit enhancements to incentivize their financial partners to offer energy improvement loans to households who would otherwise not have to access capital. Indianapolis is using a large LLR – with 50 percent[131] of losses covered – to households in its target income demographic[132] (for more information on INHP's EcoHouse Loan Program see Appendix), and the cities of Madison and Milwaukee used part of their DOE Better Buildings grant to structure a $3 million LLR to expand the inclusivity of their loan product. This five percent loss reserve reduces the lender's losses in the event of loan defaults and supports a loan pool of up to $60 million. It has been structured so that the cities' financial partner, Summit Credit Union, can recover more funds from the LLR on each loan default for lower credit quality consumers. Typically, a lender must absorb a fixed portion of each loss from any single loan to ensure it is appropriately motivated to lend responsibly. By allowing lenders to collect a greater percentage of their loss on loans to customers with low credit scores, the two cities were able to lower the minimum qualifying credit score to 540 – well below typical loan product eligibility (see Table 6).

FICO Score Range	% of Each Loss Covered By LLR	% of Each Loss Absorbed by Credit Union
690+	70%	30%
650-689	80%	20%
610-649	90%	10%
540-610	95%	5%

Table 6. Milwaukee/Madison-Summit Credit Union loan loss reserve agreement. (Wisconsin Energy Conservation Corporation)

One issue that this type of arrangement raises is whether the lender will continue to be appropriately motivated to responsibly underwrite loans. In the Milwaukee/Madison case, this concern is mitigated by

[129] Loan loss reserves (LLRs) (see next footnote) reduce lender risk by providing first loss protection in the event of loan defaults. For example, a 5 percent LLR allows a private lender to recover up to 5 percent of its portfolio of loans from the LLR. A $20 million fund of private capital would need a $1 million public LLR (5 percent coverage), leveraging each public dollar 20 to 1. On any single loan default, the LLR often pays only a percent of the loss (often 80 percent) to ensure the lender is incentivized to originate loans responsibly even as programs work to minimize the consequences to lenders of a small number of defaults.

[130] Loan loss reserves are held in an account and protect a lender against a specific level of loan losses. Subordinated debt stakes are similar to LLRs – instead of being held in an account, subordinated debt is lent out to customers, and the subordinated debt stake absorbs all losses up to a specified level. Loan guarantee protection can vary depending on the agreement, but can cover all or part of a lender's losses.

[131] In comparison, most LLRs for Recovery Act-funded programs have covered 5 to 10 percent of a portfolio's losses.

[132] INHP is targeting 80 percent of its EcoHouse lending to households at or below 80 percent of AMI and the remaining 20 percent to households earning between 80 percent and 120 of of AMI. 120 percent of AMI for Indianapolis household of 4 is $79,200.households and 80% AMI for an Indianapolis household of 4 is $52,800.

Summit Credit Union's Union demonstrated commitment to responsible lending to low and moderate income households. Summit's Chief Lending Officer, Dan Milbrandt, pointed out that expanding the inclusivity of financing is difficult and that it takes effort on the part of the credit union to understand applicants' credit situations and figure out where, on the margin, less creditworthy households are willing and able to take on debt. "You have got to be willing to move beyond automated underwriting. There is a gray area, and Summit has experience examining mitigating factors so that we can responsibly lend to less credit qualified customers."

> Alternative underwriting criteria may help to identify creditworthy borrowers that do not meet traditional lending standards.

Alternative Underwriting Criteria

Rather than using credit enhancements to expand financing to "riskier" borrowers, a number of energy efficiency financing programs are deploying alternative underwriting criteria to identify creditworthy borrowers that do not meet traditional lending standards. NYSERDA's recently-launched Green Jobs-Green New York (GJGNY) initiative is using a 2-tiered underwriting process to expand the inclusivity of financing for its Home Performance with ENERGY STAR© (HPwES) program.[133] Tier One underwriting uses standard credit score (minimum 640)[134] and DTI (maximum 50 percent) metrics to evaluate creditworthiness; 40 percent of applicants are rejected for this financing. NYSERDA is trying to reduce this decline rate with its Tier Two standards that offer households with low FICO scores or high DTIs a second opportunity to qualify for GJGNY financing (see Table 7 for a description of Tier Two underwriting standards). For those households with FICO scores below 640, NYSERDA Tier 2 standards increase the maximum DTI to 55 percent and use utility bill repayment history in lieu of credit score to assess creditworthiness. For households with a FICO score above 680 that were rejected from Tier One because they had a DTI ratio above 50 percent, Tier Two standards increase the maximum DTI to 70 percent and use utility bill repayment history.[135]

Eligibility Requirements		Participant Benefits
Tier 1 FICO≥640 DTI≤50%		3.99% financing Up to $25,000 (3.49% with Automated Clearinghouse (ACH) payment)
Tier 2 (Problem = Low FICO) FICO≤640 DTI≤55% Strong Utility Bill & Mortgage Repayment History	Tier 2 (Problem = High DTI) FICO≥680 50≤DTI≤70% Strong Utility Bill & Mortgage Repayment History	

Table 7. New York's Green Jobs-Green New York financing underwriting criteria. (NYSERDA)

[133] Households earning less than 80 percent of AMI are eligible for NY's AHPwES program, which provides a 50 percent rebate up to $5,000.
[134] Minimum FICO score is 640, unless self-employed – minimum 680 if self-employed for at least 2 years, or minimum 720 if self-employed less than 2 years.
[135] There are many ways to calculate debt to income (DTI) ratios. Most programs use gross income. It is not clear, therefore, that a 70 percent DTI maximum is a meaningful metric for assessing creditworthiness (e.g. many households pay close to a third of gross income in taxes, suggesting that this metric might exclude very few households as debt service could include 100 percent of household net income). NYSERDA already assesses DTI ratios as part of its Tier 1 evaluation, but programs considering a different underwriting process should consider this issue.

Since its November 2010 launch, over $5.6 million has been loaned to 685 households through the GJGNY initiative, of which 24 loans ($204,599) have been issued to households qualifying under the new Tier Two standards. Tier Two underwriting criteria have increased access to capital on the margin, increasing NYSERDA's overall loan application approval rate by two percent. This increase may underestimate the impacts of using utility bill repayment history as a means of assessing creditworthiness – a multi-step application process appears to have been a significant hurdle for many potential Tier Two participants and NYSERDA only launched the "High DTI" underwriting criteria in July 2011[136] (See Figure 17 for a summary of NYSERDA's GJGNY loan application process and data). NYSERDA has already made several changes to the Tier Two underwriting criteria since the initiative launched in 2010, which is indicative of the flexibility that is essential to experiment with more inclusive financing tools. One key challenge has been gaining access to customer utility bills for Tier Two consideration. Many programs around the country have struggled to access customer utility bills. In NYSERDA's case, better access to utility billing information is important to deploying alternative underwriting criteria.

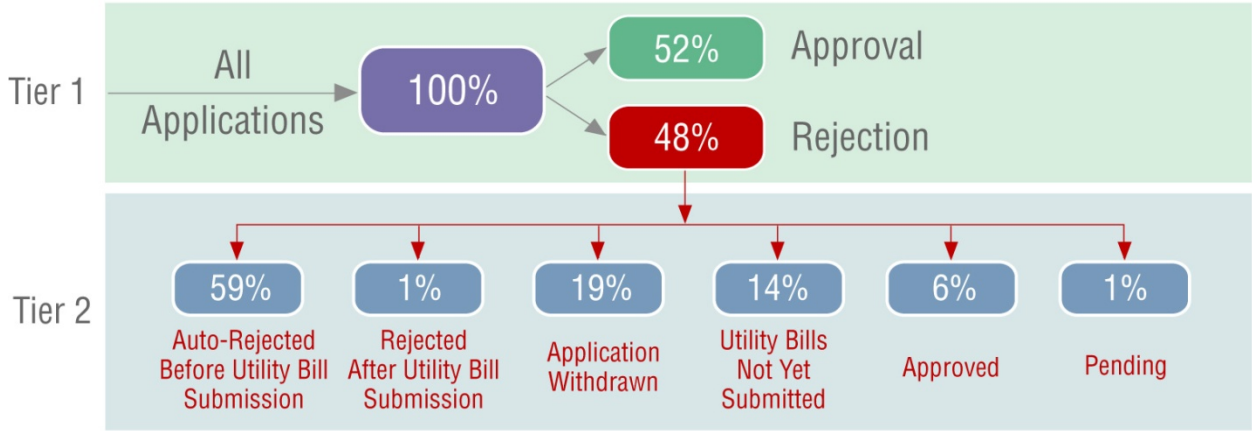


Figure 17. Summary of NYSERDA's GJGNY loan application process and data (November 2010 to October 30, 2011) (NYSERDA)

Other programs, including Midwest Energy and Clean Energy Works Oregon (CEWO), also use utility bill repayment history to evaluate creditworthiness. CEWO's underwriting process is notable for its low cost – while it includes a credit score check, instead of analyzing an applicant's DTI, CEWO examines utility bill repayment history. Using utility bill repayment history in lieu of DTI's significantly reduces loan underwriting expenses, and because more households in many programs are rejected for financing due to high DTIs than low credit scores, it may be a particularly inclusive approach. The early data are

[136] From November 2010 to October 30, 2011, NYSERDA processed 2,648 applications for GJGNY financing. 1,390 (53 percent) were approved under Tier 1 underwriting criteria. Of the 1,258 Tier 1 denials, 747 (59 percent) were rejected from Tier 2 for reasons unrelated to utility bill repayment history (e.g. recent bankruptcy, high DTI). For those 511 households not qualified for Tier 1, but not initially disqualified from Tier 2, GJGNY requires that they submit their utility bills. This step has been a significant barrier as more than 80 percent of applicants have failed to follow-up with bill submission (234 have either formally withdrawn their applications or did not submit utility billing data within 180 days of their initial application. Another 178 have not yet submitted utility billing data, but have not reached the 180 day automatic disqualification date.) 81 households submitted utility bills and 68 (84 percent) of those respondents were subsequently qualified for financing. While the net approval rate increased by just 2.6 percent, this may underestimate the impacts of using utility bill repayment history as other underwriting criteria and the multi-step application process appear to have been significant hurdles. For example, if 84 percent of all 511 households not automatically disqualified from the Tier 2 track (e.g. those that failed to submit their utility bills) had been approved, GJGNY's approval rate would have increased by 16 percent.

promising – CEWO's application decline rate is just 10 percent since the program's 2009 launch – well below that of other energy efficiency loan programs. CEWO's financing partner, Enterprise Cascadia, has dispersed $7.1 million for 565 loans, and no loans have defaulted in the first two years.[137]

These initiatives are relatively new, so it is too early to draw firm conclusions about whether these criteria will be effective at identifying households who can afford to take on debt to invest in energy improvements.[138] While there is reason for some skepticism about the predictive power of utility bill repayment history on loan performance,[139] if on-time utility bill payment turns out to be a good borrower risk assessment tool, it has the potential to increase financing access – and is especially appealing if loan repayments are made on the utility bill as the CEWO program offers. Using on-bill repayment is likely to reduce loan delinquencies, especially where nonpayment can result in disconnection (which is not the case for CEWO).

Innovative Financing Tools

In addition to making standard loan products more accessible, a number of new financial products may be more effective at serving middle income households. Here, we highlight four of these financing tools: OBF loan products that are paid off when properties transfer, employer-offered financing that is deducted from paychecks, and property assessed clean energy (PACE).

On-bill financing may reduce loan delinquencies and increase customer willingness to finance energy improvements.

On-Bill Financing (OBF)

On-bill financing is a tool through which a customer's utility bill is used to collect loan payments for energy improvements. Utilities or third parties can provide the up-front capital for the energy upgrades and the loan can be structured as an unsecured consumer loan, a secured loan, or can be attached to the meter (as opposed to the individual).[140] Some utilities have expressed reservations about performing lending functions in-house, suggesting that third party-funded on-bill models in which financial institutions have core lending responsibilities (e.g. managing credit risk, hedging interest rate risk) and utilities manage customer interactions (e.g. demand creation, quality assurance).

Because many households have long histories of paying their utility bills regularly, some financial experts believe that on bill repayment will reduce loan delinquency. On-bill financing for energy improvements is the most integrated with the savings those improvements are expected to deliver—which may help to

[137] It is important to note that most applicants – both those declined and those approved – have higher than average credit scores, most above 700. In addition, while there have been no defaults to date, CEWO's current "criticized" assets equal 2.1 percent of the outstanding portfolio, including watch list assets at 1.43 percent and problem assets at 0.67 percent (a single loan).

[138] Ultimately, the viability of these alternative underwriting approaches must be assessed not based on how many loans additional loans are made, but whether such loans exhibit payment performance that justifies approving borrowers who would otherwise not qualify for financing.

[139] Households are uniquely motivated to pay utility bills to ensure that their power stays on. This motivation may not hold for unsecured loans, where the penalty for non-payment is a credit score reduction.

[140] If the repayment obligation is attached to a household's utility meter (meter attached), the obligation to pay the loan can stay with the property if a tenant or homeowner moves. In some programs, nonpayment of the bill can trigger utility shut-off of service, a powerful customer incentive to make interest and principal payments.[140] Because of this enhanced security, a household's credit characteristics become less importing to underwriting. However, the same consumer protections that guard against utility service cancellation in the event of utility bill nonpayment also protect on-bill financing borrowers from meter shutoff in the event of loan nonpayment. Some utility commissions have expressed support for facilitating the convenience and messaging of on-bill repayment but are not inclined to support meter attachment which could lead to service disconnection. The extent to which meter-attached financing might influence real estate transactions properties also remains an open question.

alleviate consumer reluctance to take on debt to pay for them. Midwest Energy in Kansas operates a meter-attached residential loan program. If an individual doesn't pay their bill and leaves the property, only the late payments at that point are uncollectible. Any remaining monthly payments transfer to the next customer at that meter. Over three years, the Midwest Energy program has issued about 600 loans for a total of over $3.3 million in funding, and to date less than one percent of loans have been uncollectible (in line with the uncollectible rate of their other utility revenue).

Loan products that are paid off when properties transfer (Deferred Loans)

Some middle income households simply do not have the financial capacity to make consistent principal and interest payments on debt. This is especially true when the financed improvements lead to uncertain cash flow, or if building rehab needs to be funded in addition to energy upgrades, increasing net monthly payments. There are many housing and economic development agencies around the country that will fund home improvements through deferred loans – often health and safety-related rehab for fixed income seniors that have equity in their homes. No monthly payments are required, but a lien is attached to the property that must be paid off when the property is sold or otherwise transferred.

> Paycheck-deducted loans may allow more inclusive underwriting and more attractive loan terms.

The Opportunity Council in Washington uses these deferred loans for repairs needed before free weatherization services to low income families. In Camden, New Jersey the city is using Recovery Act funds to create a revolving loan fund to offer residents a home energy upgrade, paid for with a deferred loan. The Wyoming Energy Savers (WES) loan program offers both amortized and deferred loans based on participant income.[141] Those households earning less than 50 percent of AMI qualify for deferred loans, while those households earning 50-80 percent of AMI qualify for amortizing loans.[142] Income-qualified households who are current on their mortgage are eligible for loans up to $15,000 for a list of pre-approved measures including heating equipment and weatherization measures. Deferred loans are offered at 3 percent interest due at time of home property transfer or sale.[143] One key disadvantage to this product type is that borrowed funds are likely to revolve very slowly.

Paycheck-Deducted Loans

Paycheck-deducted financing involves repaying a loan through regular, automatic deductions from an employee's post-tax paycheck. The Clinton Climate Initiative (CCI) is piloting a program called the Home Energy Affordability Loan (HEAL) in Arkansas,[144] which allows employees of participating companies to finance energy upgrades with repayment through a payroll deduction. Originally, the model entailed CCI providing technical assistance for companies to make energy efficiency improvements to their own facilities. These companies would then put a portion of the savings from these improvements into a revolving loan fund for employees. The employer-assisted model is still available, but CCI found that employee demand for financing was larger than the energy savings companies were realizing, and some

---

[141] An amortizing loan is one in which loan principal is paid down over the course of the loan. A deferred loan is one in which principal and/or interest payments are postponed for a specific period of time or until a specific trigger (e.g. property transfer).
[142] Depending on the county, 50 percent of AMI ranges from $33,700 to $47,450 for families of 4, and 80 percent of AMI ranges from $53,900 to $64,200.
[143] For more information, visit http://www.wyomingcda.com/files/WESDes.pdf
[144] The Clinton Climate Initiative plans to replicate the program in other states beginning in 2012. More information on the program is available here: www.clintonfoundation.org/what-we-do/clinton-climate-initiative/cci-arkansas.

companies have policies that preclude lending to employees. CCI developed a second model in partnership with local credit unions, in which a credit union, rather than the employer, provides the loan capital and loan repayment is deducted through payroll and automatically transferred to the credit union. For one pilot with the largest hospital in Arkansas, the hospital's credit union is offering 5.75 percent interest for up to three years for unsecured loans to employees who have worked at the hospital for at least three years. The loans are unsecured, but the payroll deduction allows the credit union to do lighter underwriting and offer a lower interest rate than they would otherwise offer for standard unsecured loans.[145] Beyond this security, some experts believe that households may be more likely to pay these loans because they are offered through — or are supported by — their employer, and they want to be seen as responsible employees and members of the company's social community.

Property Assessed Clean Energy (PACE)

For those middle income households who have equity in their homes, PACE may be a promising financing tool if it gets past the current regulatory hurdles. PACE programs place tax assessments in the amount of the improvement on participating properties, and property owners pay back this assessment on their property tax bills. Like other property taxes, these assessments are treated as senior liens – which makes them very secure. PACE is debt of the property, which suggests that underwriting need not be based on a borrower's personal creditworthiness (and that the financing can be transferred with the property) – potentially getting around the credit score and debt-to-income issues highlighted in this chapter. Residential PACE currently faces significant regulatory hurdles, which have largely eliminated its use around the country, pending court rulings or federal legislation (for more information, visit http://www1.eere.energy.gov/wip/pace.html).

Loan Pool Aggregation versus Loan Pool Separation

As energy efficiency markets scale, and billions of dollars of private capital become necessary to meet household demand, program administrators and/or their financial partners will likely need to sell energy efficiency loans to "secondary market" purchasers.[146] One important issue to consider as energy efficiency financing markets scale is whether, before being sold into secondary markets, pools of loans made to lower credit quality households should be separated from pools of loans issued using "conforming" underwriting standards to higher credit quality households.[147] Some experts suggest that blended pools of loans, in which strong credits mitigate the risk of weaker credits, will be necessary to deliver attractive loan capital to middle income households at scale. These experts argue that credit enhancements should be deployed to reduce investor risk until a sufficient data set has been accumulated to evaluate the risk of these blended pools.

Others suggest that separate pools are more appropriate, because conforming loan pools would be easier to sell into secondary markets and because these pools would attract the lowest-cost capital available – enabling programs and financial institutions to pass on low-cost financing to these higher-

[145] In some states, a direct lender or employer deduction from the paycheck may not be legal as employees must maintain personal control over their income. These states include: Illinois, Indiana, New Hampshire, New Jersey, New York, Washington, D.C. and West Virgina. However, this is generally viewed as a technical obstacle, and customers may voluntarily setup automated paycheck allocations to personal accounts, which are then automatically transferred to lenders or employers

[146] A secondary market is a market into which previously issued financial instruments (e.g loans, stocks, bonds) can be sold.

[147] A conforming loan is a loan whose structure (e.g. security, term) and underwriting criteria (e.g. minimum credit score) meet specific guidelines. The bellweather of conformity for energy efficiency loans is the Fannie Mae Energy Loan.

credit households. They suggest that less creditworthy households should be offered public funding or that their loans should be heavily credit-enhanced if sold to private investors. The path forward may, ultimately, be a function of what risks secondary market investors are willing to bear, and whether policymakers deem the credit enhancements necessary to incentivize greater risk-taking to be a reasonable use of limited public monies. Today, it is not clear that demand is at the requisite scale that developing secondary market access should be a national priority. Local, often socially-interested financial institutions (e.g. credit unions, CDFIs, coops) are often offering more attractive loan terms to customers than regional and national lenders (and holding these loans on their balance sheets).[148]

Key Takeaways

- The up-front cost of energy improvements is a significant barrier. Most middle income households are less able or willing to access financing than before the recession.
- Energy efficiency loan application rejection rates of 20 to 50 percent are common—which makes scaling investment difficult.
- Some programs are deploying credit enhancements to incentivize lenders to offer financing to middle income households.
- Several programs are using novel underwriting criteria, including strong utility bill repayment history, to increase loan application approval rates.
- Underwriting criteria exist for a reason--care needs to be taken to with who is given access to credit and what claims are being made about the benefits of energy improvements.
- Other programs are offering innovative financing tools to meet the needs of middle income households including on-bill financing, deferred loans, paycheck-deducted loans and Property Assessed Clean Energy (PACE).

[148] These financial instiutions often see energy efficiency lending as serving their social missions. In addition, efficiency lending often offers them a low-cost marketing tool, which warrants attractive lending terms. In Austin, Texas, Velocity Credit Union approved, funded and cross-sold energy efficiency loans at a higher rate than its other lending products. For more information, visit LBNL's policy brief on Austin Energy's Home Performance with Energy Star program: http://eetd.lbl.gov/ea/emp/reports/ee-policybrief_032211.pdf

Delivering Energy Efficiency to Renters

One-third of moderate income households are renters, and the majority of these renters occupy single family dwellings (20 percent of all middle income households are single family renters). In addition to the barriers highlighted in this report, these renters face a key additional challenge in accessing energy efficiency – split incentives. Because renter households don't own the property in which they live, they are usually not authorized or not incentivized to invest in energy efficiency improvements. Tenants are typically responsible for paying utility costs, so rental property owners don't have a way to recoup their investment costs through lower utility bills. Several tools and strategies – all of which have potential to be effective in catalyzing demand for energy efficiency among moderate income homeowners as well – show promise in breaking down barriers in the single family rental market.[149]

Overcoming Split Incentives with Meter-Attached On Bill Financing

One mechanism for breaking the split incentive paradigm is meter-attached on-bill financing ("meter-attached financing"). Meter-attached financing is tied to the meter such that the tenant pays for the financing as a line item on her utility bill and if she moves, the subsequent tenant assumes the responsibility to pay for the remainder of the financing. This tool tackles both sides of the split incentive dilemma – it relieves building owners of the obligation to pay for energy improvements for which they do not reap utility bill savings and it releases tenants from the concern that they won't occupy the home for long enough to get the full rewards of the investment – the household is only responsible for paying while it is renting the dwelling and benefiting from the improvements. An additional benefit of this approach is that, because meter-attached financing is typically secured with meter shut-off rights, loan underwriting can move away from a moderate income renter's creditworthiness and rely more on the security of shut-off provisions. However, if tenants do not realize — or recognize — the benefits of energy improvements, there is a risk that they may discount the amount of rent they are willing to pay to reflect this added utility charge.

Driving Demand with Building Labeling

One of the major challenges of split incentives is the building owner's inability to monetize the benefits of her investment in energy efficiency. Ostensibly, building labeling initiatives that make the energy costs and/or comfort benefits of a home visible to prospective renters, have the potential to differentiate efficient and inefficient properties – and, in so doing, the market may apply a price premium (or owners may be rewarded with more stable tenancy) to the more efficient and comfortable home.[150] It is reasonable to assume that moderate income households, given their limited budgets, may be more sensitive to the energy costs of operating their rental home, so labeling initiatives might be promising for this sector.

Rental Property Regulations

Several cities in the US have taken a regulatory approach to overcoming the transaction costs to serving single and multifamily renters. In 2011, the City of Boulder, CO adopted a series of SmartRegs

[149] These tools may also be effective in the multifamily sector.
[150] An overview of existing labeling initiatives can be found in *Chapter 3: Driving Demand in the Moderate Income Sector*.

ordinances that require all single family and multifamily rental properties to meet a minimum energy efficiency standard by January 2019 (See case study on Boulder's SmartRegs ordinances in Appendix). For more than a decade the city has been incrementally strengthening energy codes for residential new construction and remodels as well as for commercial construction and renovation. However, Boulder was not on track to meet its ambitious 2012 Climate Action Plan goals, and the city determined that it needed additional policy tools to catalyze market innovation in improving existing residential building energy performance to achieve its targets. Rental units make up over 50 percent of Boulder's dwellings and thus offered a logical next opportunity for energy savings. The SmartRegs ordinances are designed to deliver multiple public and private benefits – improved building quality and marketability, safer, healthier and more comfortable housing, lower energy bills for occupants and reduced greenhouse gas emissions.

Chapter 6: The Role of Policy

Middle income households are a potentially rich yet largely untapped source of energy savings. Persuading these households to invest in home energy improvements can lower energy bills, increase comfort, address home health and safety issues, ease strain on the power grid, and reduce environmental risks. That said, our analysis – supported by extensive discussions with industry experts, program administrators, and policymakers – suggests that without more robust policy support, the delivery of energy efficiency to middle income households is unlikely to scale.

The previous chapters diagnose barriers to serving middle income households and offer promising program design and delivery strategies for addressing this underserved market. Yet public funding for these programs is modest. We estimate that home energy upgrades – involving at minimum adding insulation, repairing ducts, and air sealing – for just one third of the 32 million middle income single family households would require combined public and private investment of roughly $30 billion to $100 billion.[151] The State Energy Efficiency Action (SEE Action) Network Residential Retrofit Work Group estimated that program funding for multi-measure home energy efficiency upgrades targeted at non-low income households may be about $7.7 billion total over the next decade in its business as usual case scenario (See Figure 18).[152] Thus, the costs of delivering these energy improvements to the middle income market will far exceed expected utility-billpayer funding for energy efficiency.

As a result of ARRA, this funding by taxpayers and utility bill payers is heavily weighted to the first part of the decade; the largest single-year spending is in 2011, estimated at about $1.2 billion.[153] By 2015, ARRA funding for home energy efficiency programs will have largely ended, and the federal tax credit for residential energy improvements will have expired. Total program spending targeted at the home energy upgrade market, coming primarily from utility-customer funded programs, is expected to drop by more than half, to about $500 million per year. Based upon current energy savings targets, resource plans and state policies, program funding may then rebound to about $700 million in 2020. If annual funding for these programs were the sole source of funding for installing multiple energy saving measures in just a third of the single family housing for middle income households and if that funding remained at the decadal average - $770 million per year – *and* if projects were performed at the lowest estimated costs for multi-measure improvements, it could take approximately 40 years to upgrade just those 10.5 million homes.

Ultimately, in recognition of the public benefits that energy efficiency provides, greater funding from utility bill payers, taxpayers or both will be necessary to extend and expand programs that promote home energy improvements on the same time scale as the desired public benefits. A more aggressive effort to

[151] Assumptions behind this estimate include: 1) A low-end cost for basic insulation and air sealing of $3,000 per home; 2) A higher-end cost of $10,000 per home for a full home energy assessment followed by some combination of measures that include HVAC replacement, air sealing, duct sealing, additional wall, floor, and attic insulation (where appropriate), lighting replacements. The resulting aggregate cost estimate is derived as follows: $3,000 to $10,000 * 38.5 million middle income households * 83 percent single family households * 33 percent of eligible market = $32 billion to $105 billion.

[152] Estimate is drawn from an analysis of taxpayer and utility customer funding for home energy upgrades done for the SEE Action Residential Retrofit Working Group. Reports from this group are available here: http://www1.eere.energy.gov/seeaction/residential_retrofit.html

[153] Citation TK for CEE 2011 State of the Energy Efficiency Industry report

target middle income households will also require customer investment. Lastly, this larger push would require an interlocking framework of supportive policies, the possible elements of which we discuss in this chapter.

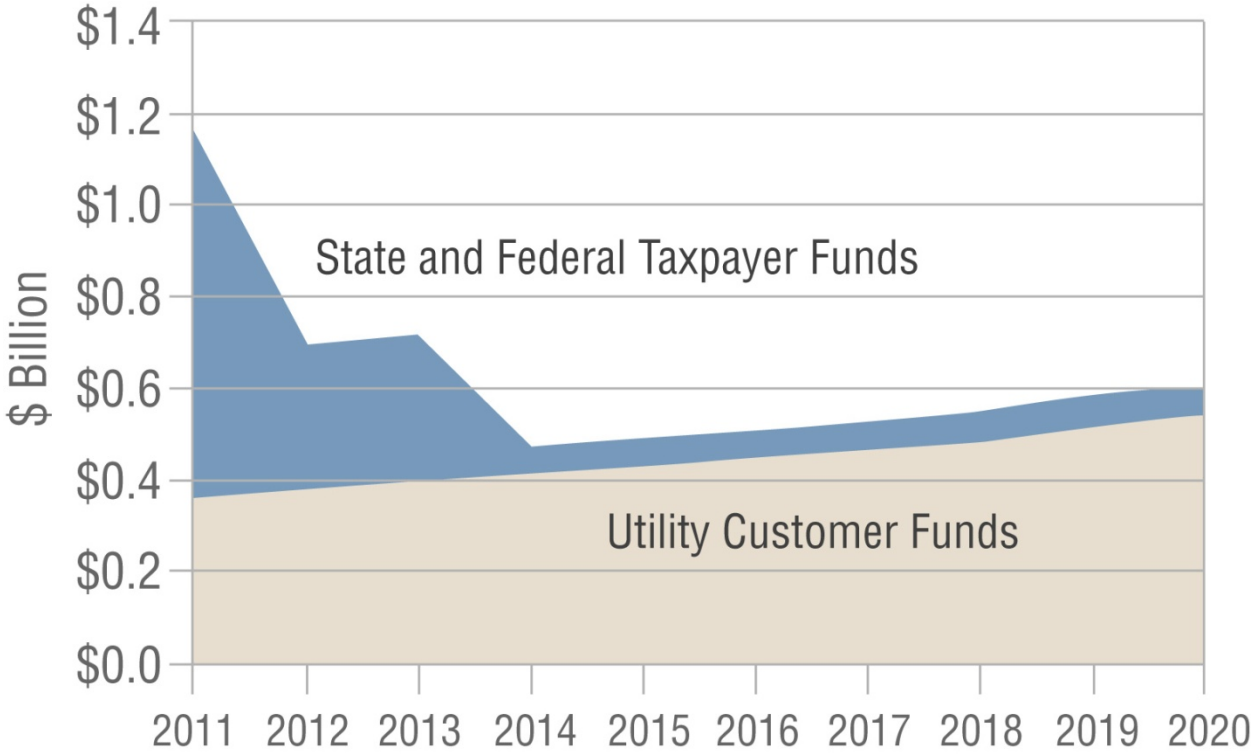


Figure 18. Taxpayer and utility customer funding ($ billions) for multi-measure home energy efficiency improvements (Source: SEE Action Residential Retrofit Working Group Roadmap)[154]

Policies that Incentivize Delivering Energy Efficiency to Middle Income Households

The policies offered below would increase overall funding for energy efficiency programs or incentivize program administrators to deliver funding to the residential sector – and deliver energy efficiency to middle income households in particular. These policies include energy savings targets, altering cost effectiveness considerations, and inter-agency coordination to leverage multiple sources of funding.

Energy Savings Targets

State legislation or regulatory commission decisions that establish energy savings targets for utilities are key drivers of customer-funded energy efficiency across sectors. More than half of the states have established energy savings targets of some sort through an Energy Efficiency Resource Standard (EERS), a statutory requirement for utilities to acquire all cost-effective energy efficiency, or energy efficiency goals that are described in utility resource plans (see Table 8).[155]

[154] Based on SEE Action Residential Retrofit Working Group's base case analysis. This analysis in turn draws upon LBNL projections of utility customer-funded spending on energy efficiency programs, using savings targets, plans and policies. (Barbose et al, 2009)

[155] These policies can include a "loading order" that places cost-effective energy efficiency at the top of the list of resources for utilities to consider in meeting energy load requirements.

Key Policy Drivers for Energy Efficiency Spending and Savings	Applicable States
Statutory requirement that utilities acquire all cost-effective energy efficiency	CA, CT, MA, RI, WA
EEPS/EERS	CA, CO, IL, MD, MN, MI, NJ (proposed), NM, NY, OH, PA, TX, VA (provisional), WI[156]
Energy efficiency eligibility under state RPS[157]	HI, NC, NV
Recently-approved Integrated Resource Plan[158]	CO, ID, OR, MT, UT
Recently-approved Demand Side Management plan or multi-year budget[159]	AZ, CT, CO, IA, MA, ME, NJ, RI (proposed), VT

Table 8. Key policy drivers for energy efficiency spending and savings projects.[160]

The design features of these policies influence the degree to which energy efficiency program administrators are incentivized to target increased funding towards home energy upgrades. For example, an EERS that includes aggressive annual savings goals in the near term with a penalty for non-performance might tend to drive efficiency program administrators towards programs and measures that are easy to implement and relatively inexpensive (e.g., discounts on compact fluorescent light bulbs, appliance rebates). On the other hand, an EERS with deep, long-term cumulative savings goals might lead administrators to take a longer term perspective, investing in home energy upgrade programs that require developing contractor capacity and possibly more emphasis on strategies for overcoming institutional and market barriers (e.g., home energy ratings, labels, disclosure policies).[161]

Policymakers also might consider moving toward targets based upon gross savings and multiple fuels. Currently, most EERS targets are expressed as savings net of what utility customers would save of their own accord. Gross savings targets could relieve utilities of narrowly focusing on savings that can be neatly attributed to their programs alone and perhaps open the door for other parties to contribute to savings targets – turning energy efficiency into a broader campaign with many players. Encouraging multiple fuel programs (e.g. electric, gas, heating oil) could have sizable benefits for whole-home savings.

In the case of "all cost-effective energy efficiency" statutes, public utility commissions that are charged with developing policy guidelines and implementation rules should consider a societal perspective (e.g. including social impacts, environmental externalities) if they want to encourage comprehensive residential energy efficiency programs.

---

[156] Since the Wisconsin Public Service Commission passed four-year savings targets in November 2010, the state legislature has capped spending on electric and gas energy efficiency programs at 2008 levels and retained sole discretion to change the funding levels. This casts some practical uncertainty over meeting the targets.

[157] A Renewable (or Alternative Energy) Portfolio Standard is a requirement that a utility secure a specific set of renewable resources at or above a minimum percentage of its retail energy sales. Such a standard may require or allow some fraction of those resources to be met with energy efficiency.

[158] An Integrated Resource Plan involves a planning process in which utilities forecast future load and demand over a lengthy planning horizon (10-20 years) and analyze alternative strategies (e.g., portfolios of supply-side and demand-side resources) that can satisfy their requirements, taking into account relative costs, benefits and risks.

[159] A Demand Side Management Plan includes a set of energy efficiency and demand reduction programs that program administrators expect to offer, along with their projected budgets and energy savings. DSM plans vary widely in detail (e.g. descriptions of programs, budget breakdowns, verification and measurement plans) and may be accompanied by, or linked to, a study of energy efficiency potential.

[160] The states listed for each policy represent the states for which that policy informed development of spending and savings projections; it does not necessarily represent a comprehensive list of all states with that particular supporting policy.

[161] It should be noted that aggressive short-term goals need not be mutually-exclusive of deep long-term goals.

Cost Effectiveness Considerations

Regulators in some states ask efficiency program administrators to screen their energy efficiency portfolio and/or programs using four or five cost effectiveness tests. More than two thirds of the states with energy savings targets place primary weight on the Total Resource Cost (TRC) test to select programs. The TRC compares the net present value of all costs for acquiring the energy efficiency resource (i.e.,program administration, financial incentives, and incremental measure costs) to the benefits of the resource (e.g. estimated dollar value of avoided energy and capacity that result from energy and peak demand savings as well as a limited set of non-energy benefits).[162]

Alternative approaches that may enhance and broaden opportunities for home energy upgrade programs targeted at middle income households include:

- **Measuring Cost Effectiveness on a Portfolio Basis.** In most states, program administrators are required to demonstrate that energy efficiency activities are cost-effective as part of the process of obtaining approval for program budgets from state regulators. Consistent with viewing energy efficiency as a resource, screening analysis at the portfolio level for a full suite of energy efficiency programs, rather than any individual program, will empower program administrators to pursue a wider range of activities in more sectors (e.g. small business, middle income) while still limiting the overall public costs of programs.

- **Balancing Program Screening Decisions Across Multiple Cost Effectiveness Tests.** Program administrators and regulators could reach beyond reliance on a single primary cost effectiveness test to weigh the merits of programs and portfolios across multiple tests that take a broader array of values into consideration. Regulators could also specify that program administrators utilize or consider specific approaches for key inputs to cost-effectiveness screening (e.g. a social discount rate, methods to quantity non-energy benefits).

- **Valuing Non-Energy Benefits.** Public health and safety, equity, and economic development could be considered as explicit policy goals in developing a portfolio of energy efficiency programs. A variety of private or participant benefits for whole-home energy efficiency could also be brought into program screening decisions. For taxpayer-funded efficiency programs, policymakers may want to consider employment benefits, as well as potential increases in the value and durability of the properties that comprise the tax base.
- **Exempting Project Components and Programs from Resource Testing.** Necessary, non-energy project costs, like those highlighted in *Chapter 4*, could be exempted from cost effectiveness testing screening methods. In some states, program administrators allow 10 to 20 percent of low income weatherization funding to be spent on non-energy improvements that may be needed for structural integrity or health and safety. Another option is for state policymakers and regulators to encourage program administrators to consider multiple screening criteria in developing a portfolio of energy efficiency programs. For example, in some states, low-income energy efficiency programs are treated as "non-resource" programs that help meet equity objectives (e.g. opportunities for all customers to participate in energy efficiency programs) and are not required to pass a TRC test as a condition for being offered. Program administrators may consider and account for the additional health, safety and social equity benefits of those programs.

[162] Regulators and program administrators typically view a benefit-cost ratio of 1.0 as the minimum threshold for cost effectiveness screening of measures, programs or the overall portfolio, depending on their policy rules.

Building from Voluntary Programs to Regulatory Solutions

Better funding for voluntary programs targeted at driving middle income energy improvements are just one *piece of* a potentially larger, evolving effort to secure energy savings for middle income households and the public at large. In this section, we touch on other policy options such as codes, standards, labeling, and upgrade regulations.

Codes, Standards and Work Specifications

Building energy codes, and appliance, lighting and equipment standards can contribute substantially to efficiency among middle income households. Energy efficiency standards for heating and air conditioning systems, appliances, and other plug loads such as lighting and consumer electronics are very effective policy tools, assuming that they are updated periodically to reflect technological advances. Standards for heating, ventilation and air conditioning (HVAC) systems and plug loads can produce savings among all households. That includes households located in regions where no substantial energy efficiency services are offered and households who won't invest in comprehensive energy upgrades but will replace failed heating systems or buy a new computer. Standards can also introduce efficiency into the design of goods that are largely untouched by efficiency programs or consumer choice, such as set-top boxes leased to consumers by cable and satellite companies.

Federal entities can support model energy codes for new and heavily remodeled homes; state and local entities can adopt and enforce them.[163] Policymakers and program administrators should consider "reach" codes and financial incentives for even higher efficiency than existing mandatory codes to encourage market innovation around further energy use reductions. These voluntary efficiency standards can then be transitioned into mandatory codes as technological and delivery innovation mainstreams the market's capacity to cost-effectively deliver deeper energy savings.

Federal agencies can also issue national specifications for weatherization and other comprehensive home energy improvements of the sort addressed in this paper. Program administrators can adopt these guidelines, which can help to reassure consumers who invest in comprehensive home energy improvements – as well as banks and other prospective sources of capital – that the work will be of a high quality and will deliver the promised energy savings.

Labeling, Disclosure and Upgrade Regulations

Another set of policies that can complement energy improvement programs are energy performance labeling, disclosure, and upgrade regulations. Labeling and disclosures can be coordinated with national energy improvement specifications and help to build a more efficient marketplace by making the full costs of operating a home more transparent to renters, homeowners and lenders. While uncertainty remains around the impacts of energy use disclosures and labels on demand for energy improvements and energy efficient properties, these initiatives reduce the risk that households will be exposed to high, unexpected energy expenses — information that may prove valuable to both households and financial institutions. For example, legislation before the current Congress proposes incorporating household

[163] A number of experts suggested that while significant progress has been made on implementing energy performance codes, there has been little enforcement of these codes during renovations of existing buildings. Enforcement of these codes is critical to their efficacy in driving energy efficiency investment.

energy expenditure data into loan underwriting.[164] These tools create greater market recognition of efficiency's private benefits and build the foundation for the implementation of regulations as these disclosures can be transitioned into minimum energy performance standards.

In turn, these standards can be adapted over time to reflect policy aims and market developments. The city of Boulder, Colorado's SmartRegs ordinances, which require all single family and multifamily rental properties to meet minimum energy efficiency standards, are a good example of incremental regulations designed to catalyze market innovation around upgrading building energy performance (see SmartRegs case study in Appendix).

Most existing energy performance regulations leverage key transaction points to trigger building owner regulation compliance. The most common intervention points for energy performance disclosure and upgrade regulations are:

- Time of property sale or transfer
- Time of property rental
- Time of obtaining a building permit for remodeling[165]

For example, Austin, TX requires existing single family homes to undergo a time-of-sale energy assessment and disclose the results to prospective building purchasers. The cities of Berkeley, CA and San Francisco, CA go further — requiring time-of-sale and major remodeling (>$50,000) installation of prescriptive energy use reduction measures through Residential Energy (and water) Conservation Ordinances (RECOs).

Particularly in the middle income sector, steps need to be taken to ensure that financing options and incentives are sufficient to mitigate household risk in meeting these obligations. Augmenting voluntary programs with regulations may allow policymakers and energy efficiency program administrators to redirect and target limited public funds toward increased support for the most financially vulnerable low and middle income households.

Key Takeaways

- The approaches described in previous chapters are not enough to be effective at the scale necessary to achieve many public policy goals. They should be seen as potential bridges or complements to more robust public policy initiatives that will enhance energy efficiency opportunities for middle income households.

- Policies, including energy savings targets and treating energy efficiency as a resource, can increase overall funding for energy efficiency programs and/or incentivize program administrators to deliver funding to middle income households.

- Other policy options for increasing the delivery of energy efficiency in this market include codes, standards, labeling, and upgrade regulations.

[164] The Sensible Accounting to Value Energy (SAVE) Act was introduced in the U.S. Senate in Fall 2011. For more information, visit: http://www.imt.org/save-act

[165] These regulations are typically extensions of existing building codes for new construction or renovation.

- Labeling creates greater market recognition of efficiency's private benefits and builds the foundation for the implementation of regulations.

- Augmenting voluntary programs with regulations may allow policymakers and energy efficiency program administrators to redirect and target limited public funds toward increased support for the most financially vulnerable low and middle income households.

Chapter 7: Conclusions

It is important to recognize that progress is being made on delivering energy efficiency to the residential sector. Programs around the country are transitioning their models from incentivizing single item replacements such as light bulbs and appliances to seeking comprehensive energy upgrades. As public programs refocus, contractors are adding to their skill sets and adjusting their business models.

Despite this progress, improving the home energy efficiency of middle income households is a challenging prospect. There is no single solution to this challenge. Beyond the significant barriers to driving demand that exist in the general population, middle income households face greater financial insecurity that can make proactive investment in energy improvements prohibitive. Those middle income households who are motivated to act are often unable to access financing or must address costly structural and maintenance issues in their homes before investing in energy efficiency. This study has described a number of financing tools, program delivery models, and outreach strategies that show some promise in overcoming these barriers – albeit with limited results to date. Before implementing at scale, many of these approaches need to be piloted and rigorously evaluated to assess their effectiveness.[166]

However, while these approaches may prove effective on the margin, they are not enough to be effective at the requisite scale for addressing broad public policy goals – reducing energy costs, creating jobs, mitigating environmental impacts from the electricity sector, improving public health, neighborhood stabilization, and a range of other public benefits that are supported by residential energy efficiency. Instead, these approaches should be seen as potential bridges or complements to robust public policies that provide access to energy efficiency for all market segments.

[166]One important first step for program administrators is to begin tracking income demographics of residential energy efficiency program participants. This information should be isolated from other identifying information to preserve privacy.

Bibliography

Barbose, G. C. Goldman, and J. Schlegel. 2009. *The Shifting Landscape of Ratepayer-Funded Energy Efficiency in the U.S..* LBNL-2258E. LINK

U.S. Department of Energy Better Buildings Program (Better Buildings). 2011. *Spotlight on Austin, Texas: Best Offer Ever Produces 564 Upgrades in Record Time*. LINK

Bricker, J., Bucks B., Kennickell A. Mach T., Moore K. 2011. *Surveying the Aftermath of the Storm: Changes in Family Finances from 2007 to 2009.* Federal Reserve Board Finance and Economics Discussion Series. Federal Reserve Board, March 2011. LINK

Bucks, B.K., Kennickell A.B., Mach T.L., Moore K.B.. 2009. *Changes in U.S. Family Financings From 2004-2007: Evidence from the Survey of Consumer Finances.* Federal Reserve Board Federal Reserve Bulletin, vol. 95, pp. A1-A55. LINK

U.S. Census Bureau (Census). 2007. *American Housing Survey.* LINK

U.S. Census Bureau (Census). 2009. *American Housing Survey.* LINK

U.S. Census Bureau (Census). 2010. *Current Population Survey*. LINK

U.S. Department of Commerce Economics and Statistics Administration (Commerce). 2010. *Middle Class in America*. Prepared on behalf of the Vice President of the United States Middle Class Task Force. LINK

Corelogic. 2011. *New Corelogic Data Reveals Q2 Negative Equity Declines in Hardest Hit Markets and 8 Million Negative Equity Borrowers Have Above Market Rates.* Press Release. LINK

DeNavas-Walt, C., Proctor B.D., Smith, J.C.. 2011. *Income, Poverty, and Health Insurance Coverage in the United States: 2010*. Current Population Reports, U.S. Department of Commerce Census Bureau. LINK

Duerst, S., Drake S., Lee L.. 2010 (Duerst et al. 2010-1). *Targeted Home Performance with ENERGY STAR® Participation Survey Results*. PA Consulting Group for Public Service Commission of Wisconsin. LINK

Duerst, S., Lee L., Schauer, L.. 2010 (Duerst et al. 2010-2). *Targeted Home Performance with ENERGY STAR® Participant Characterization.* PA Consulting Group for Public Service Commission of Wisconsin. LINK

Dunne, T. and K. Fee. 2011. *Economic Trends* Federal Reserve Bank of Cleveland. June 2011. LINK

U.S. Energy Information Administration (EIA). 2005. *Residential Energy Consumption Survey.* LINK

U.S. Energy Information Administration (EIA). 2011. *Share of energy used by appliances and consumer electronics increases in U.S. homes.* LINK

Energy Programs Consortium (EPC). *Sustaining Low-Income Home Ownership: Weatherization Rehab and Asset Preservation Partnership.* Issue Brief, March 2007. LINK

Fuller, M., Kunkel C., Zimring M., Hoffman I., Soroye L., Goldman C. 2010. *Driving Demand for Home Energy Improvements: Motivating Residential Customers To Invest in Comprehensive Upgrades That Eliminate Energy Waste, Avoid High Bills, and Spur the Economy.* LBNL – 3960E. LINK

Guerrero, A. M.. 2003. *Home Improvement Finance: Evidence from the 2001 Consumer Practices Survey.* Joint Center on Housing Studies, Harvard University. LINK

Hadley J., and J. Holahan. 2004. *The Cost of Care for the Uninsured: What Do We Spend, Who Pays, and What Would Full Coverage Add to Medical Spending*? Issue Update, The Kasier Commission on Medicaid and the Uninsured. The Henry J. Kaiser Family Foundation. May 10, 2004. LINK

Hirst, E.. 1986*. Electricity Savings One, Two, and Three Years After Participation in the BPA Residential Weatherization Pilot Program.* Energy and Buildings 9: 45-53.

Hirst, E., and Richard Goeltz, David Trumble. 1989. *Effects of the Hood River Conservation Project on Electricity Use.* Energy and Buildings 13: 19-30.

Hoen, B., Wiser R., Cappers P., Thayer M.. 2011. *An Analysis of the Effects of Residential Photovoltaic Energy Systems on Home Sales Prices in California.* LBNL-4476E. LINK

Joint Center for Housing Studies (JCHS). 2011. A *New Decade of Growth for Remodeling.* Harvard University. LINK

Lansing, K. J.. 2011. *Gauging the Impact of the Recession.* Economic Letter, Federal Reserve Board of San Francisco. LINK

National Association of Realtors (NAR). 2011. *Existing Homes Sales Rise in March.* Press Release. LINK

National Association for State Community Service Programs (NASCSP). 2009. *Weatherization Assistance Program Funding Survey PY09*. LINK

National Coalition to End Childhood Lead Poisoning (NCECLP). 2010. *Identified Barriers and Opportunities to Make Housing Green & Healthy Through Weatherization: Report from Green & Healthy Homes Initiative Sites.* LINK

Robert Wood Johnson Foundation (RWJF). 2009. *Beyond Health Care: New Directions to a Healthier America Report.* Commission to Build a Healthier America. LINK

Rohe, W. M., Cowan S.M., Quercia, R.. 2009. *Coordinating Energy and Rehabilitation Services for Lower-income Homeowners: Lessons Learned from the Weatherization, Rehabilitation and Asset Preservation Program* Center for Urban and Regional Studies, The University of North Carolina at Chapel Hill. LINK

Schweitzer, M. 2005. *Estimating the National Effects of the U.S. Department of Energy's Weatherization Assistance Program with State-Level Data: A Metaevaluation using studies from 1993 to 2005.* Oakridge National Laboratory. ORNL/CON-493. LINK

Stuart, E.. 2011. *The Value of Energy Performance and Green Attributes in Buildings: A Review of Existing Literature and Recommendations for Future Research.* Clean Energy Program Policy Brief. LINK

Sum, A. and Khatiwada, I.. 2010. *Labor underutilization problems of U.S. workers across household income groups at the end of the great recession : a truly great depression among the nation's low income workers amidst full employment among the most affluent*. Center for Labor Market Studies Publications. Paper 26. LINK

Standard & Poors (S&P). 2011. *Seasonally-adjusted S&P/Case-Shiller Home Price U.S. National Index Level Q2-2011*. LINK

Transunion. 2011. *Sample FICO Score Distribution.* In SEE Action Financing Solutions Working Group. LINK

U.S. Department of Energy Office of Weatherization and Intergovernmental Programs (WIP). 2009. *National Weatherization Assistance Program Training and Technical Assistance Plan.* LINK

U.S. Department of Energy Technical Assistance Program Webcast (TAP Webcast). 2011. *CDFIs: Opportunities for Partnerships with Energy Efficiency Programs.* LINK

Wilson, J., and E. Tohn. 2011. *Healthy Housing Opportunities During Weatherization Work*. National Renewable Energy Laboratory. NREL/SR-7A20-49947. LINK

Appendix: Case Studies

Indianapolis EcoHouse Project Loan Program
Large Credit Enhancement Leverages Existing CDFI Capacity

As part of the American Recovery and Reinvestment Act (ARRA), Indianapolis received a $10 million grant through the Department of Energy Better Buildings initiative. The City of Indianapolis Office of Sustainability partnered with the Indianapolis Neighborhood Housing Partnership (INHP), a community development financial institution (CDFI) focused on affordable housing, to design a financing program for low and middle income Indianapolis homeowners. Launched in June 2011, the $6 million EcoHouse Project Loan Program is available to Indianapolis households earning up to 120 percent of Area Median Income (AMI).[167]

Unsecured loans are available for up to $4,000 and four years, and secured loans are available for up to $15,000 and 10 years. According to INHP, eligible homeowners typically have little access to anything but credit card financing – often at rates from 15-25 percent, so the Eco House Project's mid-single digit fixed interest rate loans[168] are very attractive tool for enabling energy improvements among households who are otherwise unlikely to be able to access affordable financing. Program managers expect that they will make a minimum of 400 loans, utilizing up to $6 million over the next two years.

Finding the Right Partners

John Hazlett, Director of the City of Indianapolis Office of Sustainability, pointed out that understanding INHP's mission and ensuring that the program served both City and INHP objectives was critical to the partnership. INHP was an ideal partner because of its long history working in the City and its substantial internal program and capital delivery infrastructure. Since the year 2000, INHP has facilitated the delivery of over $220 million of financing for mortgages and home improvements to Indianapolis homeowners. In addition, INHP has provided home ownership assistance, including lending and education programs to over 17,500 households.

Eco House messaging focuses on improving a home's comfort and value while saving money, but City of Indianapolis staffers emphasized that working through INHP and other community organizations– rather than any specific marketing messages – has been a key driver of middle income household interest in the first few months of the program.[169] The City of Indianapolis has also engaged the community center in one of its target neighborhoods, Indianapolis' Near Eastside for a neighborhood sweeps initiative. Indianapolis Office of Sustainability Director John Hazlett pointed out that representatives from the community center have been working in the Near Eastside for years delivering services, and that some low and middle income residents distrust local government, "Having a physical presence in the

[167] INHP is targeting 80 percent of its EcoHouse lending to households at or below 80 percent of AMI and the remaining 20 percent to households earning between 80 percent and 120 of of AMI. 120 percent of AMI for Indianapolis household of 4 is $79,200 and 80% AMI for an Indianapolis household of 4 is $52,800.

[168] Loan interest rates are based on U.S. Treasuries. In July 2011, fixed interest rates on secured loans were 5.97 percent and on unsecured loans were 6.66 percent.

[169] Neighborhood associations have been a major driver of program interest. More so than in suburban neighborhoods, Indianapolis's neighborhood associations are very well-organized and INHP has have worked hard to get association leaders connected to the Eco House Project so that they can communicate the benefits to their members

neighborhood is important. Everyone knows the community center – the trust and name recognition associated with it has helped to drive interest."

The city of Indianapolis got an experienced lending partner with extensive knowledge of what type of program structure and financing tools have the greatest potential to drive energy improvements among the city's low and middle income households.

Making Financing More Inclusive

INHP targets its financial products and services primarily to low and middle income households – in 2010, over half of INHP lending went to households earning between 50-80 percent of AMI (See Figure 19).[170]

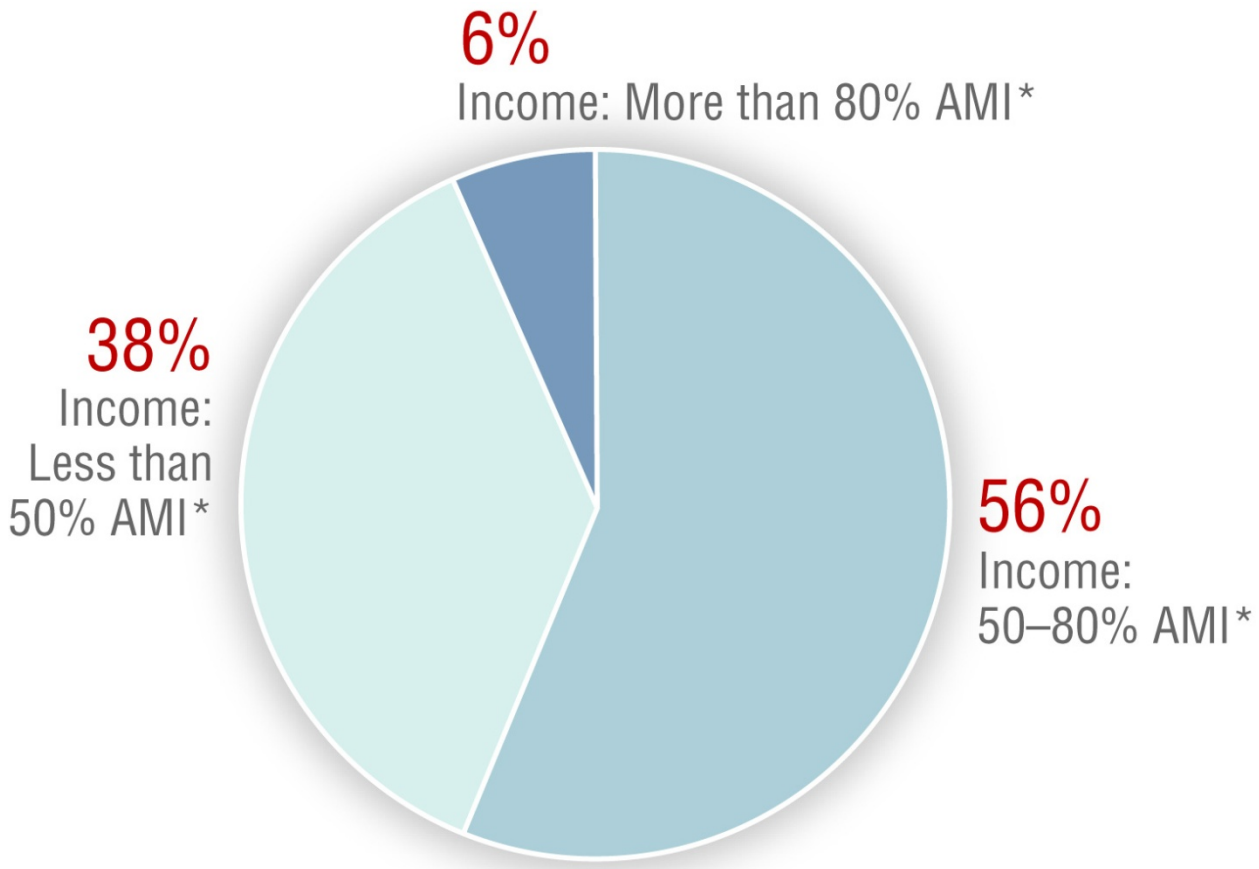


Figure 3. 2010 distribution of Indianapolis Neighborhood Housing Partnership customer funding (Source: TAP Webcast 2011)

In an attempt to deliver inclusive financing to these households, INHP permits FICO scores down to 580 (secured) & 615 (unsecured) (see Table 8).

[170] Department of Energy Webinar. "Community Development Financing Institutions – Opportunities for Partnerships with Energy Efficiency Programs". March 17, 2011. Available here: http://www1.eere.energy.gov/wip/solutioncenter/media/CDFI%20Webinar%20Slides.pptx

	Unsecured	Secured
Loan Amount	• $1,000-$4,000	• $4,000-$15,000
Loan Term	• Up to 4 years	• Up to 10 years
Lien Position	• N/A	• First, second or third
Interest Rate	• 6% over the 3 year Treasury (currently 6.66 %)	• 3% over the 10 year Treasury (currently 5.97 %)
Minimum Credit Score	• 615	• 580
Income Eligibility	• Up to 80 or120% of AMI depending on property location[171]	
Maximum Debt-to-Income Ratio (DTI)	• 45 percent	
Maximum Combined Loan-to-Value (CLTV)	• 100 percent	
Other Underwriting Criteria	• Bankruptcy Limitations: At least 24 months since Chapter 7 discharge and/or At least 12 months into Chapter 13 payout, with letter from court representative • No Foreclosure within most recent 30 months • No Repossessions within most recent 24 months • No Outstanding Collections, unless medical, only up to $3,000 • Judgments/Liens may be allowed case-by-case, must be current in repayment	
Other Eligibility Restrictions	• Single family homeowners primary residence • Units occupied by borrower for at least 12 months • US citizen or permanent resident alien	
Eligible Improvements	• Items identified in energy audit report may be included and/or required • Applicable health & safety measures may be included, up to 25% of the total project	

Table 1. Indianapolis EcoHouse Project Loan Program loan terms and eligibility. (Source: INHP)

Even with lenient underwriting standards, INHP is unable to accommodate a significant number of potential program participants – approximately 30 percent are turned away because their credit scores are too low or because they are not current on their mortgage and taxes (See Figure 20).

**For the 14 percent of interested households with significant deferred maintenance or health and safety issues, INHP refers them to another program within the organization.

[171] A maximum of 20 percent of loan funds may go to residents with income between 80 and 100 percent of AMI – at least 80 percent must go to residents with income between 100 and 120 percent of AMI.

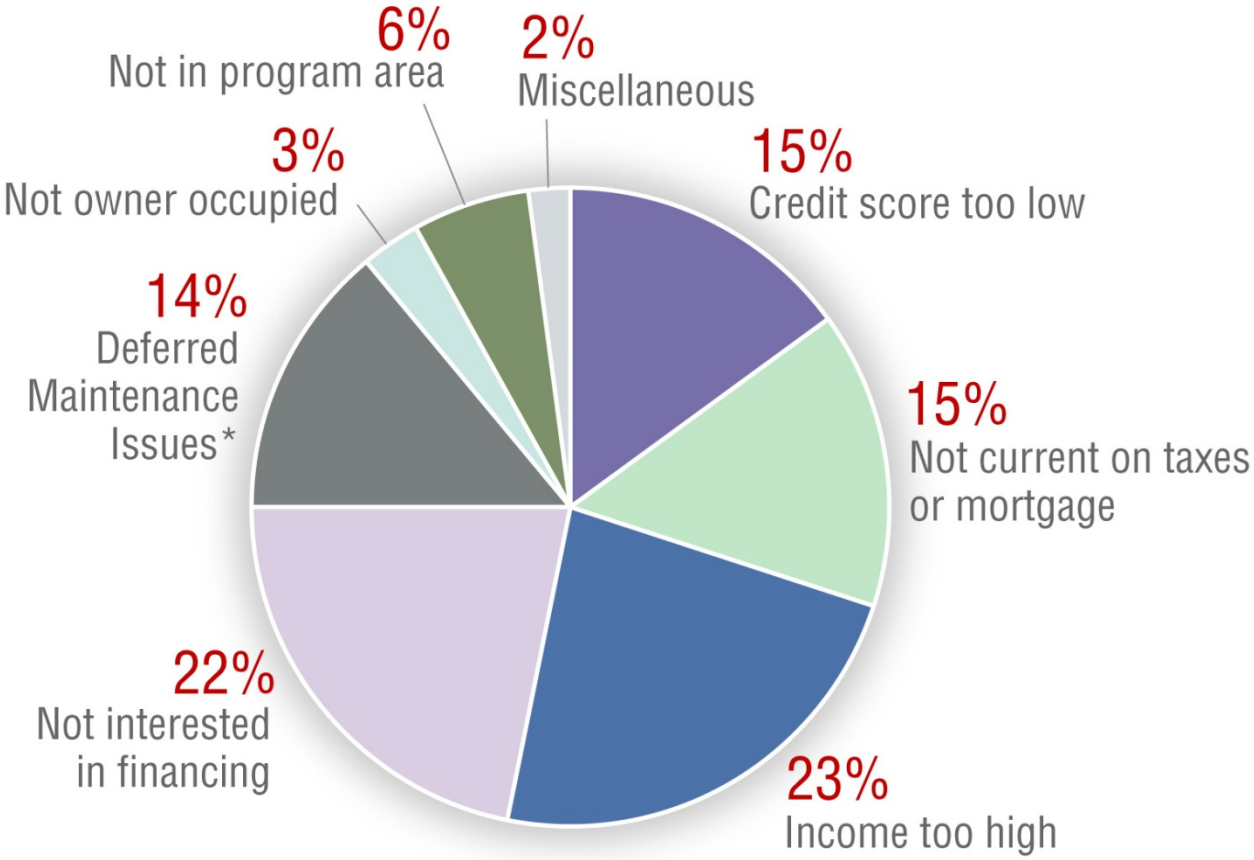


Figure 4. Reason for INHP Eco House Loan Project non-participation (n=200). (Source: INHP)

Make it Easy, But Not Too Easy (to Weed Out "Tire Kickers")

INHP Vice President of Lending, Capital and Corporate Development Joe Huntzinger argued that, "You have to make this program extremely attractive to somebody so that it's hard to say no in a weak economy. Today, there is tremendous debt aversion and people generally want to deleverage not add leverage." To make this program palatable, INHP is delivering low interest rate loans and eliminating fees for energy assessments, title searches, and lien recordings.

Once INHP receives an inquiry, program staff does extensive pre-screening – explaining the details of the program by phone before bringing applicants in for a meeting. At the meeting, INHP collects $50 to reserve an energy assessment (valued at $650), which is refunded if customers move forward with an energy upgrade. This nominal fee is primarily intended to ensure customer commitment to participating in the program. While this fee is small, INHP is very careful NOT to advertise low cost audits. Eco House Loan Program manager Becca Murphy noted that, "We don't want to give away free assessments because these audits are expensive. We need a way to weed out the tire kickers." And INHPs experience to date suggests that there are a lot of tire kickers – just 25 quality applicants have resulted from almost 200 inquiries; "We have to go through a lot of leads to identify someone who is both interested and qualified so that when we do an (assessment) it's for a homeowner that is very likely to act."

To further simplify the customer experience, INHP has selected qualified program contractors (three types – HVAC, insulation and air sealing, and windows and doors) who have all agreed to fixed pricing for

energy improvement measures. While the homeowner is free to select one of these contractors, INHP plays a very active role in helping to facilitate this process. Murphy emphasized that program staff must be hands on throughout the upgrade process, "In INHPs target income range, households can become passive very quickly."

Leveraging Private Capital

INHP has structured a number of loan pools in the past to fund residential mortgages, and participating banks have always been paid back in full. Banks are motivated to participate in INHP's loan pools because of their safety, their social objectives and because these investments help meet their Community Reinvestment Act requirements. Like its past loan pools, the $6 million EcoHouse loan pool is structured such that INHP borrows money from the pool and then relends it to participating homeowners. The underlying credit for these loan pools is INHP not customer mortgages – for the EcoHouse Loan Program, INHP has agreed to purchase all delinquent loans from the pool after 180 days of non-payment. While this means that INHP bears most of the loan default risk, past investors have required INHP to have a 10 percent loan loss reserve (LLR) for its first mortgage lending programs (often funded with foundation grants). Once INHP has purchased delinquent loans from the pool, it may draw down funds from the LLR to cover 100 percent of each loss. Because the EcoHouse Loan Program will make primarily unsecured and subordinated loans, investors and INHP's board required a larger credit enhancement – a $3 million (50 percent) LLR.[172] INHP has historically offered second mortgage products to finance emergency repairs for low income households. This experience suggested a large credit enhancement was necessary. Since the recession, secondary market investors are only willing to pay ~20 cents on the dollar for these loans, and INHP experienced non-payment of approximately 50 percent. While the credit profiles of EcoHouse Loan participants are likely to be better than those of past programs (many past loans, for example, were for elderly households on fixed incomes that couldn't afford to make interest or principal payments),[173] unsecured loans and second mortgages in a declining housing market are still very high risk. INHP believes the default rate may be lower than 50 percent, and the City has agreed to grant any funds remaining in the LLR once the loan pool is paid off to INHP. These grant monies will support affordable housing, and may include energy efficiency improvements that meet INHP's mission of increasing safe, decent, affordable housing opportunities that foster healthy, viable neighborhoods. INHP program managers believe they could have gotten the deal done with investors at a significantly lower LLR, but that this would have required restricting product offerings and raising credit standards – likely offering only secured financing and increasing minimum credit scores. In the end, even with this robust credit enhancement, INHP's strong track record on past pool performance was key to attracting its four bank partners to this less-secure loan pool.

Next Steps

INHP is testing this loan model in hopes that demand and loan performance will be strong enough for it to continue after Recovery Act monies are exhausted. While no loans have closed yet, program managers expect that a number of current applicants will move forward with energy improvements. According to INHP President Moira Calrstedt, the program has many potential benefits, "The Eco House Project is good for homeowners' financial situations, it's good for their personal comfort, and it's good for the environment and the neighborhood…Helping homeowners increase energy efficiency is (also a) way to help them remain as long-term assets to Indianapolis neighborhoods"

[172] This loan loss reserve was funded from the City of Indianapolis's Better Buildings grant.
[173] The average INHP emergency loan borrower has historically earned about 40 percent of AMI.

Resources

Program website:
https://www.inhp.org/EcoHouseProject/EcoHouseProject.aspx

Contacts:

Becca Murphy, EcoHouse Project Manager, INHP
rmurphy@inhp.org

John Hazlett, Director, City of Indianapolis Office of Sustainability
John.Hazlett@indy.gov

Sources:
Conversation with Joe Huntzinger 7/25/11
Conversation with Becca Murphy 7/15/11
Conversation with John Hazlett 6/17/11
Department of Energy Webinar. "Community Development Financing Institutions – Opportunities for Partnerships with Energy Efficiency Programs." March 17, 2011. Available here:
http://www1.eere.energy.gov/wip/solutioncenter/media/CDFI%20Webinar%20Slides.pptx

NYSERDA's Assisted Home Performance with ENERGY STAR Program: **Extending Energy Efficiency Services to Underserved Households**

Since 2001, New York residents have completed over 39,000 energy upgrades through NYSERDA's Home Performance with ENERGY STAR (HPwES) initiative. Approximately one third of these projects have been completed through the Assisted HPwES track, which offers large incentives to middle income households earning too much to qualify for the Weatherization Assistance Program (WAP). New York's suite of energy efficiency offerings, from free weatherization for low income residents to free energy assessments and large energy upgrade financial incentives for middle income households to reduced incentives for wealthier homeowners represents a compelling approach to delivering energy improvements in the residential sector. These incentives are complemented by the recently-launched Green Jobs-Green New York (GJGNY) financing platform, which uses alternative underwriting criteria in an effort to qualify creditworthy households for financing and reduce the 40 percent loan applicant rejection rate NYSERDA experienced with the Fannie Mae Energy Loan.

Assisted Home Performance with Energy Star (AHPwES)

AHPwES provides middle income New York homeowners[174] with a free home energy assessment and rebates of 50 percent of the energy upgrade cost (up to $5,000) for single family buildings. Qualifying households can also take advantage of several financing products to cover the cost of the remaining 50 percent of their upgrade – and, in some areas, community groups have covered the other 50 percent with grants.

Driving Demand for AHPwES

Historically, about one third of the HPwES projects completed in New York have come through the Assisted track, but these numbers have dropped since the recession began and the number of units completed is missing program goals and failing to exhaust available funds. Before the launch of GJGNY in late 2010, AHPwES jobs were down to about 17 percent of overall home performance upgrades. NYSERDA Program Manager John Ahearn suggested that the AHPwES target population has been hard hit by the financial crisis and ensuing recession and many households are just not willing and/or able to make even heavily-incented energy efficiency investments. Crystal Purcell, Deputy Director at Home HeadQuarters (HHQ) [175], a New York CDFI said that the majority of households financing energy upgrades through HHQ are motivated to participate in New York's AHPwES program by the need to address a necessary equipment or structural repair or replacement. She noted that as a result of the difficult economy, many middle income households are deferring basic investments in maintaining their homes – notably in addressing roofing issues – and, over the past several years, HHQ has seen its home improvement loan portfolio shift away from investments in preventative maintenance and towards investments in emergency interventions. HHQ has more demand for financing emergency repairs than it can meet, and addressing these problems in conjunction with energy improvements may motivate households. It is easy, then, to understand why motivating investments in proactive comprehensive energy improvements, even with robust financial incentives in place, is a challenge.

---

[174] Households earning 60 to 80 percent of AMI qualify for NYSERDA's AHPwES program. Those households earning less than 60 percent of AMI qualify for the Weatherization Assistance Program (WAP).) and NYSERDA's EmPower New York[SM] program.).

[175] Home Headquarters is a program partner of NYSERDA. See *Home HeadQuarters: Offering Another Financing Option For Less Qualified Households* below.

While still lower than before the recession, Assisted participation has rebounded to 36 percent of all completed jobs in 2011. NYSERDA residential programs manager, Karen Hamilton, suggested that a contributor to this increase has been the free energy assessment provided to income-qualified households through the GJGNY initiative. According to many participating contractors, the $350 to $500 assessment cost was a major barrier for middle income households. The AHPwES conversion rate from free assessment to energy upgrade has been 30 percent – in-line with overall program averages – and Hamilton attributes this to New York's mature contractor infrastructure, "Our contractors know how to screen customers and sell jobs." In addition, many AHPwES participants are referred to the program by WAP providers, who likely provide an initial level of pre-screening. In addition, NYSERDA's HPwES program has targeted affordable housing through a low-rise building pilot, which targets multi-unit developments consisting of one-to-four family structures of three stories or less.

Increasing Financing Inclusivity

NYSERDA has historically used Fannie Mae Energy Loans to provide HPwES participants with access to financing. The underwriting standards on this unsecured loan product, including a minimum credit score of 640, made financing inaccessible to many households – in recent years approximately 40 percent of loan applications were rejected. NYSERDA has declined more loan applications because household debt-to-income (DTI) ratios exceed the allowable limit than for any other reason – 43 percent of NYSERDA's loan application declines (17 percent of loan applicants) have been caused by excessive DTI ratios while just 23 percent of declines were triggered by low household credit scores (See Figure 21). Major credit events like bankruptcy, foreclosure, repossession and outstanding collections account for more loan denials (33 percent) than low credit scores – and this ~13 percent of loan applicants will be very difficult to serve moving forward.

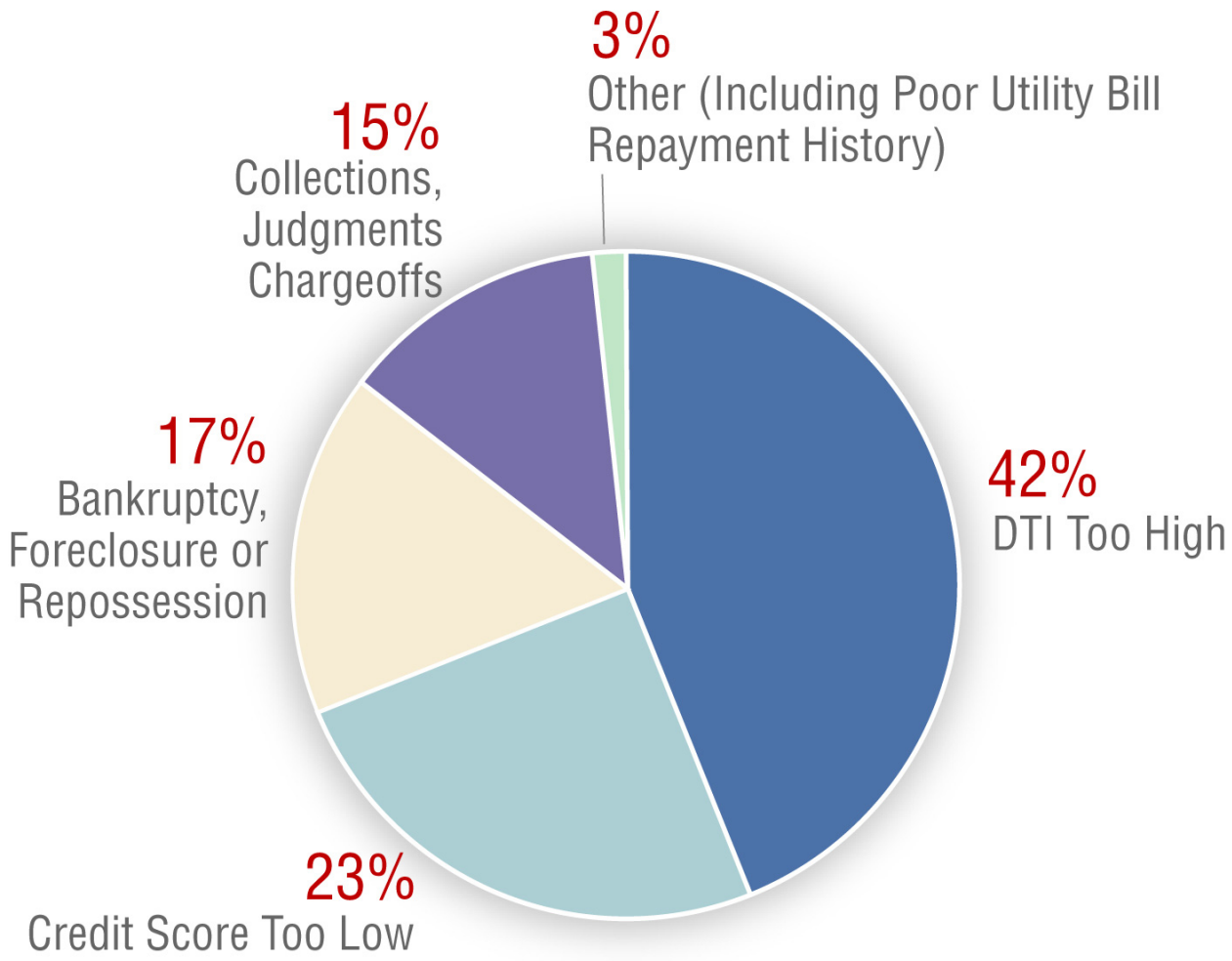


Figure 5. Reason for application rejection in NYSERDA's residential energy efficiency loan program November 2010-August 2011. (Source: NYSERDA)

In November 2010, NYSERDA replaced its Fannie Mae Energy Loan offering and, through its GJGNY financing platform, is now using two tiers of underwriting standards to qualify applicants for up to 15 year unsecured loans from $3,000 ($1,500 for AHPwES customers) to $13,000, or up to $25,000 with a project payback period of under 15 years; with an initial interest rate of 3.99 or 3.49 percent.[176]

Tier One underwriting uses standard credit score (minimum 640)[177] and DTI (maximum 50 percent) metrics to evaluate creditworthiness, and 40 percent of applicants are rejected for GJGNY financing. Tier Two standards offer households rejected from Tier 1 due to low FICO scores or high DTIs a second opportunity to qualify for GJGNY financing (See Table 9 for a description of Tier Two underwriting standards).[178] For those households with FICO scores below 640, Tier Two standards increase the maximum DTI to 55 percent and use utility bill repayment history in lieu of credit score to assess

[176] The interest rate will be 3.49 percent for participants that establish automatic bill pay – a potentially innovative incentive to reduce administrative costs and loan non-payment rates.
[177] Minimum FICO score 640 (minimum 680 if self-employed for at least 2 years or minimum 720 if self-employed less than 2 years).
[178] 23 percent of Tier 1 rejections are due to low FICO scores and 43 percent of rejections are due to high DTIs.

creditworthiness. For those households with a FICO score above 680 that were rejected from Tier One because they had a DTI ratio above 50 percent, Tier Two standards increase the maximum DTI to 70 percent and uses utility bill repayment history. These Tier Two underwriting standards offer a promising new approach to assessing consumer creditworthiness and helping more homeowners overcome the upfront cost hurdle of an energy upgrade.

<table>
<tr><th colspan="2">Eligibility Requirements</th><th>Participant Benefits</th></tr>
<tr><td colspan="2"><u>Tier 1</u>
FICO≥640
DTI≤50%</td><td rowspan="2">3.99% financing (3.49% with automatic ACH payment)
Up to $25,000</td></tr>
<tr><td><u>Tier 2 (Low FICO)</u>
FICO≤640
DTI≤55%
Strong Utility Bill & Mortgage Repayment History</td><td><u>Tier 2 (High DTI)</u>
FICO≥680
50≤DTI≤70%
Strong Utility Bill & Mortgage Repayment History</td></tr>
</table>

Table 2. New York's Green Jobs-Green New York financing underwriting criteria. (Source: NYSERDA)

Since its November 2010 launch, over $5.6 million has been loaned to 685 households through the GJGNY initiative, of which 24 loans ($204,599) have been issued to households qualifying under the new Tier Two standards (See Figure 22). Tier Two underwriting criteria have increased access to capital on the margin, increasing NYSERDA's overall loan application approval rate by two percent. This increase may underestimate the impacts of using utility bill repayment history as a means of assessing creditworthiness as a multi-step application process appears to have posed a significant hurdle for many potential Tier Two participants and NYSERDA only launched the "High DTI" underwriting criteria in July 2011.[179] NYSERDA has already made several changes to the Tier Two underwriting criteria since the initiative launched in 2010, which is indicative of the flexibility that is essential to experiment with more inclusive financing tools.

[179] From November 2010 to October 30, 2011, NYSERDA processed 2,648 applications for GJGNY financing. 1,390 (53 percent) were approved under Tier 1 underwriting criteria. Of the 1,258 Tier 1 denials, 747 (59 percent) were rejected from Tier 2 for reasons unrelated to utility bill repayment history (e.g. recent bankruptcy, high DTI). For those 511 households not qualified for Tier 1, but not initially disqualified from Tier 2, GJGNY requires that they submit their utility bills. This step has been a significant barrier as more than 80 percent of applicants have failed to follow-up with bill submission (234 have either formally withdrawn their applications or did not submit utility billing data within 180 days of their initial application. Another 178 have not yet submitted utility billing data, but have not reached the 180 day automatic disqualification date.) 81 households submitted utility bills and 68 (84 percent) of those respondents were subsequently qualified for financing. While the net approval rate increased by just 2.6 percent, this may underestimate the impacts of using utility bill repayment history as other underwriting criteria and the multi-step application process appear to have been significant hurdles. For example, if 84 percent of all 511 households not automatically disqualified from the Tier 2 track (e.g. those that failed to submit their utility bills) had been approved, GJGNY's approval rate would have increased by 16 percent.

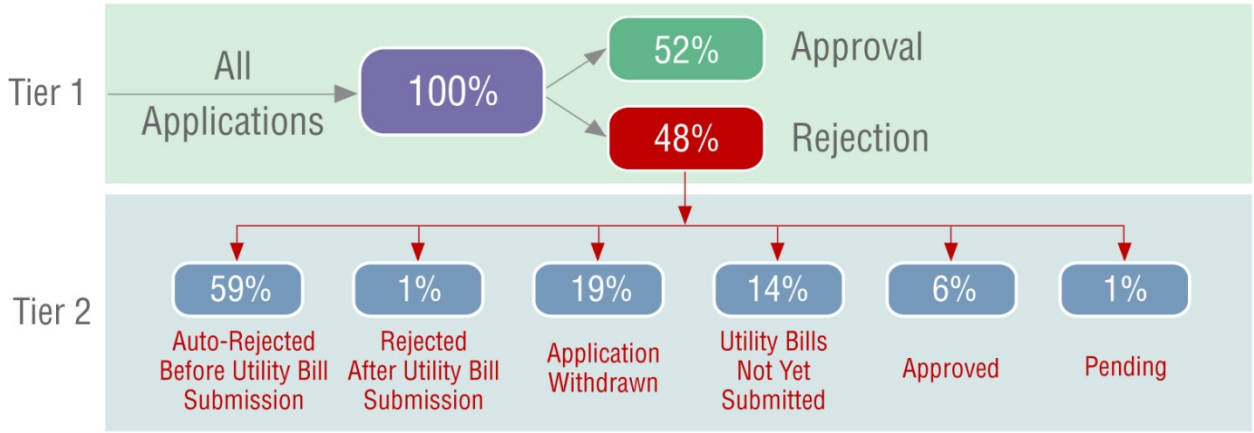


Figure 6. Summary of NYSERDA's GJGNY Loan Application Process and Data (as of August 31, 2011). (Source: NYSERDA)

Home HeadQuarters: Offering Another Financing Option For Less Qualified Households

Income-qualified homeowners in central and upstate NY can also apply for financing through Home HeadQuarters (HHQ), Inc., a CDFI and a chartered member of NeighborWorks America.[180] HHQ has been offering a range of secured and unsecured financing products to qualifying households participating in the AHPwES program for several years, averaging approximately 20 loan originations per month, and has not had a single default. NYSERDA buys down the loan interest rate from seven to three percent and pays NeighborWorks $425 for each originated loan – $75 for determining income eligibility for AHPwES and $350 for providing credit counseling, financing management education, and pre/post upgrade inspection.[181] This counseling and education are critical to HHQ's low loan default rate – it issues over 800 home improvement loans a year and has a default rate below five percent on this portfolio.

GJGNY Update

In August 2011, the State of New York enacted legislation to pilot residential meter-attached financing in six utility service territories. While many details remain to be worked out – including underwriting standards and loan security – the program is intended to simplify and increase the inclusivity of NYSERDA's existing GJGNY residential financing options. New York's on-bill legislation offers NYSERDA another opportunity to test inclusive financing approaches and program managers expect to finalize plans in the coming months and the 2 year pilot is set to launch in Spring 2012.

Resources:

[180] In addition to offering affordable financing, HHQ provides credit counseling, financial management education, pre/post site confirmation, verifying the existing condition of home and the installation of proscribed measures. Under the previous contract/RFP, NYSERDA provided compensation to HHQ, $75 for each income eligibility determination and $350 for the other services, however under the next funding cycle these incentives are not likely to be continued.

[181] NYSERDA does not have sufficient funding to continue the $350 counseling, education and inspection incentive. However, Neighborworks expects to continue to offer these services using alternative funding sources as program managers view this program as serving the organization's core mission.

Program website:
http://nyserda.ny.gov/en/Program-Areas/Energy-Efficiency-and-Renewable-Programs/Green-Jobs-Green-New-York.aspxLBNL Policy Brief:
Zimring, M. and M. Fuller. "NYSERDA's Green Jobs-Green New York Program: Extending Energy Efficiency Financing to Underserved Households" Clean Energy Program Policy Brief. LBNL-4556E January 2011. Available at: http://eetd.lbl.gov/ea/emp/reports/ee-policybrief_012411final.pdf

Contacts:
Jeff Pitkin, Treasurer, NYSERDA
jjp@nyserda.org

Sources:

Conversation with Crystal Purcell, HHQ 08/03/11

Conversation with John Ahearn, NYSERDA 03/31/11

Conversation with Karen Hamilton, NYSERDA 09/23/11

Clean Energy Works Oregon

Bill Payment History as a Proxy for Credit

Clean Energy Works Oregon (CEWO) is relevant to the middle income market because of its alternative underwriting practices, and its provisions for addressing deferred maintenance and other physical barriers to efficiency. CEWO is a non-profit program launched in June 2009[182] to reduce energy waste by encouraging Oregon homeowners to make improvements to their homes. The program is supported by ARRA funds, utility customer funds, foundations, and other sources. CEWO provides outreach, education, and energy advisors that walk program participants through the home energy upgrade process. A key element of the program is low interest financing that is repaid through a line item on the utility bill.

Enterprise Cascadia, a Community Development Financing Institution (CDFI), manages the on-bill financing program and does the loan underwriting. Loans for approved measures are for up to $30,000 over 20 years, with an interest rate of 5.99 percent. They are generally secured with a subordinate lien on the property, though in a few cases with very small loan amounts an unsecured loan has been offered. The debt is able to transfer with property ownership, which requires payment of a transfer fee, a credit check on the new owner, and the new owners' consent – this has not happened to date, but is potentially a way to spread out the payments past one owner's tenancy in the home.

CEWO's underwriting process is notable for its low cost and potential to responsibly increase the inclusivity of financing. While it includes a credit score check, instead of analyzing an applicant's debt-to-income (DTI) ratio, CEWO examines utility bill repayment history. Using utility bill repayment history in lieu of DTI's significantly reduces loan underwriting expenses, and because more households in many programs are rejected for financing due to high DTIs than low credit scores, may be a particularly inclusive approach.

Enterprise Cascadia uses the following point system[183] to assess credit worthiness:

1. **Length of Bill Payment History Available:** If primary heating source utility payment history for the subject property is available, but the length of time serviced by utility is less than six months, one point. If length of time serviced by the utility is less than three months or if payment history for the subject property is not available, two points.

2. **Utility Current Delinquency:** Borrower currently past due to the utility, greater than 30 days but less than 60 days, one point. Borrower currently past due to the utility greater than 60 days, four points.

3. **Utility Historical Delinquency:** Borrowers with up to two 30-day delinquencies in the past 12 months, one point. Borrowers with three delinquencies, including up to one notice of disconnection for non-payment in the past 12 months, two points. Borrowers with more than three delinquencies or more than one notice in the last 12 months, four points

[182] The Portland pilot Clean Energy Works program launched in June 2009; the statewide program launched early 2011.
[183] Excerpted from CEWO's *Lending and Servicing Guidelines* (April 2011 version).

4. **Applicant's Credit Score:** Applicant's credit score <660, one point; < 640, two points; <590, four points.

The number of points totaled would result in the following Risk Rating:

Points	Risk Rating
0-1 Points	4
2	5
3	6
4	7

Applicants with a Risk Rating of five or less are automatically pre-approved for a CEWO loan. Applicants with a Risk Rating of six will automatically receive a second review and may be approved or declined based on further review. Applicants with a Risk Rating greater than six will be declined for a CEWO loan.

Proof of title is obtained for all applicants. If the applicant is not on title to the home proposed for the retrofit, or if the applicant is not a resident at the home, this may result in a decline. In addition, there will be an automatic decline if the credit history shows any of the following: foreclosure activity (or equivalent) within the last 12 months; bankruptcy filing, discharge, or dismissal within the last 12 months; unpaid federal tax liens; current child support delinquency; the mortgage currently past due, or more than two 30-day delinquencies in the last 12-months; or any other unsatisfied judgment that would impact lien position or the ability to repay the loan. *[end excerpt from CEWO's Lending and Servicing Guidelines]*

The early data is promising – CEWO's application decline rate is just 10 percent – well below that of other energy efficiency loan programs. CEWO's financing partner, Enterprise Cascadia, has dispersed $7.1 million for 565 loans since 2009, and no loans have defaulted in the first two years.[184] However, it is also important to note that most applicants – both those declined and those approved – have strong credit scores, most above 700.

As of June 30, 2011 Enterprise Cascadia had disbursed 565 loans with an average loan amount of about $12,500 for a total of $7.1 million in financing dispersed. They have another $1.4 million in loans that have closed. The actual current outstandings are $6.5 million due to pay-downs/pay-offs. Enterprise Cascadia estimates that by the end of the year, they will have $10 million in total outstandings – a portion of which will be for loans in Seattle, where they are expanding the same loan offering. Thus far no loans have defaulted, but their current criticized assets equal 2.1 percent of the outstanding portfolio, including watch list assets at 1.4 percent and problem assets at 0.67 percent (a single loan).

The CEWO program also addresses another important issue for many middle income households – deferred maintenance and physical barriers to efficiency. The program permits households to use up to 20 percent of the energy improvement loans as a "contingency allowance" for non-energy improvements such as water damage repair, ventilation improvements, dealing with old knob and tubing wiring, etc. In addition, in areas of the City of Portland targeted for urban renewal – often those neighborhoods with low and middle income families – the Portland Development Commission provides additional loan capital to

[184] It is important to note that most applicants – both those declined and those approved – have higher than average credit scores, most above 700. In addition, while there have been no defaults to date, CEWO's current "criticized" assets equal 2.1 percent of the outstanding portfolio, including watch list assets at 1.43 percent and problem assets at 0.67 percent (a single loan).

increase the contingency allowance to 40 percent of the total project cost up to $10,000. This funding is provided seamlessly within CEWO's existing on-bill financing program, and does not require a separate application.

Resources:

Program website: http://www.cleanenergyworksoregon.org

Contacts:

Adam Zimmerman, Senior Vice President, Enterprise Cascadia
azimmerman@sbpac.com

Derek Smith, Chief Executive Officer, Clean Energy Works Oregon
derek@cleanenergyworksoregon.org

Sources:

Interview with Adam Zimmerman 7/15/11

Enterprise Cascadia – CEWO Lending and Servicing Guidelines (April 2011 version)

Boulder SmartRegs

Energy Efficiency Requirements for the Residential Rental Market

Enacted in January 2011, the City of Boulder, Colorado's SmartRegs ordinances require all single and multifamily rental properties to meet a minimum energy efficiency standard by January 2019. While not exclusively focused on middle income households, the SmartRegs working committee – charged with designing the new regulations – specifically targeted affordable housing landlords and middle income renters during its extensive stakeholder engagement process. Over 50 percent of Boulder's housing units are rentals, and the SmartRegs initiative is designed to help the city achieve its ambitious carbon emissions reduction goals. Six months into the program, the city has already met its first-year goals of 1,000 units inspected and 500 units achieving compliance.

Making the Case for Regulations

The City of Boulder's Climate Action Plan calls for greenhouse gas emissions reductions across all sectors of the community (e.g., buildings, transportation, industry) – and energy conservation in new and existing buildings plays a prominent role in the plan's ambitious goals. For more than a decade, the city has been steadily strengthening minimum energy efficiency standards for new construction and remodels.[185] Despite these efforts, Boulder is not on track to meet its 2012 Climate Action Plan. The city's 19,000 existing residential rental units make up over 50 percent of Boulder's housing stock, so the rental sector offered a large opportunity for greenhouse gas emission reductions. Boulder's rental market has perennially low vacancy rates, giving landlords little market incentive to provide energy upgrades or other improvements to attract tenants. Officials determined that regulations were needed to overcome this barrier and to harness the city's rental housing stock to reach Boulder's emissions reduction targets.

The city's existing rental licensing ordinance requires rental unit owners to complete a health and safety inspection as part of the license renewal process every 4 years. This existing intervention point, and the database of licensed properties it has created, provided the necessary leverage for cost-effectively implementing and enforcing the new regulations.

Getting to YES

After more than a year of community engagement and collaboration, Boulder, Colorado became the first U.S. city to require existing residential rental properties to meet a minimum energy efficiency standard.[186] The regulations, which require building owner compliance by January 2019, were unanimously approved by the Boulder City Council and went into effect in January 2011. Getting SmartRegs passed, even in a progressive city, required a sophisticated strategy. The SmartRegs working committee purposefully developed the regulations as 3 separate ordinances so the City Council would have the option to approve

[185]Boulder's "Green Points and Green Building Program" consists of optional and mandatory green building requirements for residential and commercial new construction and renovations. For more information, see: www.bouldergreenpoints.com.

[186]SmartRegs scope and compliance exemptions include: 1) manufactured homes; 2) affordable housing units that have applied for or received state or federally subsidized weatherization; 3) prescriptive point modifications for certain historic buildings; and 4) buildings achieving equivalent energy efficiency performance through innovative means, determined at the discretion of the code official. The code official also has discretion to approve additional time to achieve compliance if one rental license cycle is deemed not financially feasible. Properties in which some measures are technically impractical must purchase carbon offsets for the improvements not made.

some or all of the program components, increasing the chance that at least some components would be approved[187] – ultimately, the City Council approved all three.

The SmartRegs development process involved over two years of extensive collaboration with community and technical working groups that solicited input from market-rate and affordable housing rental property owners, property management and rental associations, rental inspectors, student housing advocates, environmental organizations and other community interests. The effort also incorporated online surveys, social media channels and official public processes. Megan Cuzzolino, Residential Sustainability Specialist for the City of Boulder, stresses that involving stakeholders from the beginning, and making sure that their input is incorporated into planning, was critical to their ultimate success.

SmartRegs proposals were initially met with concern and resistance from many property owners. Key sticking points were the stringency of the regulations and time frame for compliance. Boulder's rental owners range from middle income residents relying on a single rental unit for retirement income and affordable housing owners with hundreds of units with little free cash flow to make regular maintenance and basic capital improvements to luxury, high-end condo owners.

The final ordinances ultimately won community support by including an eight year compliance period that will allow rental owners sufficient time to budget for energy improvements over several years, offering financial incentives and technical assistance through the city's EnergySmart program and by including two paths for compliance – a streamlined prescriptive path and a custom, energy assessment-based path. In addition, the fact that the city had already addressed most of the other building sectors (residential and commercial new construction and renovations) with even more stringent requirements than SmartRegs helped allay some landlords' concerns that the rental community was being singled out.

Two Compliance Paths

Initially, the SmartRegs committee proposed requiring building owners to meet a minimum Home Energy Rating System (HERS) Index score of 120.[188] However stakeholder concerns about the costs and time commitment associated with this approach led the city to add a streamlined prescriptive compliance path as well. The prescriptive approach involves awarding points for energy efficient features such that achieving

The SmartRegs Prescriptive Checklist

The prescriptive checklist provides landlords with a clear roadmap for understanding how to reach the 100 points necessary for SmartRegs compliance. This excerpt from the checklist, shows that a smaller amount of duct leakage garners more points, as does the presence and percent coverage of duct insulation throughout a building.

DUCT LEAKAGE Base:_____ Final:_____

CFM per 100 SF	POINTS
80 cfm @ 25 Pa	0
60 cfm @ 25 Pa	4
40 cfm @ 25 Pa	9
20 cfm @ 25 Pa	14
10 cfm @ 25 Pa or Less	17

DUCTS Base:_____ Final:_____

LOCATION / INSULATION	25%	50%	75%	100%
Uninsulated	0	0	0	0
Insulated to at Least R-4 (unconditioned space)	1	3	4	6
No Ducts / Ducts Entirely Within Conditioned Space	2	3	5	7

[187] Ordinance 7724 replaced the existing housing code with the 2009 International Property Maintenance Code (IPMC) with local amendments added. Ordinance 7725 updated the rental licensing ordinance with new baseline and safety inspection checklists. Ordinance 7726 created the new energy efficiency requirements for existing rental housing units.

[188] HERS compares the energy efficiency performance of an assessed home with a standard reference house (assigned a HERS Index of 100) that meets the 2006 International Energy Conservation Code. Each point higher or lower along the index scale represents a one percentage change (more or less, respectively) in energy use from the reference point. A HERS score of 120 equates to 20 percent more energy usage than the reference standard.

the minimum compliance score of 100 points is roughly the equivalent of a HERS rating of 120 (see text box).[189,190]

The EnergySmart Program: Encouraging Early Compliance

At the same time that SmartRegs went into effect, Boulder County launched the ARRA-funded EnergySmart program, which provides rebates, low-cost energy assessments, and technical assistance to encourage residential and commercial property owners to invest in energy efficiency. The City of Boulder complemented these County incentives by launching the EnergySmart Service a streamlined one-stop-shop and offering extra financial incentives for properties working toward prescriptive path SmartRegs compliance (see Table 10).[191]

Feature	Boulder County EnergySmart Program	City of Boulder EnergySmart Service Program
Eligibility	Open to all residential EnergySmart participants	Available only to properties requiring upgrades to comply with SmartRegs
Full Service[192]	$120 for full home assessment and energy advisor service.	$120 for full home assessment by a SmartRegs Energy Inspector and energy advisor service.[193] Fee is waived for affordable housing properties.
Partial Service[194]	$30 for advisor service only, for those already working with a contractor. Service excludes home energy assessment.	
Rebates (in addition to utility, state and other rebates)	Up to $250 per unit ($1,000 maximum for owners of multiple units)	Up to $750 per unit to pay for necessary upgrades ($5,000 maximum for owners of multiple units)

Table 3. Summary of Boulder County and City of Boulder EnergySmart incentives.

The county-wide EnergySmart program offers rebates in time-limited rounds (e.g., the current round of rebates ends October 31, 2011, or until funds run out), a strategy which is intended to create a sense of urgency for taking action among building owners with messaging such as, "Did you miss our last round of

[189] The prescriptive checklist assigns points according to the efficiency of the building construction and systems including cooling and heating, lighting, appliances and such thermal attributes as foundation type, insulation and air leakage. Shared walls and interior ductwork garner points due to their thermal advantage. The system also adds points for building operator and tenant energy conservation training and for various types of solar equipment.
[190] The rating or score must be achieved by each individual unit. Common areas and ground floor retail space in multifamily buildings are exempt from SmartRegs but are covered under the city's commercial building codes.
[191] These City of Boulder initiatives are funded by the city's Climate Action Plan tax.
[192] Full service package includes home energy assessment (including blower door and infrared testing, direct install measures, one-on-one guidance from EnergySmart energy advisor including help with rebate paperwork, contractor selection and financing if needed.
[193] Only SmartRegs Energy Inspectors can credit building owners with points towards SmartRegs compliance for direct install measures.
[194] Partial service includes the same energy advisor service and direct install measures as the full service package, but not the home energy assessment.

rebates? It's not too late!" The local EnergySmart Service program marketing campaign also encourages early action by stressing that funds are first-come first served, offered only for a limited time.

Early Results

During the first six months of implementation, the program had already surpassed Boulder's first year goals of 1,000 units inspected and 500 units compliant. As of July 19, 2011, over 1,600 units had queued up for the EnergySmart Service, 1039 had completed initial inspection and over 635 units had been deemed SmartRegs compliant using the Prescriptive Pathway. Next year's goals are four times the 2011 goals. By the end of 2012 staff hopes to have inspected over a quarter of the city's 19,000 rental units and to get nearly 16% of the city's units in compliance.

Of the 935 multifamily and 104 single family units, about 60 percent were SmartRegs compliant on initial inspection and required no energy improvements.[195] Megan Cuzzolino noted that they are finding that multifamily residences are faring better in meeting SmartRegs requirements because of features like a higher number of shared walls (which provide thermal efficiency and earn prescriptive points) per square foot of floor space. The city expects that single family residences, many of which date from the 1970s, will make up a majority of required energy upgrades.

Owners who were required to upgrade their properties to meet compliance spent an average of $1,815 per unit before rebates and incentives – with incentives covering approximately one third of this cost.[196] Upgrade investments for all projects that have come through the SmartRegs program in the first 6 months total over $600,000, most of which has been self-funded by building owners.[197] Based on deemed savings, city officials estimate that these investments will avoid retail energy costs of $129,000 annually, an average of over $100 per unit. For those properties that were initially noncompliant, upgrades will result in an estimated total of $72,000 in avoided energy costs, or $243 per unit per year.

Unexpected Benefits

The city is seeing some surprising outcomes. Owners of over 400 units (most located in two large apartment complexes) where the majority of units were found to be already compliant, voluntarily chose to upgrade beyond the minimum requirements. Though the compliant units are not eligible for the extra incentives offered by the city, the owners are using the county's rebates for improvements throughout their buildings.

Resources

SmartRegs coordinators:

Yael Gichon, Sustainability Coordinator, City of Boulder
gichony@bouldercolorado.gov

Megan Cuzzolino, Residential Sustainability Specialist, City of Boulder

---

[195] 63 percent of multifamily units and 38 percent of single family units inspected were found compliant on initial inspection.
[196] Project costs so far have ranged from approximately $1,100 per multifamily unit for basic air sealing and insulation to $4,718 per unit in a historic duplex for upgrades that involved window replacements.
[197] Program managers noted that most of the investment to-date has been self-funded by building owners.

cuzzolinom@bouldercolorado.gov

SmartRegs website which includes information for owners, renters and inspectors:
www.bouldercolorado.gov/smartregs

Project background including history of proceedings and stakeholder engagement:
http://www.bouldercolorado.gov/index.php?option=com_content&view=article&id=13005&Itemid=22#BACK

Property Maintenance Code – Ordinances 7724 (2010) and 7726 (2010):
http://www.colocode.com/boulder2/chapter10-2.htm

Rental License Code – Ordinances 5798 (1996) and 7725 (2010) – which provides for enforcement of the Property Maintenance Code:
http://www.colocode.com/boulder2/chapter10-3.htm

Prescriptive Path Handbook:
http://www.bouldercolorado.gov/files/PDS/rentalhousing/Energy_Efficiency_Project/handbook_final_12.13.2010.pdf

Class "G" license information:
http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=13987&Itemid=22

EnergySmart program website:
http://www.energysmartyes.com/

EnergySmart SmartRegs web page:
http://www.energysmartyes.com/home/smartregs

City of Boulder Rebates Matrix web page:
http://www.bouldercolorado.gov/files/PDS/rentalhousing/Energy_Efficiency_Project/COB_rebates_8.2.11.pdf

Populus Case Study which includes the prescriptive path methodology:
http://www.bouldercolorado.gov/files/PDS/rentalhousing/Energy_Efficiency_Project/SmartRegs_Final_Report_to_City_of_Boulder_March_26.pdf

Boulder's Climate Action Plan Tax webpage:
http://www.bouldercolorado.gov/index.php?option=com_content&task=view&id=7698&Itemid=2844