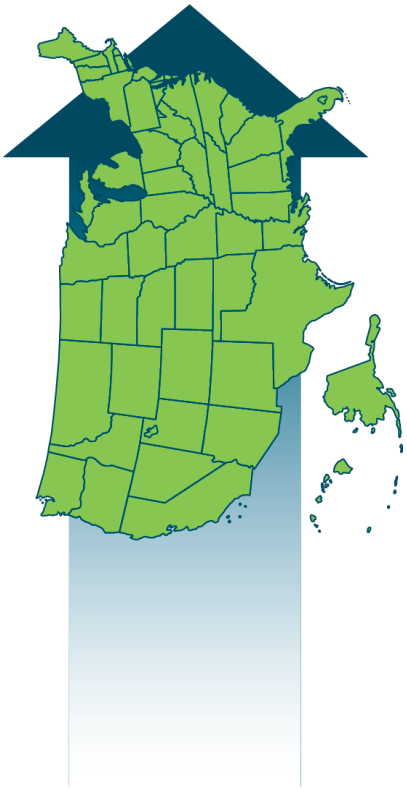
SEE Action

STATE & LOCAL ENERGY EFFICIENCY ACTION NETWORK



Roadmap for the Home Energy Upgrade Market

Residential Retrofit Working Group

June 2011

The State and Local Energy Efficiency Action Network is a state and local effort facilitated by the federal government that helps states, utilities, and other local stakeholders take energy efficiency to scale and achieve all cost-effective energy efficiency by 2020.

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List of Acronyms

ARRA	American Reinvestment and Recovery Act
BE	Bundled Efficiency
BPI	Building Performance Institute
DIFM	Do it for Me
DIY	Do it Yourself
EECBG	Energy Efficiency and Conservation Block Grant
HP	Home Performance
LBNL	Lawrence Berkeley National Laboratory
L-I	Low-income/assisted energy efficiency
RLF	Revolving Loan Funds
RRWG	Residential Retrofit Working Group
SEE Action	State and Local Energy Efficiency Action Network
SEP	State Energy Programs
WAP	Weatherization Assistance Program

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Executive Summary

Keeping our homes powered and comfortable uses about a quarter of all energy consumed nationally, about what it takes to run every civilian vehicle on the nation's roads. Unlike vehicles, however, inefficient housing can persist for generations[1] as a drain on household finances and the national economy. Energy use in homes accounts for about 22% of U.S. emissions from burning fossil fuels.[2] Energy waste from inefficiency in homes has health and environmental costs—needless emissions of soot, sulfur oxides, carbon monoxide, and greenhouse gases. Achieving energy and climate security will be highly challenging without addressing the enduring legacy of existing inefficient homes.

These homes also present an opportunity. The fixes would redirect investment from the capital-intensive production and transmission of energy toward more labor intensive industries—construction, manufacturing, retail sales, and services—that create more jobs for every dollar invested. Better performing homes make families more comfortable and healthier, and homeowners and renters can save hundreds of millions of dollars per year[3] for other activities.

Yet very few homeowners invest in comprehensive home energy upgrades—professional, multimeasure efficiency improvements across the home, usually driven by an energy assessment that prioritizes measures by cost-effectiveness. The nation's most successful home energy upgrade programs have achieved very low market penetration to date, less than 2% by one recent estimate (Neme et al. 2011). In areas not served by such programs, market penetration undoubtedly is lower.

With expertise in home energy upgrade policy, programs, and delivery, the SEE Action Residential Retrofit Working Group (RRWG or working group) explored the barriers and pathways to realizing this abundant source of energy savings.

The group decided at the outset to focus on households not targeted by the federal Weatherization Assistance Program (WAP), which funds direct installs of comprehensive packages of energy efficiency measures at no cost to low-income households. The working group decided to concentrate on increasing the pace of home energy upgrades in which households bear a considerable share of the cost of the energy improvements.

This roadmap lays out a vision for overcoming many of the barriers to comprehensive home energy improvements. The working group reviewed a range of energy efficiency policies and programs nationwide, then analyzed three funding and policy scenarios (Base, Moderate, and Aggressive) to gauge the impact of these potential changes on the market for home energy upgrades over the next decade.

The analyses revealed several insights:

- Households are spending billions of dollars annually fixing their homes but not on comprehensive home energy upgrades. Since the mid-1990s, each year about 20 million U.S. households have spent an average of $165 billion per year on home remodeling, renovations, and replacements, with significantly higher spending in recent years. A very small fraction is being spent on whole home efficiency improvements across multiple end uses. This market reflects thousands of lost opportunities every day for energy improvements—a vast, largely untapped potential.

[1] Median age of light-duty vehicles in 2009 was 10.2 years (U.S. DOE, Transportation Energy Data Book 2010). Median age for U.S.-occupied housing stock in 2009 was 35 years (U.S. Census, American Housing Survey, 2009).
[2] Emissions associated with energy use in the residential sector are slightly smaller than emissions from all U.S. light-duty vehicles. U.S. Environmental Protection Agency, U.S. Greenhouse Gas Inventory 2011.
[3] Based upon working group estimates of cumulative upgrades under a Moderate Scenario and the average cost to residential consumers for a generic quad of delivered energy, as reported in the U.S Department of Energy's Residential Energy Consumption Survey 2005.

- The market for home energy upgrades is growing, but the prospects for decline are significant in the business-as-usual case. Efforts nationwide at producing more home energy improvements are fractured, and the number of homes upgraded is modest relative to the stock of inefficient housing. Those efforts are growing rapidly, but a reversal may occur because dozens of newly launched programs are expected to close down when Recovery Act funding ends.
- Driving large-scale home upgrades nationwide will be challenging. Absent greater policy support, rapidly scaling today's programs to deliver several million comprehensive home energy upgrades annually will not be easy or achievable without considerable policy and program investment.
- No single entity or level of government can drive a dramatic increase in the market for home energy upgrades. Accelerating and transforming this market will require the combined efforts of private contractors, lenders and other real estate market actors, utilities, homeowners, and all levels of government.
- Consumer financing is no panacea for motivating households to invest in energy efficiency but is important once homeowners decide to pursue an upgrade. Financing can be critical once the homeowner is already interested in upgrading their home or apartment. It is important, though, that programs and policies do not assume that the existence of financing alone will create demand for upgrades. Once a homeowner is engaged in pursuing an upgrade, however, financing is a critical sales tool for contractors and programs.
- Cofunding or financing of service providers is essential. The success of home energy upgrade programs depends critically on an adequate supply of qualified, certified contractors and work crews. Managing cash flows in these new or rapidly expanding businesses, however, requires working capital, and outfitting new crews is costly. This would be facilitated by affordable financing or cost sharing with programs. For example, outfitting work crews to perform the number of home energy upgrades projected in the working group's Moderate Case would require a one-time estimated outlay of ~$1.8 billion.
- Natural or logical roles for market stakeholders are not well defined. Mature markets in other industries have developed clear roles—and reaped efficiencies—for service providers, different levels of government, and nonprofit entities. The home energy improvement market has not developed these divisions of labor, resulting in duplication, inefficiency, and confusion in some markets.
- Leverage—and high-quality work standards—holds promise as a path to market sustainability. Policies such as a tiered, performance-based federal tax credit or rebate program, a clean energy standard, and expansion of existing home energy upgrade programs can result in significant movement toward a self-sustaining market, by leveraging more than $3 of private funds for every $1 of public and utility billing funds, according to the working group's analysis.

A summary of the results of the working group's analyses can be found below (Table ES-1).

Table ES-1. Market Penetration, Total Energy Savings, and Total Market Investment by 2020 in the Base, Moderate, and Aggressive Scenarios

Cumulative Investment 2010-2020		$27 **B**	$83 **B**	$132 **B**
Private Investment 2010-2020		$17 **B**	$65 **B**	$91 **B**
Public Investment 2010-2020		$9 **B**	$18 **B**	$41 **B**
Ratio of Private to Public Investment 2010-2020		**1.8**	**3.6**	**2.2**

Metrics	2009	Base Case in 2020	Mod. Case in 2020	Agg. Case in 2020
TOTAL HOUSING STOCK	112 M	128 M	128 M	128 M
TARGET MARKET: Households with incomes >149% Federal Poverty Level residing in homes built prior to 2005	82 M	93 M	93 M	93 M
HOME ENERGY UPGRADE MARKET ACTIVITY				
Annual Number of Homes Upgraded		**0.5 M**	**1.7 M**	**3.0 M**
Homes upgraded as % of Households >149% Federal Poverty Level & Pre-2005 Construction	0.7%	0.5%	1.8%	3.2%
Cumulative Number of Homes Upgraded (2010-2020)		7 M	14M	22M
Market Saturation: Cumulative # of Home Upgrades by 2020 as % of Households >149% Poverty Level & Pre-2005 Construction		**7%**	**15%**	**23%**
ENERGY SAVINGS & INVESTMENT REQUIRED				
Delivered Energy Savings in 2020*		**0.08 Quads**	**0.22 Quads**	**0.32 Quads**
Cumulative Delivered Energy Savings, All Homes Upgraded (2010-2020)*		**0.53 Quads**	**1.14 Quads**	**1.59 Quads**
Annual Public/Private Investment in 2020		**$2.1 B**	**$10.1 B**	**$19 B**
Total Private Sector Investment		$17 B	$65 B	$91 B
Total Public Sector Investment		$9 B	$18 B	$41 B
Ratio of Private to Public Investment		**1.8**	**3.6**	**2.2**

The working group identified ten major priorities for establishing a vibrant, sustainable industry for comprehensive home energy improvements. These solutions target four priority areas—greater policy commitment, greater access to capital, more market transparency, and better market delivery systems (Figure ES-1). Each solution in turn is tied to tangible actions by primary market actors—contractors, efficiency program administrators, lenders, real estate agents, appraisers, nonprofit entities, and governments.

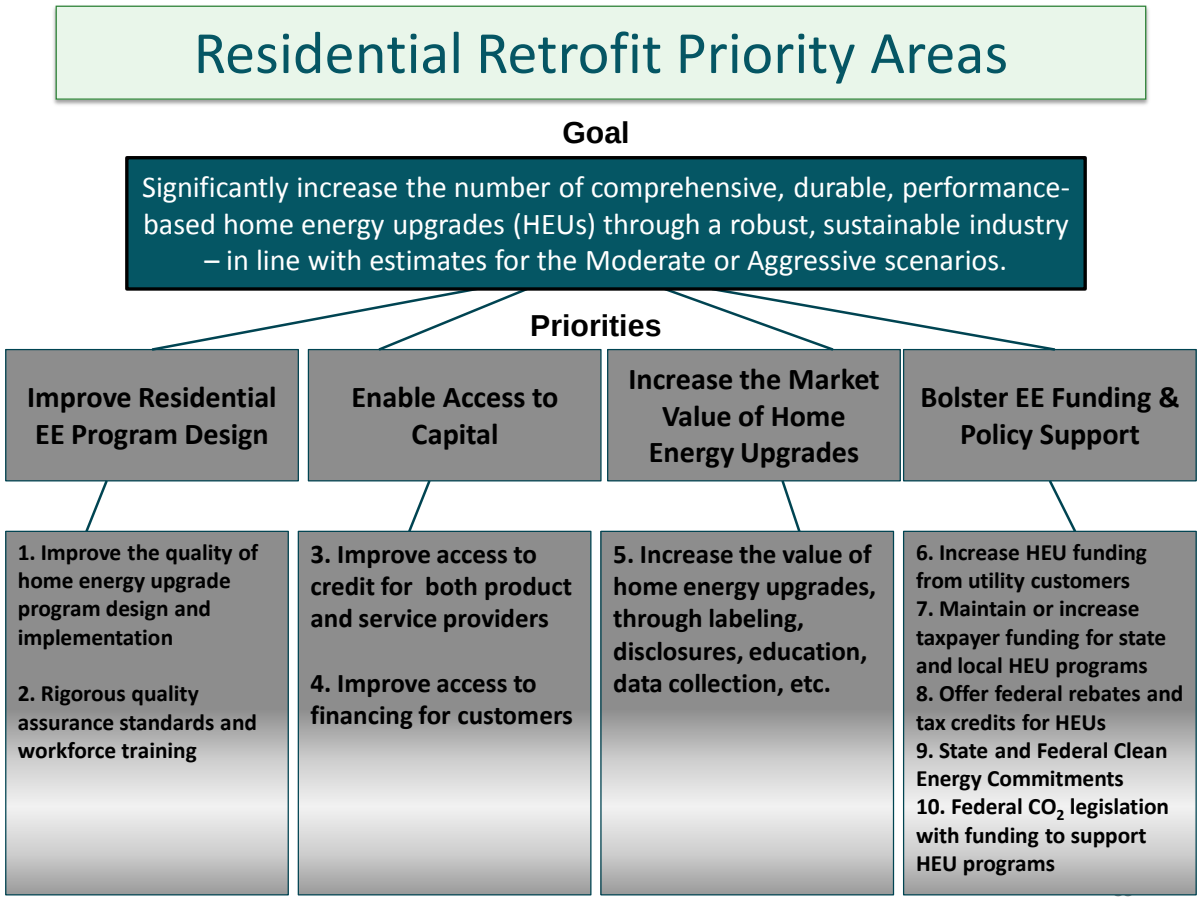


Figure ES-1. Residential retrofit roadmap goal and priority areas

The barriers to realizing comprehensive home energy savings on a large scale are complex and difficult to surmount. Many of the working group's solutions can be acted upon today with potentially powerful impacts on the market. These near-term reforms include spreading best practices in program designs, linking high-quality work standards to energy efficiency programs and financing, and making the benefits of energy efficiency apparent for homebuyers and other actors in real estate and energy markets.

Coupling these changes with additional investments from government and the power sector can accelerate the market in home energy upgrades. What the working group's analysis makes clear, though, is that improvements in program design and policy support will not materialize overnight, nor will the market respond immediately.

It takes time to revamp program designs, obtain more funding, and publicize the changes. Contractors cannot deliver higher numbers without obtaining more equipment and trained, certified crews. Lenders must become comfortable with the performance of programs and the energy savings resulting from the upgrades. It takes time for households to hear about their neighbors' upgrades and take the first steps toward their own comprehensive energy savings.

In short, delivering the significant private and public benefits of comprehensive home energy efficiency is not a matter of quick fixes. It is a committed effort on multiple fronts, and there is no better time to start than now.

A Guide to This Roadmap

Section 1 describes the scope of this roadmap, and Section 2 describes the working group's long-term vision for the home energy upgrade market. Section 3 evaluates the current state of the home energy improvement market and maps existing home energy upgrade programs in that market. Section 4 outlines barriers to market growth. Section 5 identifies key drivers of market development and the working group's attempts to quantify their impacts in three alternative scenarios: a Base Case, a Moderate Case, and an Aggressive Case. The results are estimates of the number of home energy upgrades and market investment that might be expected in the three scenarios. Section 6 discusses important nonmodeled drivers of market development. Section 7 suggests priorities and next steps for key players in this market, including policymakers and other actors in government, industry, real estate, and finance.

Disclaimers and Citations

The Residential Retrofit Working Group of the State and Local Energy Efficiency Action Network is committed to encouraging investment in cost-effective energy efficiency.

This roadmap was developed under the guidance of and with input from the working group. The document does not necessarily represent an endorsement by the individual members of the RRWG or the organizations to which they belong.

The RRWG Roadmap is a product of the State Energy Efficiency Action Network and does not reflect the views, policies, or otherwise of the federal government.

If this document is referenced, it should be cited as: State Energy Efficiency Action Network (2011). Residential Retrofit Roadmap. www.seeaction.energy.gov.

I. Introduction

The State Energy Efficiency Action Network's (SEE Action) goal is to help the nation's consumers achieve all cost-effective energy efficiency by assisting private and public entities with energy efficiency policies and programs. The Residential Retrofit Working Group (RRWG)[4] of SEE Action has focused on assessing the current state of the home energy improvement market, the potential for future growth, and the path to achieving this savings potential in the residential market. The purpose of this roadmap is to inform consumers, policymakers, regulators, and industry stakeholders on key steps along the path to achieving significant energy savings in the residential market. The first step on that path is a move away from outdated and—for the general public—unfamiliar and unappealing language. "Audits" and "retrofits" are terms that are ill-suited to taking advantage of the largest source of nontransportation energy savings in the U.S. economy. The working group adopts more contemporary and intuitive terms: "energy assessments" and "home energy upgrades" or "home energy improvements."[5]

Energy Efficiency Opportunities in the Residential Market

Improved energy efficiency in residential buildings is a vital part of reducing the burden of energy costs to families, creating jobs, reducing emissions from power plants, and increasing the nation's energy independence. The U.S. Energy Information Administration projects that Americans will spend $1.2 trillion this year on energy—nearly a tenth of U.S. gross domestic product—roughly half in the transportation sector and half in buildings. Energy bills for homes are the largest share of building energy costs, projected at about $225 billion in 2011 and rising to $232 billion in 2020 (EIA 2010).[6] McKinsey & Company (2009) estimates that energy efficiency investments in homes, offices, and buildings could save $130 billion in energy costs that will pay for themselves with the energy savings. Approximately 35% of all cost-effective energy savings in buildings are in the residential market, with 71% of those savings from improvements to the building shell and heating, ventilation, and air conditioning systems (McKinsey 2009).

Home Energy Upgrades: Target Market

In 2010, about 112 million households existed in the U.S. In identifying the target market for home energy upgrades in this roadmap, the working group used criteria based on demographics and age of structure. The demographic market includes about 86 million households. The working group assumes that about 26 million households can potentially be served by the federal Weatherization Assistance Program (WAP) or state and local low-income, direct-install programs that do not involve cost sharing by the participating household and so are not included in the target market addressed in this roadmap (Figure 1).[7]

[4] A list of the members of the Residential Retrofit Working Group can be found in Appendix A. Staff at Lawrence Berkeley National Laboratory (Ian Hoffman, Charles Goldman, Merrian Fuller, and Mark Zimring) provided technical support to the working group.

[5] For more discussion on this topic please see Driving Demand for Home Energy Improvements (LBNL 2010): drivingdemand.lbl.gov

[6] All figures for 2011 and 2020 are in 2009 dollars.

[7] It is important to note that the American Reinvestment and Recovery Act (ARRA) raised the eligibility threshold for the federal WAP to households earning 200% of the federal poverty guidelines.The RRWG, however, nonetheless judges that, as a practical matter, the large majority of households served by WAP will still have incomes of 150% of federal poverty guidelines or less due to limited funds.

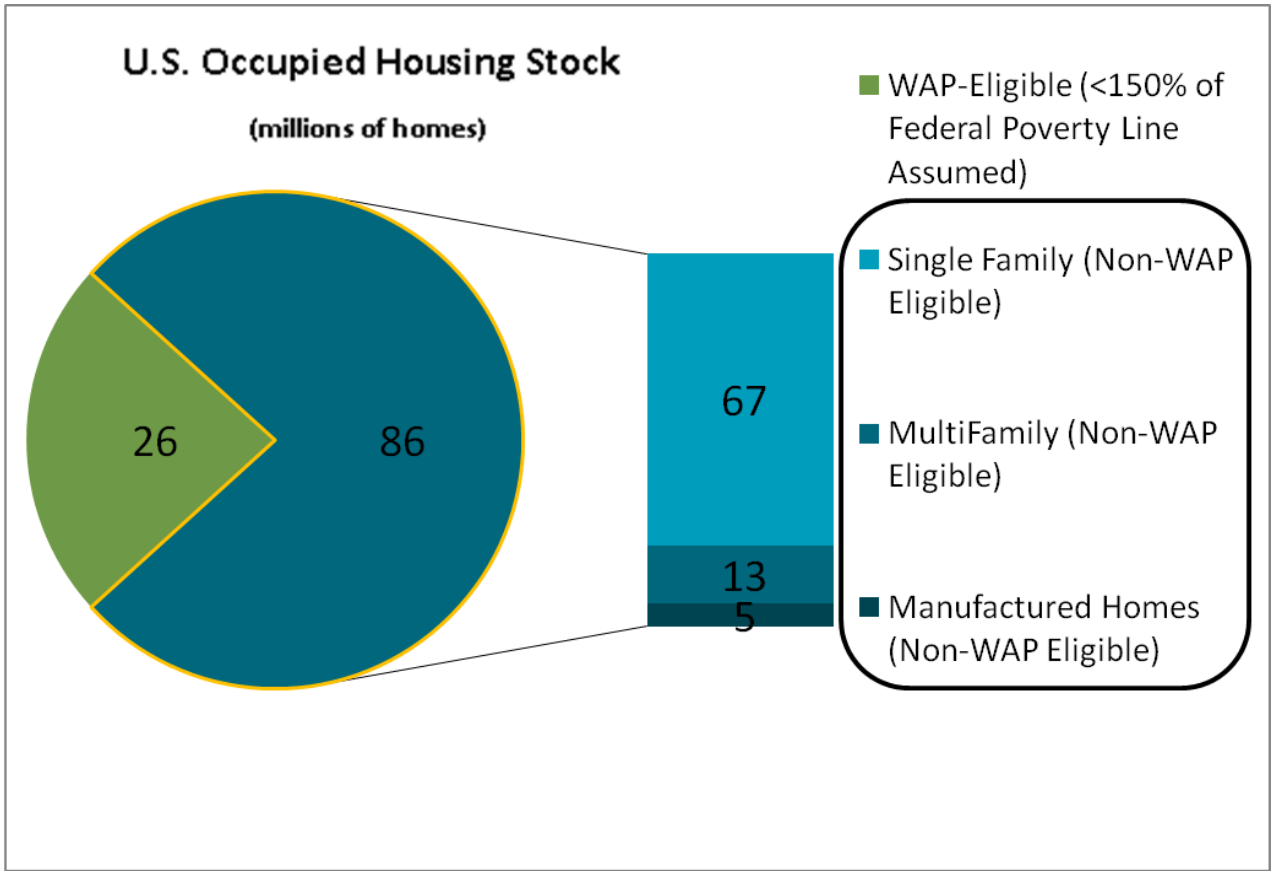


Figure 1. Target market by type of housing, tenure, and income

From among these 86 million households, we focus on the 82 million residing in homes that were built prior to 2005 and include the more inefficient structures in the housing stock. These older homes pose the greatest opportunity for acquiring robust energy savings and reaching consumers heavily affected by energy costs.[8]

It is also useful to segment the residential target market by housing type (i.e., single family, multifamily, manufactured homes) and ownership characteristics (i.e., owner-occupied and rental units) (Figure 2). Multifamily buildings, manufactured homes, and rental units tend to face higher market barriers to energy upgrades than single family homes. Market barriers and energy efficiency opportunities vary across property types and occupancy characteristics – a challenge that public programs and private partners will need to grapple with in the coming years.

[8] Older homes are often more affordable to buy or lease and so a larger share of occupants of these homes have low or moderate incomes than in the housing stock at large. This means that upgrades to older housing can alleviate energy costs for households that spend a larger fraction of their income on energy.

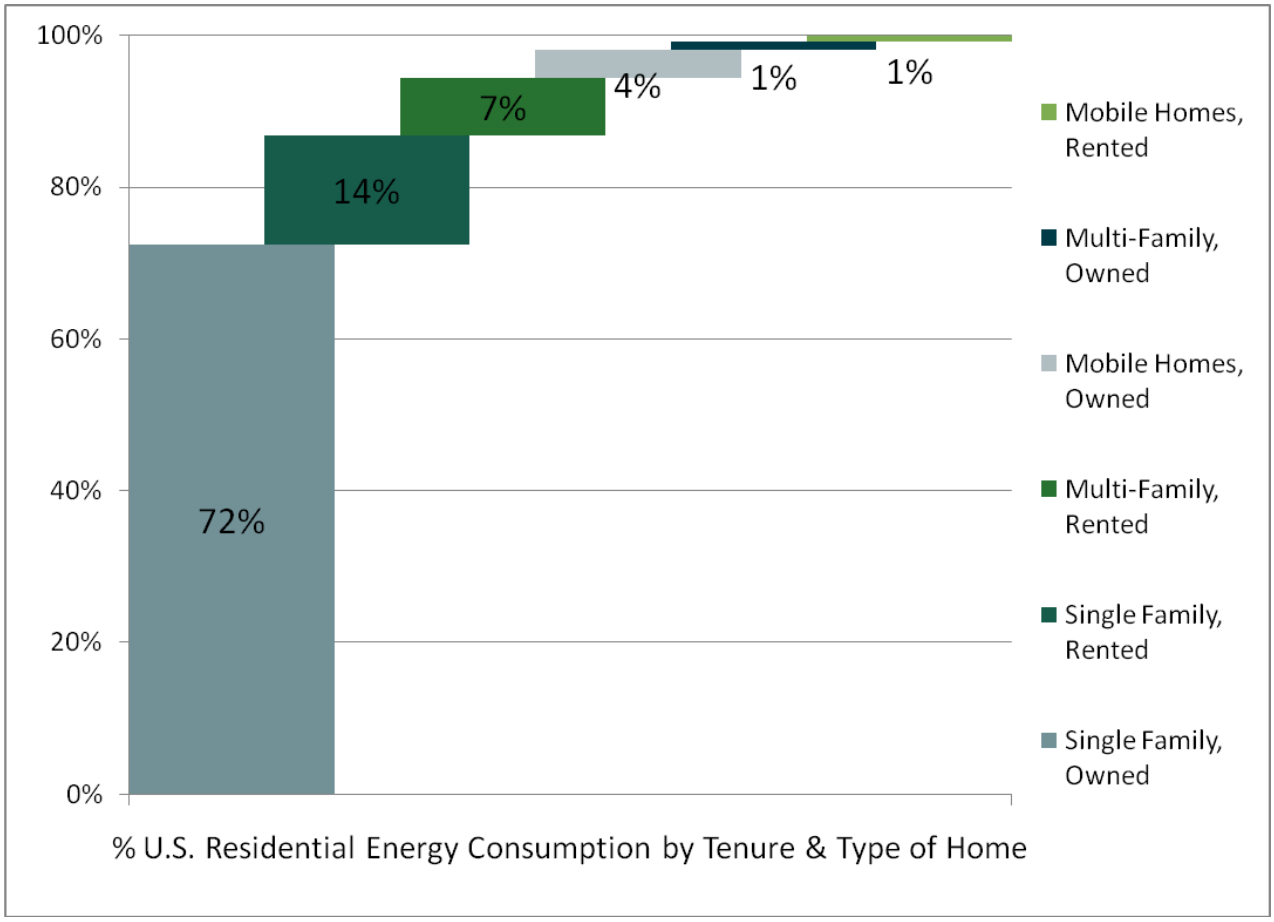


Figure 2. Home energy upgrade target market: breakdown by housing type and ownership characteristics

Source: EIA, 2005 Residential Consumption Survey

II. Vision for the Home Energy Upgrade Market

The working group envisions a thriving U.S. home energy upgrade industry by 2020. This market will create jobs, reduce household energy costs, increase real estate values, reduce greenhouse gas and other emissions, and enhance energy security (McKinsey 2009). This market will be characterized by robust demand for energy upgrades, a well-qualified network of home performance contractors to meet this demand, and sufficient pools of private capital available to address upfront cost barriers to energy efficiency investments.

The RRWG envisions a thriving industry for comprehensive, durable, performance-based home energy upgrades**.** The working group defines these upgrades as generally starting with an assessment (Neme et al. 2011) or appropriate benchmarking that includes relevant health and safety checks and provides a set of recommended energy improvements prioritized by cost-effectiveness. The upgrades involve installation of several of these measures to improve the efficiency of the building shell, HVAC systems, and other end uses such as plug loads and lighting. Where applicable, these comprehensive improvements deliver savings across multiple energy sources

(primarily electricity, natural gas, and oil). In the near term (through 2015), comprehensive upgrades should aim to achieve savings levels of 20% or more of total energy use.[9]

Households may choose not to install the full set of comprehensive measures at once, and single measure investments can be an entry point for future investments in more comprehensive energy upgrades.[10] A "one-size-fits-all" approach is not likely to be appropriate in all regions of the country, given the diversity in housing stock, technical efficiency opportunities, varying levels of market development, and local conditions. The Working Group expects that program administrators will test a variety of program designs, and contractors will test multiple business models, to facilitate growth in their respective markets.

The group can envision evolving program and business models that will ultimately lead to a market where multiple market actors value the benefits—both related and unrelated to energy alone—of taking a comprehensive approach to improving the efficiency of homes. Households, lenders, and homebuyers will value the private benefits of such an approach, and utility system planners will treat comprehensive home upgrades as a resource that provides significant public benefits (e.g., avoided energy costs, deferred supply-side investments). Monetizing these public benefits should inject additional capital into the market to help fund efficiency upgrades.

Incentives and technical assistance provided by various programs will help customers leverage their investments in home energy upgrades. In the view of the working group, these funds increasingly would be targeted at those lower- and moderate-income households and rental units most in need of incentives and other support. Policies and programs will be designed with the ultimate goal of facilitating a robust, sustainable private sector industry that provides a suite of home energy upgrade services.

III. Market Characterization and Baseline

The residential energy upgrade market is a part of a larger U.S. home improvement market. From 1994 to 2007, there were approximately 20 million home improvements annually—as many as one in four owner-occupied homes in the U.S. are being renovated in some fashion every year (Joint Center for Housing Studies 2009). Energy-related home improvements are made as part of this larger home improvement market and include actions such as installation and/or replacement of insulation, HVAC equipment, windows, doors, and appliances. The working group estimates that at least $23 billion per year has been spent on these types of energy-related improvements over the last decade (Joint Center for Housing Studies 2009; Lawrence Berkeley National Laboratory [LBNL] analysis).[11]

The existing market for comprehensive home energy upgrades is relatively small and fragmented and fluctuates in response to short-term economic cycles, housing trends, changes in the construction industry, and enabling legislation and policies (e.g., tax credits, the American Recovery and Reinvestment Act). This energy-related market mirrors the broader home improvement market with approximately a 40-60 split between expenditures on do-it-yourself (DIY) and do-it-for-me (DIFM) work (Joint Center for Housing Studies 2009; AHS 2009; LBNL analysis). Homeowners who undertake DIY energy improvement projects account for a sizable share of the private sector market, though the projects tend to be smaller in scope and investment level.[12] Because family members are

[9] The RRWG is mindful that savings potential varies with climate, housing characteristics, and local electricity, gas, and fuel oil prices. These variations impact the cost-effectiveness of measures, scope of projects, and savings targets. The working group has discussed further research into the effect of these variations on program design and support.

[10] Neme et al. (2011) note that there are potential opportunity losses that depend on the order of improvements made to the home.

[11] The estimate of $23 billion includes average annual expenditures for installation or replacement of insulation, HVAC, windows and doors, and appliances. If roofing replacements, major electrical upgrades, and other potential energy-related projects are included, the annual average could be in the $36 billion-$40 billion per year range; including replacements of dishwashers and hot water heaters would increase the estimate to more than $50 billion annually.

[12] With DIY projects, most homeowners typically engage in these activities without explicit involvement in a comprehensive home energy upgrade program.

performing the work and per-project expenditures often are small, DIY projects are less reliably linked to significant energy savings and create fewer jobs than projects performed by professional contractors.

In the DIFM market, larger retailers also act as contractors. The majority of other contractors that serve the DIFM market for home energy upgrades are small- to medium-sized firms that specialize in the installation or replacement of HVAC, insulation, roofing, or windows and doors. A small number of these contractors are certified in building science and focus on performing residential energy improvements on a whole-home basis, usually driven by an energy assessment. These "home performance" contractors can range from one-person operations to regional and national chains with hundreds of employees and subcontractors.

The market for energy-related home improvements numbers hundreds of thousands of contractors of various sizes. Many of their jobs are influenced by energy efficiency policies (e.g., tax credits) or programs offered by utilities and/or state and local governments. Most are not. There is good reason, however, to believe that most projects are not influenced by policies and programs. Homeowners make improvements for myriad reasons including improved comfort, aesthetics, enhanced services and amenities, additional living space, and enhanced resale value. Reduced utility costs (or energy savings) may be taken into consideration but are typically not among the highest priorities for customers.

The working group's review suggests that, at present, a relatively small fraction of these improvements performed by private sector contractors result in comprehensive home energy upgrades to the building envelope and HVAC systems that are the focus of this roadmap. During months suitable for construction work, households are performing thousands of remodeling projects daily with little regard to potential energy savings. Even home improvement projects that do have an energy component are likely to leave significant savings on the table. The moment when homeowners are undertaking major home improvements is a critical intervention point where contractors and others can encourage more efficient choices and comprehensive home energy upgrades.

Existing Home Energy Upgrade Programs

A number of utilities and state and local governments offer energy efficiency programs that employ a comprehensive, whole house approach.[13] The working group has divided the whole home programs into three broad categories:

- **Home Performance (HP)** programs offer technical assistance and financial incentives to encourage customers to get a full energy assessment and have a professional contractor install multiple energy efficiency measures. The package of measures involves a significant capital investment (e.g., often including replacement of HVAC equipment, installation of wall insulation or installation of high-efficiency windows). Total project costs typically range between $6,000 and $15,000 and can result in savings of 20% or more of household energy use.14
- **Bundled Efficiency (BE)** programs provide financial incentives (e.g., rebates) that encourage customers to install selected energy efficiency measures and may or may not require a full energy assessment. Projects typically have a more modest scope than HP-style projects and involve lower investment (total project costs in the $1,500 to $4,000 range). Customers can expect energy savings in the 5%-20% range. BE programs are numerous and serve important roles in opening

[13] Programs funded by utility customers are administered by utilities in many states; in some states, third-party firms or state agencies administer energy efficiency programs funded by utility customers.

[14] Project costs for HP and BE projects are based upon estimates provided by experts in residential efficiency programs and contracting, both within and outside of the working group.

doors among households, building awareness of whole home energy efficiency, and serving as a step for states and localities toward more comprehensive programs.15

- **Low-Income/Assisted Energy Efficiency (L-I)** programs promote home energy upgrades for low-income households through modest to moderate cost sharing on measures that generally are somewhat less extensive in scope and cost than typical HP projects. Income guidelines vary widely from state to state but often are in the range of 60% to 80% of state median income, higher than WAP eligibility before the Recovery Act increase in WAP eligibility.

Most of the programs that the working group classifies as HP are designed and marketed under the Home Performance with ENERGY STAR (HPwES) brand.16 More than 40 utilities, energy offices, and local governments promote Home Performance with ENERGY STAR programs. Administrators of state- and utility customer- funded programs account for the bulk of the HP program activity.17 State and local governments have become bigger players in recent years, offering programs funded by federal, state, or local appropriations; utility customers; CO2 allowance revenue; or other sources. For example, the Missouri Department of Natural Resources and Alaska Housing Finance Corporation each administer programs that are performing several thousand home energy upgrades per year. The passage of the American Recovery and Reinvestment Act, in particular the Better Buildings initiative under the Energy Efficiency and Conservation Block Grant (EECBG), has provided more than $450 million of new funding to support comprehensive home energy upgrades. For example, almost all of the 35 Better Buildings grantees are implementing comprehensive residential efficiency programs.

As part of preparing this roadmap, the working group compiled information on HP programs. As of 2009, the working group identified 39 comprehensive HP programs operating in 28 states (Figure 3). Twenty-three of these states have statewide programs; the other five states have initiatives that cover only a portion of the state (Navigant Consulting 2010). Twenty-two states and the District of Columbia had no HP programs running in 2009. Utilities administer the majority of the existing comprehensive programs, followed by state and local governments and third party administrators. Data on completed home energy upgrades were available from 25 (of 39) programs; these 25 programs reported completing energy upgrades on approximately 46,000 homes in 2009 (Navigant Consulting 2010). The seven largest HP programs each treat fewer than 10,000 homes per year, and market penetration is less than 2% of the single-family housing stock in those jurisdictions (Neme et al. 2011).

[15] Many BE programs may not achieve the deeper savings for which the working group strives in its long-term vision for market transformation.

[16] http://www.energystar.gov/index.cfm?c=home_improvement.hm_improvement_index

[17] Utility customer funding for all residential energy efficiency programs was about $1.66 billion in 2009. Based on 2009 data from the Consortium for Energy Efficiency and expert consultations within and outside of the working group, the group estimates that the portion of this residential efficiency funding that was spent on home energy upgrade programs ranged between $300 and $450 million in 2009.

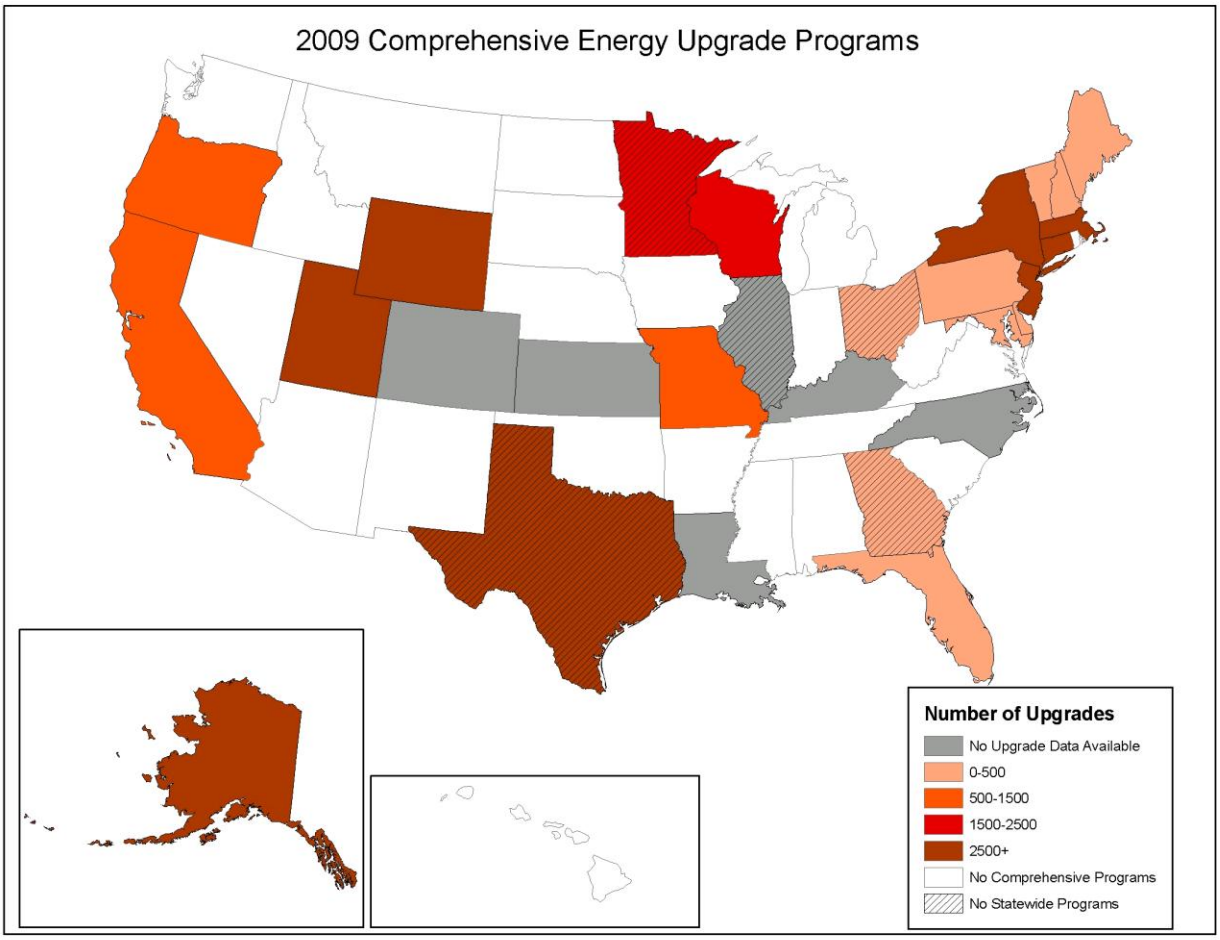


Figure 3. States with comprehensive home energy upgrade programs in 2009

Source: Navigant Consulting Inc. 2010

The working group also identified 15 new programs that were in varying stages of startup in late 2009 and 2010. Moreover, grantees in the ARRA-funded Better Buildings program are expected to roll out another 34 home energy upgrade programs during 2010 and 2011. None of these was included in the working group's count of HP programs.

The working group did not attempt to systematically compile information on BE programs offered by program administrators (e.g., number of programs, market activity, and program budgets). Nonetheless, many government- and utility customer-funded entities offer BE programs that take a whole home approach, albeit more modest in scope and project cost than HP programs.

IV. Barriers to Market Expansion

Today, the comprehensive residential energy upgrade market is characterized by weak household demand, uneven policy support, and a limited number of qualified contractors to respond to, or drive, increases in demand. Comprehensive energy improvements are large investments. Most customers either show little interest in, or are uninformed about, comprehensive energy efficiency, and there is reticence to spend cash or take on debt in the current economic environment. Many contractors are wary of developing a business model around energy upgrades in light of weak demand, tight credit, and uncertainties regarding future government or public support for

energy efficiency programs. This situation hinders private investment and results in an inadequate supply of qualified, skilled workers to deliver energy upgrades.

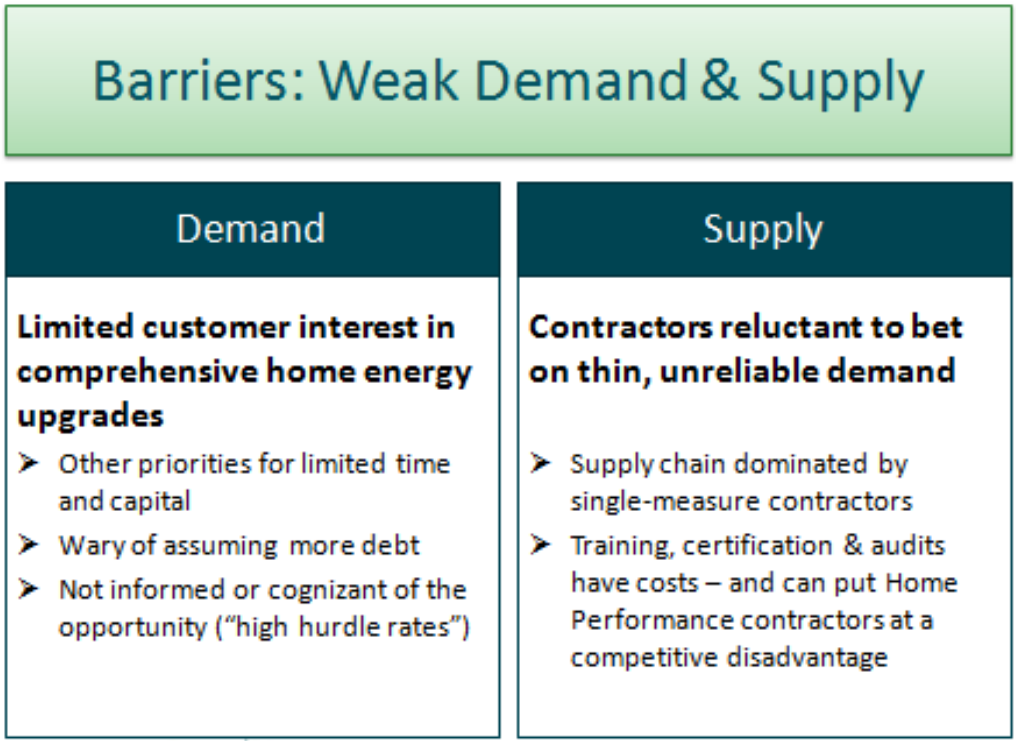


Figure 4. Market barriers pose challenges on both the demand and supply side of the home energy upgrade market

Additional specific barriers include:

- Lack of information and high transaction costs. Many Americans have little knowledge of their home's energy performance or the need for energy improvements. Even if information is provided, comprehensive energy upgrade programs place significant demands on homeowners, particularly around time, effort, and cost. Consumers must often navigate energy assessments, multiple bids, multiple contractors, a bewildering array of energy improvement measures and incentives, and burdensome paperwork and approvals. This process is often complicated and can be an alienating experience for many homeowners—for a product that, for now, many are uncertain that they want.
- Uneven policy support. State and local funding is limited. Aside from Recovery Act grants, federal funding traditionally has been modest. Contractors can face markedly different efficiency-related rules and inspections from one city or county to the next.
- Home performance is a small part of the contracting market. Single-measure contractors—a roofer, an insulation installer, a window installer, an HVAC installer—significantly outnumber expert HP contractors who perform whole home energy assessments and install comprehensive energy improvements. Comprehensive energy upgrade contractors face higher training, certification, equipment, and installation costs than competitors. Many customers do not yet value this integrated approach—making for a challenging sales environment and thin profit margins.

- Split incentives in rental units. Nearly a third of American households do not own their dwelling (Figure 5) and often have little interest in investing in the property. Property owners infrequently pay energy bills for residential buildings with leased units (U.S. Census Bureau 2009)—owners pay electric bills for about 14% of rental units and gas bills for about 25%—so owners often will not reap the bill savings that result from energy efficiency investments. As a result, improvements to rental properties are rare.

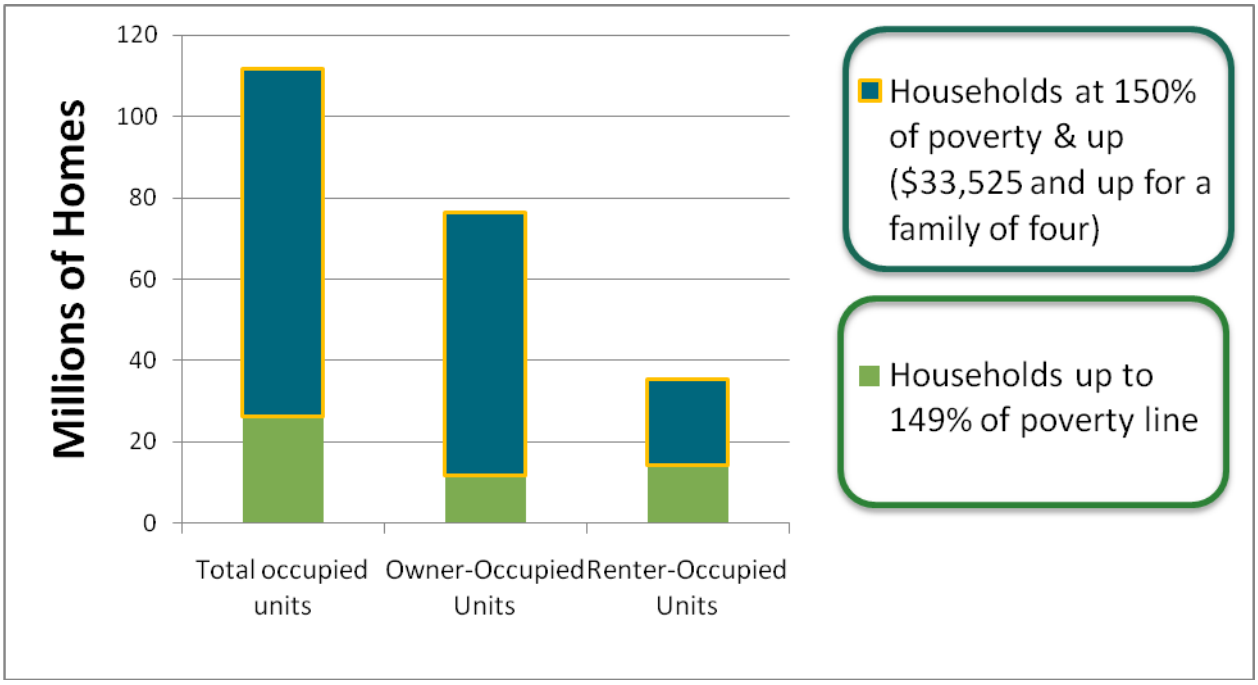


Figure 5. Residential market breakdown by tenure (owner- and renter-occupied units) and program income guidelines

- **Few attractive financing options, especially for less qualified borrowers.** Financing is not a silver bullet, but the upfront cost of home energy upgrades is a significant market barrier for many consumers. Lenders have been hesitant to provide low-interest and long-term financing, and a secondary market for residential energy efficiency loans has not yet developed. Contractors and programs have generally been left to buy down loan interest rates or offer other credit enhancements, which can be an expensive proposition.

- **Energy savings are not captured in property value.** Most homebuyers have not yet demonstrated a willingness to pay more for a home with energy efficiency upgrades. Real estate values and prices are based in whole or part on comparable sales nearby, so the lack of market appreciation for energy savings is self perpetuating: Appraisers usually do not credit operational energy savings in residential property values, and real estate agents often do not promote efficiency features as much as other amenities.

- **Physical barriers.** Substantial numbers of homes are particularly difficult and costly to upgrade. Many pre-1950s homes and most pre-1930s homes, approximately 24 million in total, have knob-and-tube wiring that can pose special difficulties for installing insulation (Home Energy Magazine Online 1991). This wiring adds contractor liability and labor cost. Approximately 8 million homes have elevated radon concentrations (U.S. Environmental Protection Agency 2010); many homes also have asbestos insulation in the attic. Older homes can have structural deficiencies—leaking

roofs or unsound walls—that preclude effective installation of efficiency measures. Collectively, these homes are challenging and require additional contractor time and expense or the completion of other work before energy efficiency improvements can be made.

- **Separate electric and gas efficiency programs.** In some states, administrators of efficiency programs funded by electric or gas utility customers administrators can only offer incentives or claim electricity or gas savings for measures that save the resource that they provide (e.g., electricity or gas). These types of requirements can limit the scope of residential efficiency projects, often do not allow contractors to realize heating and cooling savings from weather-dependent measures, and tend to increase program administration costs (e.g., gas and electric utility customer-funded programs may use separate contractor networks to deliver their programs).

V. Home Energy Upgrade Market Assessment and Opportunity

The working group set out to understand the existing home energy upgrade market and assess future prospects. This section reviews those efforts, leading with an extensive discussion of the group's analytical approach, then enumerating the policy and funding components of three scenarios, and concluding with modeling results for those scenarios. In summary, the working group finds that certain policies can reverse a prospective decline in the home energy upgrade market in the business-as-usual scenario and leverage billions of dollars in new investment in that market, producing economic benefits in multiple sectors of the national economy.

The Working Group's Approach

The working group first developed a working definition for comprehensive home energy upgrades[18] and then identified programs funded by utility customers and/or state and local governments that met the group's definition (referred to as "programmatic" upgrades). The group also attempted to assess private sector activity in the home energy upgrade market that was not driven by these programs. Federal surveys of homeowners and contractors show that households perform a large number of potential energy-related projects. Many of these involve multiple measures installed by contractors. Based on consultations with experts, the working group judged that a small fraction of this spending closely resembles the projects that home energy upgrade programs attempt to motivate, although these projects are not driven by programs.[19] Significant data availability and quality issues limit the working group's ability to produce definitive estimates of the private sector home energy upgrade market, which is not influenced by programs. The working group made national estimates that, in the absence of more data, are subject to significant uncertainties.

For purposes of market assessment characterization, the working group assumes then that the entire home energy upgrade market has two basic components: programmatic upgrades (i.e., those influenced by energy efficiency programs) and nonprogrammatic upgrades (similar activity in the private sector that is not influenced by programs). To estimate the potential market activity and investment through 2020, the group developed a model in an attempt to characterize the home energy upgrade market. The model is designed as a transparent tool (e.g., menu-driven input assumptions with values that can be changed by users) that allows representation of the impacts of specific policies and programs in order to estimate current and projected home energy upgrade market activity to 2020. The working group used the model to analyze three scenarios that reflect alternative futures involving varying levels of policy and programmatic initiatives and support for energy efficiency.

- The **Base Case** is a "business-as-usual" scenario that assesses the likely impact of existing state and federal policies to 2020 (e.g., energy efficiency programs funded by utility customers, energy

18 See section II (Vision for the Home Energy Upgrade Market) for RRWG definition for home energy upgrades.

19 The working group concluded that, at present, a relatively small number of U.S. households are engaging in comprehensive home energy improvements without being motivated by a home energy upgrade program.

efficiency programs funded by the Recovery Act end and state/local government programs return to pre-ARRA funding levels, tax credits expire).

- The **Moderate Case** assesses the impact of several major federal and state policy initiatives (e.g., a federal Clean Energy Standard with energy efficiency as an eligible compliance option, a Home Star-like rebate program, renewal of tax credits, a financing program targeted at rural utilities, and energy efficiency programs funded by utility customers).
- The **Aggressive Case** assesses the impact of a full suite of aggressive federal and state programs (e.g., higher funding levels for energy efficiency programs supported by utility ratepayers, significant funding for State Energy Programs (SEP) and EECBG programs, a Home Star-like rebate program, and federal climate legislation that applies a price to carbon and provides funds that can be used by utilities and states to support energy efficiency programs).

For each scenario, the working group estimated future market activity (number of homes upgraded) by three main factors: administrators of home energy upgrade programs funded by utility customers; administrators of home energy upgrade programs funded by local, state, or federal taxpayers; and private consumers, some motivated by a program and some acting entirely on their own (see Appendix C for description of the approach used to estimate market activity and investment to 2020).

Analytic Framework: Policy Drivers and Market Activity

Figure 6 provides a conceptual overview of the group's analytic framework. The policies of the Moderate Case are represented for illustrative purposes only, but most features of the schematic apply across all three scenarios. Various types of programs that target the home energy upgrade market (e.g., HP, BE, and L-I) are offered by administrators of energy efficiency programs funded by utility customers and state/local government programs, which are paid for by taxpayers. The working group also assumes that private sector market contractors working in the home improvement market will develop some HP- or BE-type projects as part of their involvement in DIFM projects that involve energy-related equipment or measures (e.g., insulation, HVAC). Other federal policies in the Moderate Case (e.g., a federal tax credit, rural loans, and a federal rebate program that is similar to the proposed Home Star program) are assumed to impact the entire market, influencing both the demand for and spending on projects driven by home energy upgrade programs as well as private sector market activity.[20]

[20] We assume that customers participating in home energy upgrade programs take advantage of a federal energy efficiency rebate program (e.g., Home Star-type program) and tax credits. This additional funding contribution allows home energy upgrade program administrators to redesign their programs to offer lower rebate levels for each project and so free up money for more projects—that is, help more households perform energy upgrades. The leveraging power of the rebates and tax credits, therefore, extends market wide and is more significant for projects driven by programs rather than private households performing upgrades on their own.

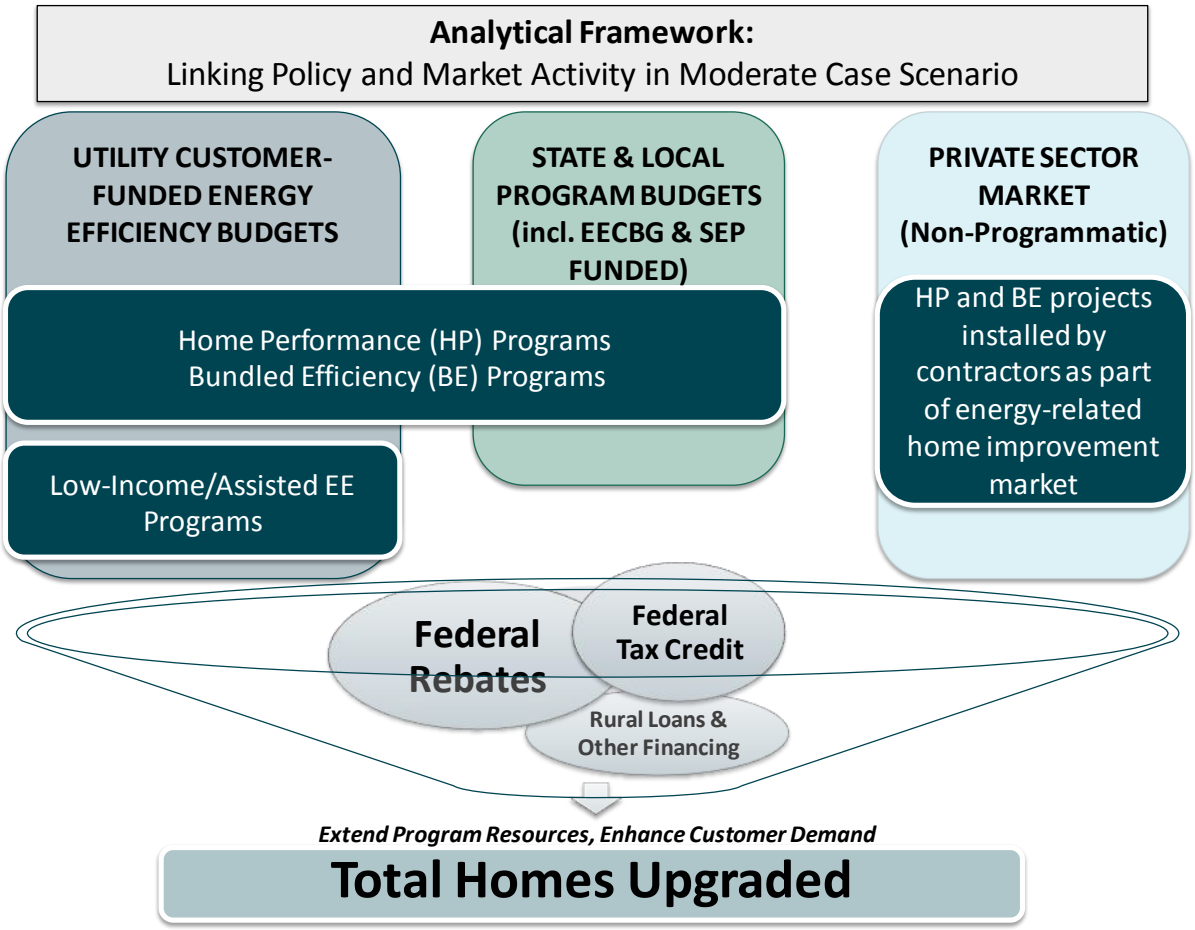


Figure 6. Conceptual overview of the home energy upgrade market assessment model: market activity

In addition to estimating market activity, the model estimates market investment in the home energy upgrade market. Figure 7 illustrates the overall analytic framework used to estimate market investment in the Aggressive Case, which is shown because it includes a particularly broad array of policy and programmatic initiatives that could stimulate investment in the home energy upgrade market.

In the Aggressive Case, total market investment is the sum of five types of spending (Figure 7):

- Utility customer-funded programs
- Total taxpayer spending
- State and local home energy upgrade programs (including any federal contribution)
- Federal expenditures for such policies as rebates and tax credits21
- Consumers' share of projects driven by utility customer-funded and state/local government programs

[21] The congressional Joint Committee on Taxation determines the budgetary impact of tax policies and treats funds associated with these policies as expenditures.

- Private sector spending (consumer spending on projects not driven by programs but influenced by policies such as tax credits and rebates)
- Emissions allowances given to electric and gas utilities under a cap-and-trade program for unspecified "public benefits"; the working group assumes that utilities use a small fraction of emission allowance revenues for home energy upgrade market programs.

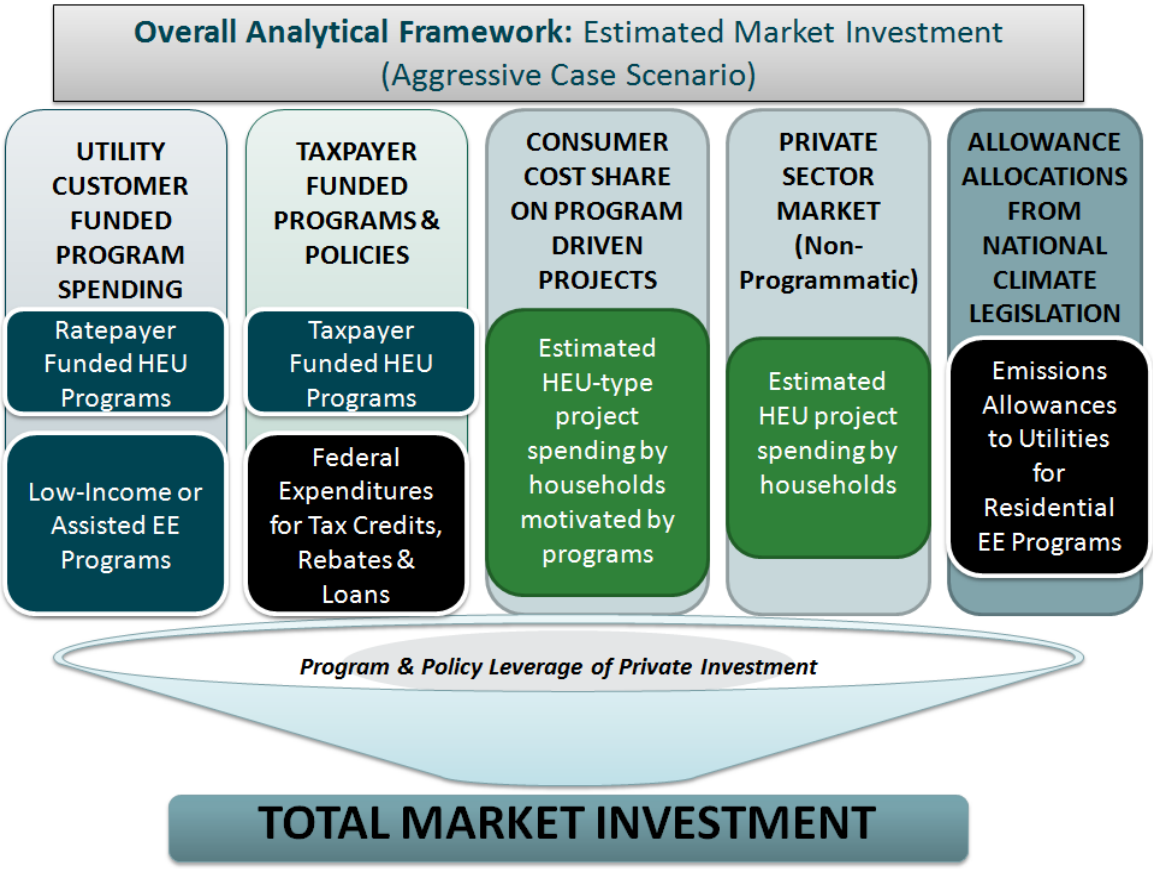


Figure 7. Conceptual overview of the home energy upgrade market assessment model: total market investment

Energy Efficiency Programs Funded by Utility Customers

Historically, energy efficiency programs funded by utility customers have played a key role in the initial development of the home energy performance market. The working group provides a more detailed description of the approach used to characterize the future of ratepayer-funded energy efficiency programs and the role of home energy upgrade programs. Energy efficiency programs funded by utility customers vary significantly from state to state driven by state legislation (e.g., Energy Efficiency Resource Standards) and regulatory policies and practices, utility resource plans, and demand-side management plans. The working group used the state-specific estimates developed in a recent LBNL study (Barbose et al. 2009) to project total spending on energy efficiency programs to 2020. The working group assumes that states will continue to allocate energy efficiency budgets between residential, commercial, and industrial and low-income customer markets in the future consistent with current practices (CEE 2010). To estimate future spending on home energy upgrade programs as part of their overall portfolio of residential energy efficiency programs, the working group developed a classification scheme that grouped states into three categories based on their level of policy commitment and experience offering energy efficiency programs and the level of maturity of their home energy upgrade programs:

- "Leading" states with significant, long-standing funding and policy commitments to energy efficiency and with established home energy upgrade programs (in place three years or more)
- "Rising" states with recent and generally accelerating commitments to energy efficiency and with maturing home energy upgrade programs (typically in place one to two years)
- Uncommitted states with modest if any regulatory policy commitment to energy efficiency and no home energy upgrade programs funded by utility customers

Figure 8 provides a schematic representation of the analytic framework used to estimate future spending on home energy upgrade programs funded by utility customers, including the 2010 budgets for residential energy efficiency and home energy upgrade programs. As more states increase their investment in energy efficiency, they are assumed to move beyond residential lighting and appliance efficiency programs over time and include comprehensive, whole house programs such as home energy upgrades. Federal appliance, equipment, and lighting standards may also influence the mix and types of programs offered by utility customer-funded program administrators (e.g., the new federal lighting standards will capture some of the energy efficiency potential).

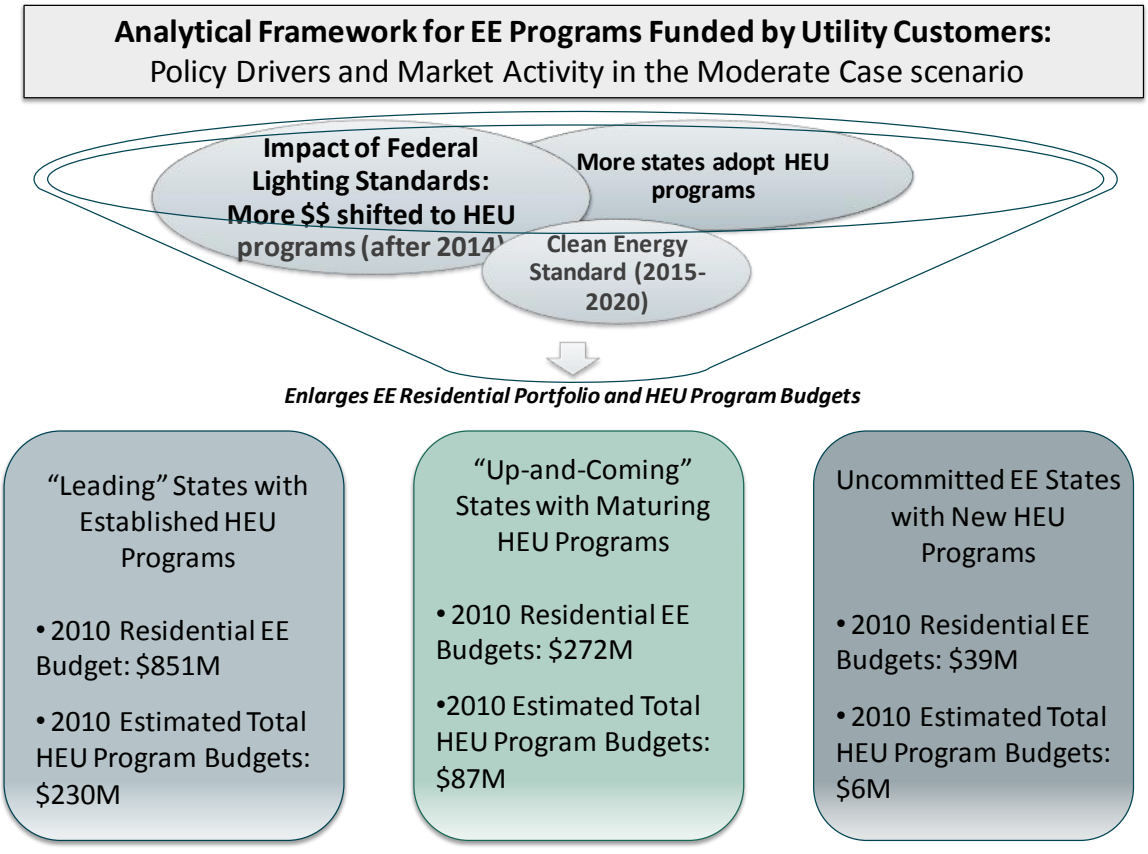


Figure 8. Energy efficiency programs funded by utility customers: 2010 budgets for residential sector and home energy upgrade programs among states

Sources: Barbose et al. 2009; Consortium for Energy Efficiency The State of the Efficiency Program Industry 2010. Note that the working group classified states into one of these three groups. The group's assumptions regarding the share of total residential budgets devoted to home energy upgrade programs drives estimated home energy uprade program budgets.

Overview of Scenarios

The time horizon for the working group's market assessment is 2010 to 2020; initial years of the study period are influenced by the energy efficiency policies and programs ushered in by the 2009 American Recovery and Reinvestment Act (ARRA). Thus, each scenario case starts with significant tax credits for residential energy efficiency investments and sizable federal investments in local and state programs promoting home energy improvements.

The Base Case

In the working group's business-as-usual or Base Case, the group assumed that no new federal or major state policies are enacted over the study horizon, yet utility customer-funded program budgets continue to grow in response to policy drivers in each state. The impacts of state policies that exist as of 2010 are projected out to 2020. The Recovery Act policies and funds are phased out. The tax credit is reduced in 2011 and then eliminated. Elevated funding for the State Energy Program returns to 2008 levels. The EECBGs—authorized in 2007 but never funded until the Recovery Act—return to zero funding.

Spending for energy efficiency programs funded by utility customers grows at a moderate pace ($5.3 billion in 2010 to $7.4 billion in 2020) as approximately 30 states meet the energy savings goals laid out in their energy efficiency standards or utility resource plans. It is also assumed that funding increases slowly in the 15-20 states that are "uncommitted" today in the sense that they have not made explicit policy commitments to ratepayer-funded energy efficiency (Barbose et al. 2009).

The Moderate Case

In the Moderate case, the overall funding level for ratepayer-funded energy efficiency programs is similar to the Base Case (i.e., $7.4B in 2020).The working group does assume, however, that many program administrators will devote a larger share of their residential program budget to home energy upgrade programs than is assumed in the Base Case.

In the Moderate Case, the working group assesses the impact of several major new federal policies:

- A federal rebate program with half the projected outlays of the Home Star legislation, spread over a longer time; annual outlays peak at $319 million versus a projected peak for Home Star of $886 million
- A rural utilities loan program of the same magnitude as the Rural Star legislation, with loans distributed state by state in the same proportions as recent rural utility loans from the U.S. Department of Agriculture
- A Clean Energy Standard similar to the Practical Energy and Climate Plan introduced by Sen. Lugar, R-Ind., in 2010
- Renewal of the federal Non-Business Energy Property Tax Credit (25C) at the pre- and immediate post-ARRA level of 10% of project costs

The Moderate case also includes very modest budgets for federal energy efficiency programs. The EECBG would be funded at $45 million, which is comparable to the pre-ARRA funding for the State Energy Program. The working group assumes that about 20% of the EECBG budget would be targeted to home energy upgrade programs.

The Aggressive Case

Significantly more ambitious policies and increases in funding are assessed in the Aggressive Case scenario. Spending for energy efficiency programs funded by utility customers is assumed to increase to about $12 billion in

2020, which is based on the high scenario in a recent LBNL study (Barbose et al. 2009). States also are assumed to spend a larger portion of their residential energy efficiency budgets on home energy improvement programs than in the Moderate Case.

Funding for state and local programs (SEP and EECBG) is substantially higher in the Aggressive Case; annual SEP and EEBCG funding is roughly half of ARRA levels during the 2010-2012 period. Moreover, the working group assumes that about 33% of EECBG funds are spent on home energy upgrade programs.

The group also assumes that an ambitious set of new or enhanced policies are established and implemented, particularly at the federal level:

- A federal rebate program fully funded at $6.6 billion—with $5 billion for rebates, as in the draft Home Star legislation—but extended out through 2025.
- Extension of the federal residential energy efficiency tax credit at 30% to 2020.
- Federal climate legislation with distributions of emissions allowances to utilities for consumer benefit. Allocations follow the formula laid out in the American Power Act (Kerry-Lieberman, 2010 discussion draft), which distributes allowances to utilities based in large part on carbon intensity and sectoral shares of retail sales. The working group caps allocations to residential energy efficiency budgets so that residential budgets – and home energy upgrade programs—grow by no more than 50% annually.22

Scenario Results

Base Case Results

In the Base Case scenario, it is likely that home energy upgrade market activity and investment levels may actually *decrease* by 2020 compared to 2010-2011 levels. Total market investment declines from about $4.2 billion in 2010 to $2.1 billion in 2020 (Figure 9). Market activity and investment in the 2010-2012 period is stimulated by Recovery Act funding and policy support (e.g., the tax credit). The end of Recovery Act funding, which may result in the termination of most or all EECBG programs (including Better Buildings), has a downward impact on market activity and investment. In addition, the expiration of the federal residential energy efficiency tax credit in 2011 has an even greater impact that affects all home energy upgrade programs as well as private sector market activity and investment. Budgets for home energy upgrade programs paid for by utility customers, however, are projected to increase by about $340 million over the 10-year period.

[22] A Clean Energy Standard is not included in the Aggressive scenario. In all analyses of proposed climate legislation of which the working group is aware, carbon pricing elicits greater energy savings and clean generation than the Clean Energy Standard targets analyzed here produce.

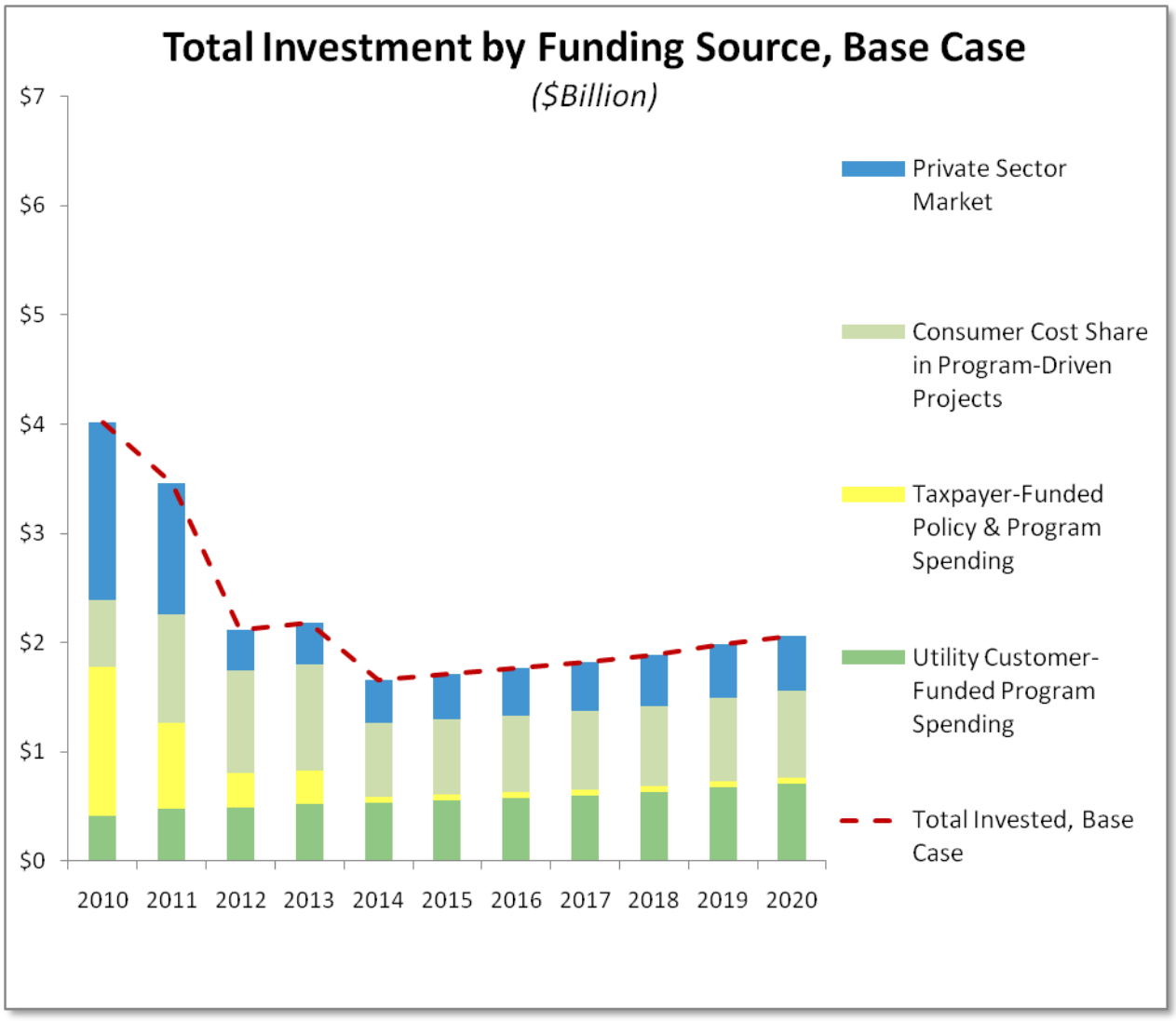


Figure 9. Total investment in home energy upgrade market by funding source: Base Case

In the Base Case, market activity is projected to be around 500,000 homes per year by 2020, which may be lower than 2010-2011 levels (Figure 10). Aggregate market investment for the decade is about $25 billion. Private investment is about 1.6 times the amount of taxpayer and utility customer support for programs and policies—that is, households spend about $1.60 for every dollar of utility customer and taxpayer funds directed into the market.

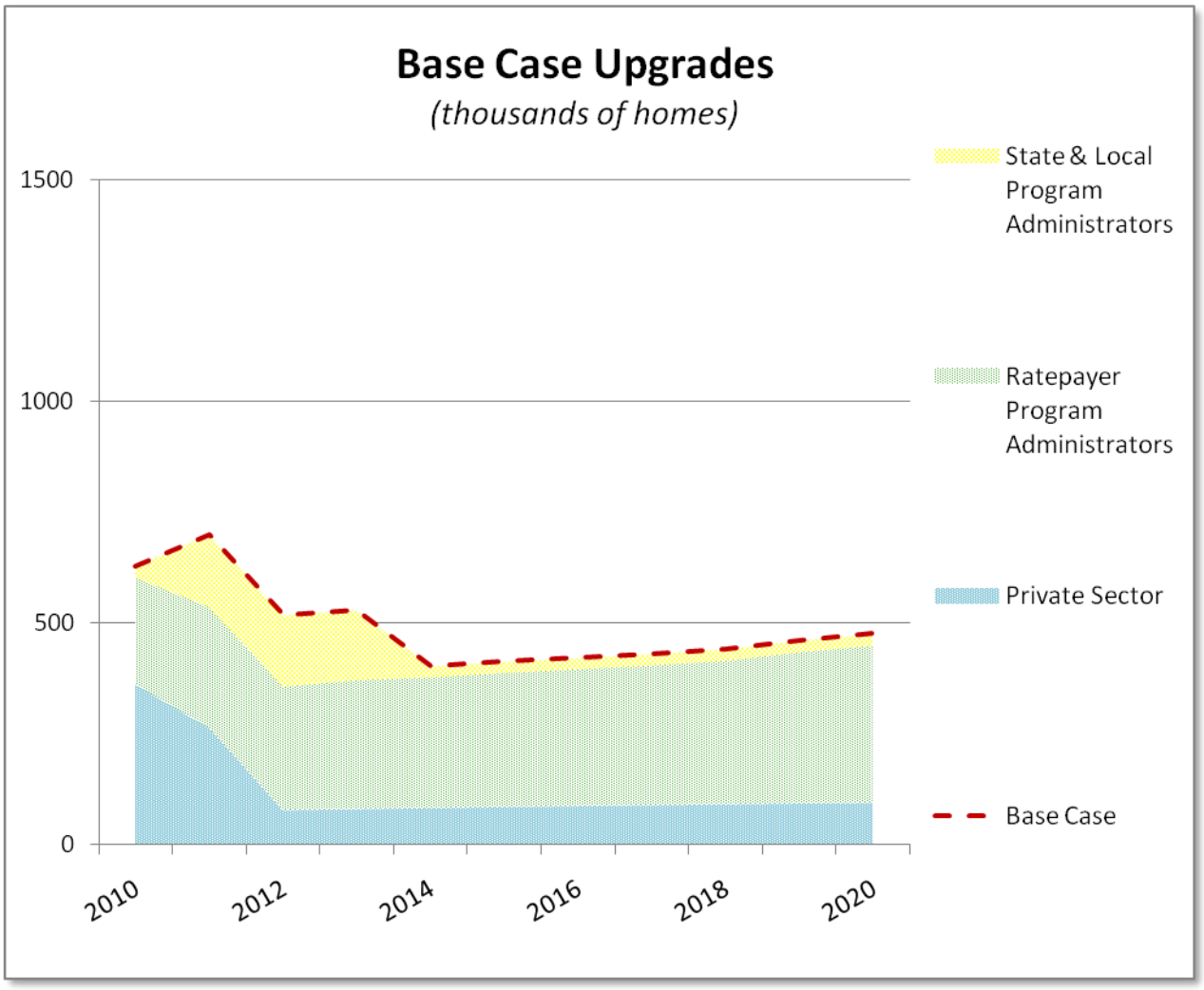


Figure 10. Market activity in home energy upgrade market: Base Case

Moderate Case Results

Investment in the home energy improvement market grows significantly in the Moderate Case. Annual investment rises at 9% per year to $10 billion a year in 2020. Key drivers are a federal rebate program with modest annual funding, a federal tax credit, and increasing funding by utility customers for residential energy efficiency and home energy upgrade programs. In this scenario, federal lighting standards and a surge in states with utility customer funded home energy upgrade programs produce a large step up for the market at mid-decade. A federal Clean Energy Standard elicits more residential energy efficiency spending—rising to $254 million in 2020—with the biggest impact on those states with modest commitments to ratepayer-funded energy efficiency programs today.

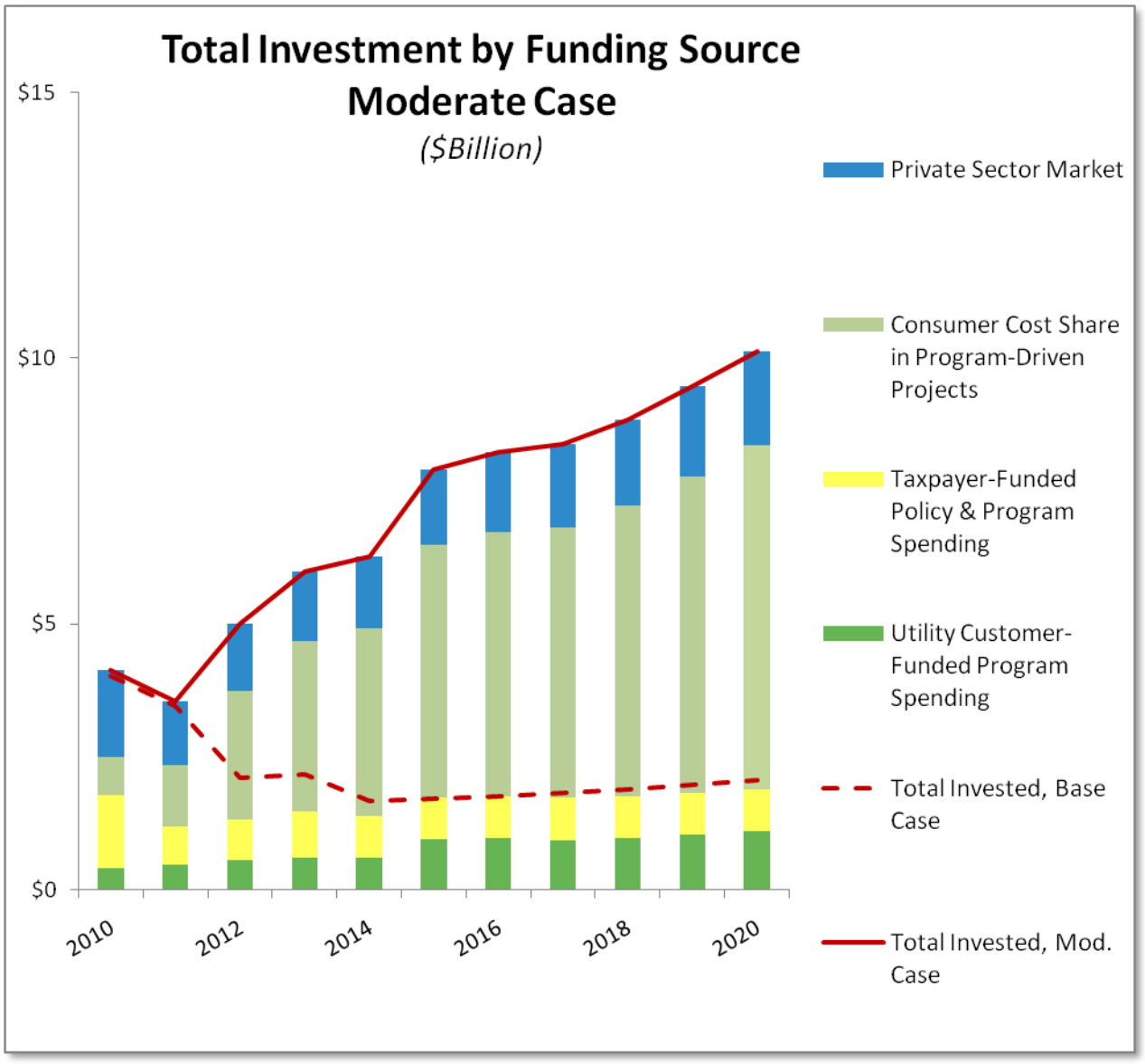


Figure 11. Total investment in home energy upgrade market by funding source: Moderate Case

Total investment market wide is $78 billion or three times the level of investment in the Base Case. Consumer investment is 3.4 times spending on programs and policies (e.g., federal rebate program and tax credits), which is much greater than in the Base Case.

The pace of market activity increases significantly under the Moderate scenario, with 1.7 million homes receiving energy upgrades in 2020 and a 10% per year growth rate between 2010 and 2020. By 2020, about 14 million homes would have received comprehensive home energy upgrades for about 15% penetration of the target market.

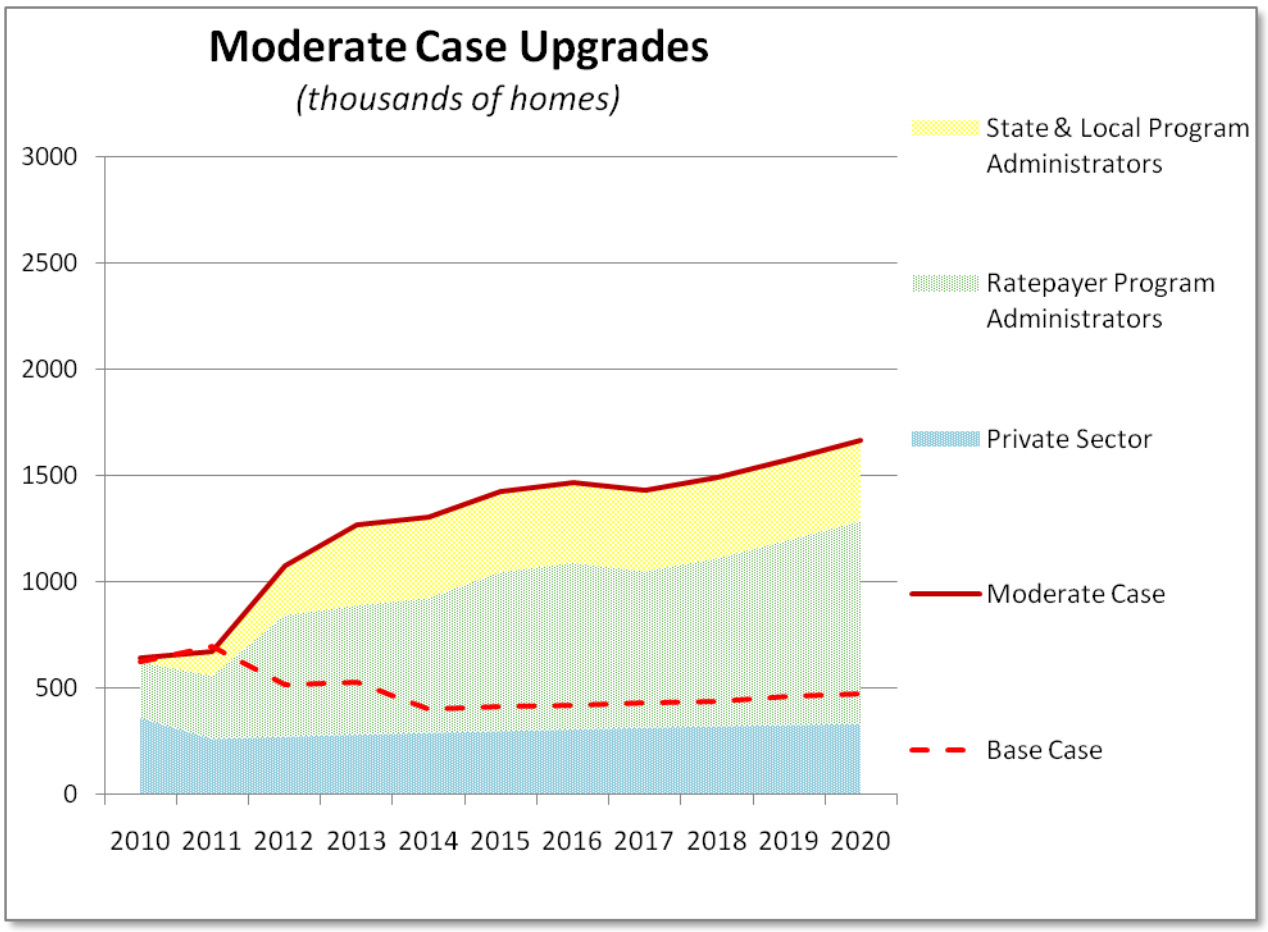


Figure 12. Market activity in the home energy upgrade market: Moderate Case

Aggressive Case Results

Aggressive policies and increases in funding could raise total investment in the home energy upgrade market more than fivefold to $132 billion. Primary drivers for this growth include:

- Aggressive actions by states to meet their energy efficiency targets. States with very modest or no binding efficiency targets are expected in the near future to increase their spending on energy efficiency to 0.8% of annual utility revenues in 2020, which is comparable to the 2009 national average for utilities with energy efficiency programs;
- Federal tax credits at 30% of project costs.
- A fully funded federal rebate program.
- Emissions allowance allocations from a federal cap-and-trade program.
- Assumed reductions in the costs to HP programs for projects, with corresponding increases in cost sharing by consumers.
- Significant federal funding for both the State Energy Program and the EECBGs.

These factors move consumers to make sizable investments in home energy upgrades and drive annual market investment from all sources up by 16% per year, to more than $19 billion in 2020.

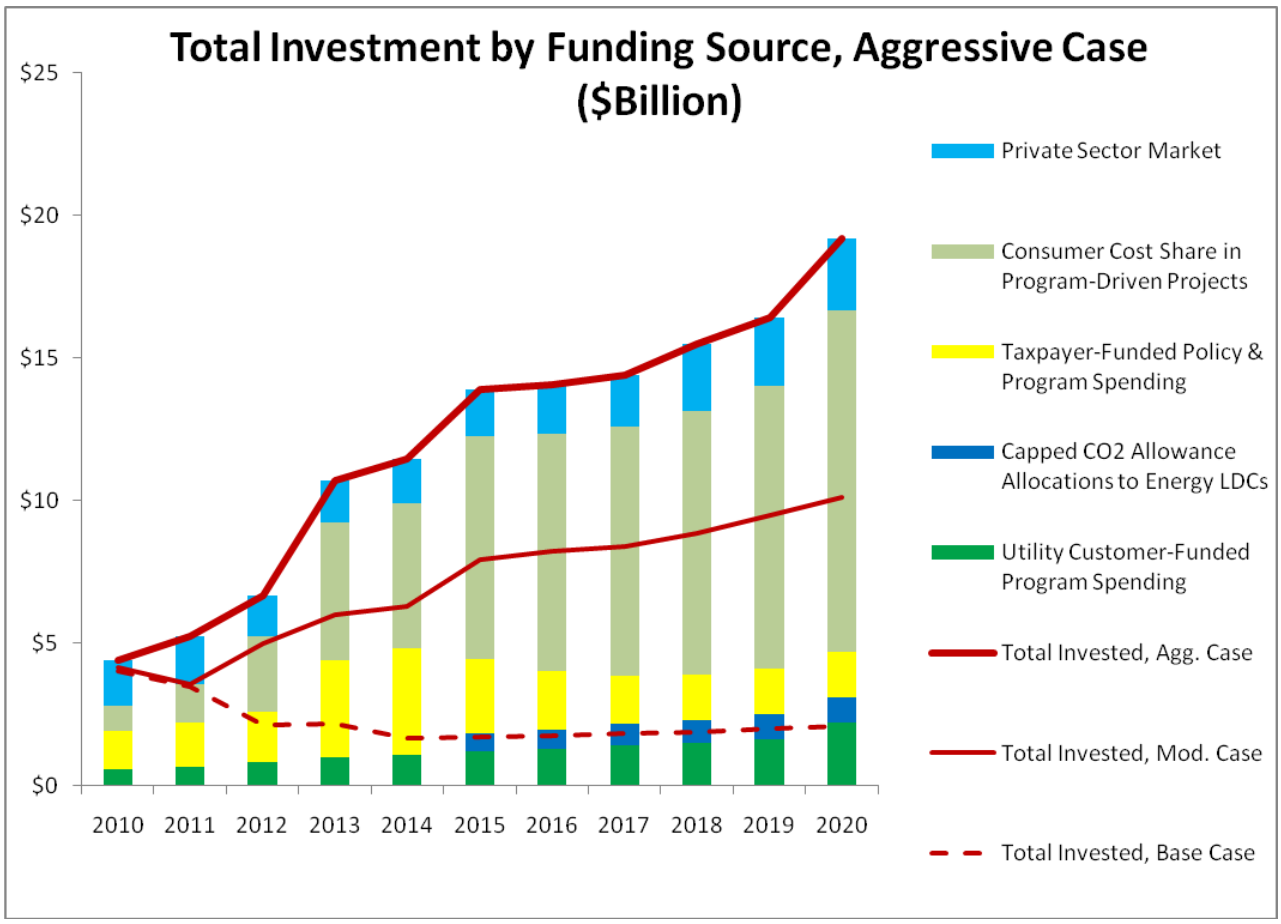


Figure 13. Total investment in home energy upgrade market by funding source: Aggressive Case

Leverage of private sector resources is less than in the Moderate Case—about 2.6 times spending on programs and policies—but still 100% greater than in the Base Case.

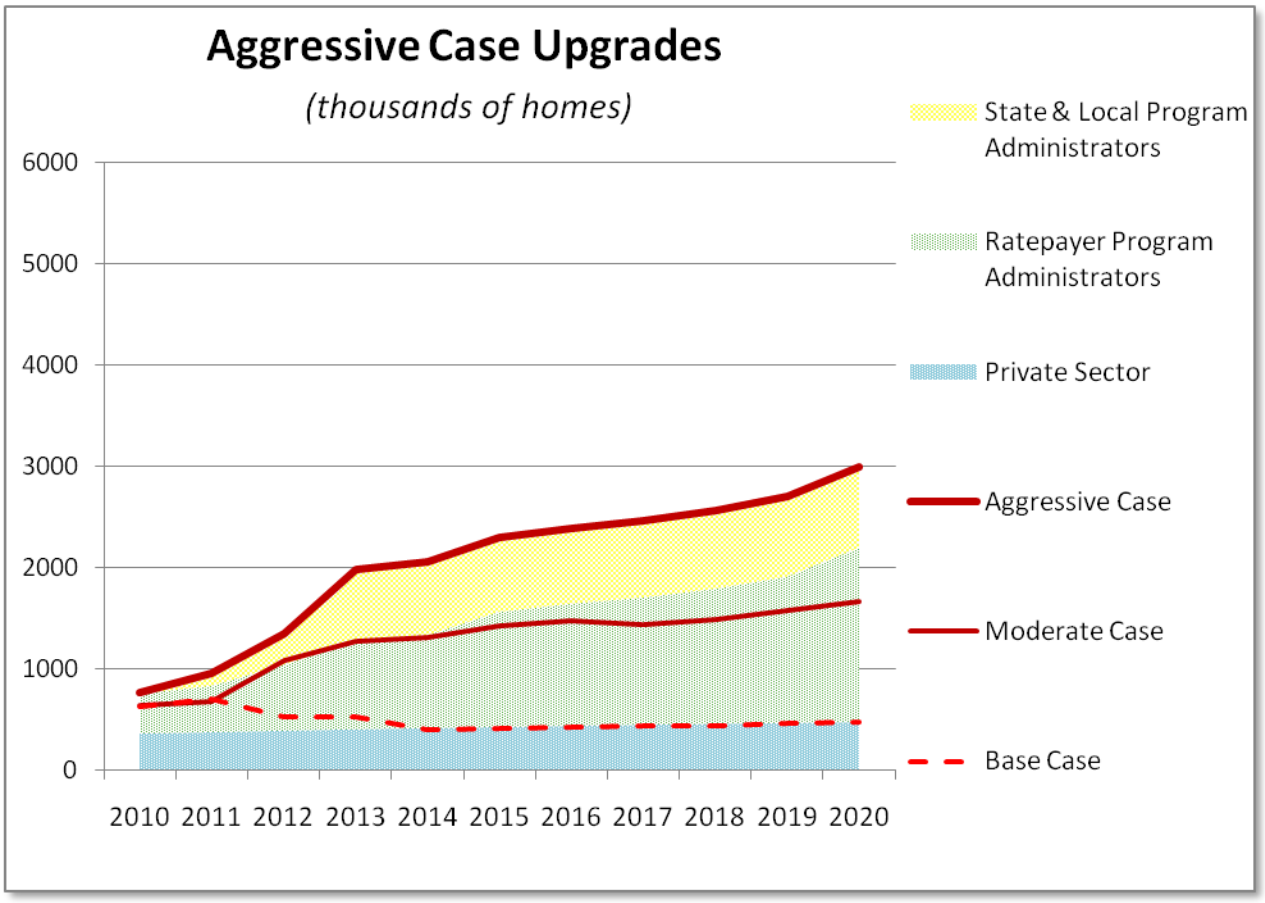


Figure 14. Market activity in the home energy upgrade market: Aggressive Case

Upgrades in the Aggressive Case are accelerated by the same factors that drive market investment, particularly the rise in utility customer funding enhanced by emissions allowances, a sizable federal rebate program, and a very robust federal tax credit. In aggregate, the policies and spending decisions of this scenario could produce cost-effective energy savings by 2020 for nearly one in four U.S. households living in older, energy-intensive homes that do not qualify for the federal WAP. The pace of market activity increases significantly under the Aggressive scenario with about 3 million homes receiving energy upgrades in 2020. By 2020, about 22 million homes would receive home energy upgrades resulting in about 23% penetration of the target market.

Table 1 summarizes the results of this market assessment across the three scenarios.

Table 1. Market Penetration, Total Energy Savings, and Total Market Investment by 2020 in the Base, Moderate, and Aggressive Scenarios

Metrics	2009	Base Case in 2020	Mod. Case in 2020	Agg. Case in 2020
TOTAL HOUSING STOCK	112 M	128 M	128 M	128 M
TARGET MARKET: Households with incomes >149% Federal Poverty Level residing in homes built prior to 2005	82 M	93 M	93 M	93 M
HOME ENERGY UPGRADE MARKET ACTIVITY				
Annual Number of Homes Upgraded		**0.5 M**	**1.7 M**	**3.0 M**
Homes upgraded as % of Households >149% Federal Poverty Level & Pre-2005 Construction	0.7%	0.5%	1.8%	3.2%
Cumulative Number of Homes Upgraded (2010-2020)		7 M	14M	22M
Market Saturation: Cumulative # of Home Upgrades by 2020 as % of Households >149% Poverty Level & Pre-2005 Construction		**7%**	**15%**	**23%**
ENERGY SAVINGS & INVESTMENT REQUIRED				
Delivered Energy Savings in 2020*		**0.08 Quads**	**0.22 Quads**	**0.32 Quads**
Cumulative Delivered Energy Savings, All Homes Upgraded (2010-2020)*		**0.53 Quads**	**1.14 Quads**	**1.59 Quads**
Annual Public/Private Investment in 2020		**$2.1 B**	**$10.1 B**	**$19 B**
Total Private Sector Investment		$17 B	$65 B	$91 B
Total Public Sector Investment		$9 B	$18 B	$41 B
Ratio of Private to Public Investment		**1.8**	**3.6**	**2.2**

The Dual Role of Financing

Expanded or enhanced access to affordable financing often is cited as the difference between today's market and a vastly larger, more sustainable market. The working group finds that affordable financing *is* essential for fostering this larger market but will not necessarily *drive* market expansion.

Financing in this market takes two primary forms: consumer financing for households undertaking home energy upgrades and business financing for contractors and other service providers.

Consumer Financing

For households, the upfront costs of residential energy efficiency improvements and poor access to capital can be significant deterrents to consumer investment in improving the efficiency of existing homes (Hendricks et al. 2009). Lenders have been hesitant to provide low-interest, long-term financing that matches the savings from energy upgrades. A secondary market for residential energy efficiency loans has not yet developed,,[23] and contractors and programs have generally been left to buy down loan interest rates for households to attractive levels—an expensive proposition that can often cost more than10% of the total cost of the project.

[23] The RRWG anticipates that the development of secondary markets will lead to the availability of less costly capital for energy efficiency loans.

The availability of attractive financing by a program, on its own, however, is not a silver bullet to increasing demand for home energy upgrades. Many existing financing programs reach less than 0.5% of their target population each year (Fuller 2008). Evidence from current home energy upgrade programs suggests that a relatively small fraction of participants—about 10%-20%—take advantage of financing when available through an energy efficiency program.[24] Financing products may enable households to perform an energy upgrade when they already are inclined to do so. Participants in HP programs tend to be more affluent than the average American. This group of customers may have less need for financing or have access to attractive financing options.[25]

For these reasons, in this analysis, the working group assumes that financing offered directly by utility customer-funded and taxpayer-funded programs generates about 10% of additional upgrades for those programs. The rural utility loan program also contributes to demand. Most other sources of financing, however (e.g., secured and unsecured loans guaranteed by the Federal Housing Administration), are projected and quantified but not associated with additional demand in the market assessment model.[26]

Business Financing

For contractors, business financing is essential to the growth of the home energy upgrade market. Programs simply cannot deliver thousands of home energy upgrades every year without a supply of trained, certified contractors and crews. Equipping a crew to perform home energy upgrades can take $30,000 to $50,000, according to contractors on the working group. Assuming each crew performs about 40 comprehensive home energy upgrades per year, establishing the contractor base necessary to realize the working group's Moderate Case would require more than 40,000 crews nationwide by 2020, outfitted at a one-time cost of $1.3 billion to $2.2 billion. Capitalizing the home energy upgrade industry at those levels will require profitability in a consistent, reliable market environment. Recommendations for establishing that program and market environment may be found in the following section on Additional Drivers of Market Development.

Observations from the Market Assessment

The results of this market assessment are driven by assumptions underlying key policy as well as programmatic and market drivers in the various scenarios. Thus, it may be more appropriate to focus on the high-level insights and observations that are revealed by the analysis:

- **Achieving comprehensive, whole home savings in the existing housing stock is challenging**—Assuming that program infrastructure and marketing can expand without cost or performance penalty, rapidly scaling today's programs—reaching perhaps a few hundred thousand households—to deliver several million comprehensive home energy upgrades annually will be difficult to achieve within just a few years.
- **Complementary energy policies can have a large impact**—The working group's analysis suggests that no single policy at any single level of government will scale the home energy upgrade market. Instead, multiple policy initiatives are required (e.g., renewal or enhancement of the residential efficiency tax credit, establishing a federal rebate program, or aggressive goals and targets for ratepayer-funded energy efficiency programs) to significantly accelerate the pace of home energy improvements and achieve cumulative market penetration rates of 15%-20% by 2020.

[24] Based upon observations by several program administrators in the working group.
[25] Affluent households are likely to have greater access to Home Equity Lines of Credit (HELOCs) and superior credit qualifications than less affluent households. In addition, less affluent households often have higher priority uses for limited financing capacity or they may prefer to maintain this capacity to mitigate the risk of unforeseen expenses.
[26] Evidence that financing drives significant demand in the residential market is ambiguous. Thus, the working group adopted a conservative approach in estimating the incremental market demand that would result from broader availability of financing in this market assessment.

- **Cumulative energy savings can exceed 1 quad with strong policy and programmatic support—** Cumulative savings in delivered energy are about 1.1 quads between 2010 and 2020 in the Moderate Case.
- **Optimal package of policies unclear and highly dependent on objectives—**Further analysis with more sophisticated tools would be necessary to arrive at the "best" combinations of policies—as long as the objective is clear: energy savings, job creation, emissions avoidance, or, cost-effectiveness.

VI. Additional Drivers of Market Development

In addition to the market drivers modeled in the three scenarios, a number of vital policies, program elements, and activities that are difficult to model are likely to have a meaningful impact on the evolution and development of the home energy upgrade market. In this section, the working group provides a brief overview of key elements, which are a critical component of a comprehensive strategic approach to developing a vibrant and sustainable home energy upgrade market.

- **Development and sharing of policy and program best practices**—Many administrators of taxpayer- and utility customer-funded efficiency programs are developing and implementing pilot home energy upgrade programs that test innovative designs and delivery strategies targeting the home energy upgrade market. Policy and program best practices should be identified and shared among states, localities, program administrators, and regulatory bodies. Such an initiative could build upon existing efforts (e.g., collections of best practices by the Consortium for Energy Efficiency from utility customer-funded programs, the Department of Energy from the Better Buildings grantees, or Efficiency First). Regulators and program administrators could benefit from a "toolkit" of policy foundations and program design components as well as the forging of more active working partnerships among state commissions, program administrators, utilities, lenders, and local governments. These tools should be tailored and customized to the situations and context in regions and states – development of the contractor market, technical and market opportunities for energy efficiency given housing stock characteristics, regulatory context, and funding levels – and should evolve as program implementers and policymakers learn more over the next few years. These best practices should include effective strategies for marketing and outreach, which will likely need to be much more creative and dynamic than past outreach efforts (Neme et al. 2011).
- **Structuring incentives to encourage comprehensive home energy upgrades**—In designing home energy upgrade programs, financial incentives must be structured to encourage individuals to pursue more comprehensive improvements that in turn help develop the home energy upgrade market. For example, offering rebates with minimum estimated savings levels (e.g., 15% savings or more) and increasing the incentive as estimated savings increase could push the market toward more comprehensive improvements. Another approach is to offer incentives that are flexible and encourage the private sector contractor market to promote comprehensive home energy upgrades (e.g., the ability to offer lower interest rates or larger rebates to contractors that have more advanced training).
- **Workforce training, including sales training for contractors**—As the market grows, many more trained workers will be needed to meet demand. Recent investments in training by the Department of Labor and the Department of Energy have created a foundation for home energy upgrade workforce training, but these activities may need to be scaled up if the market expands. According to a recent study, the nation currently has about 30 Building Performance Institute (BPI) certified individuals per million households (Neme et al. 2011). Reaching half of the nation's total occupied homes over the next decade would require 1,000 BPI-certified individuals per million households. In addition to technical skills training, contractors need to improve their sales techniques to start and expand profitable businesses in this space. A number of sales training workshops are already

available; replicating the most effective training programs in emerging markets could accelerate market growth.

- **Rigorous quality assurance standards**—High-quality work is important to build trust with customers, to reassure financial partners, and sustain public support and funding. The Department of Energy and a large group of stakeholders are developing national work and quality assurance standards. These standards are critical for a sustainable industry in home energy upgrades. Local entities should encourage innovation in quality assurance and quality control approaches, with clear conduits for passing those innovations back to the federal level for the next iteration of quality assurance standards.

- **Access to capital for new home energy upgrade businesses**—Starting a new home energy upgrade business or expanding into additional services related to home energy upgrades can be expensive. As a result of the recent financial crisis and economic recession, it has become more challenging for new businesses to obtain working capital. Entrepreneurs need access to start up capital and lines of credit to smooth cash flow in order to launch and grow their businesses.

- **Increased support for difficult-to-reach segments of the home energy upgrade market**—Several segments of the home energy upgrade market are particularly difficult to reach, including multifamily buildings, manufactured homes, rental properties, and moderate-income households who are not eligible to participate in state low-income weatherization programs or the federal WAP. Reaching these market segments has been challenging and may require more targeted and customized program designs, innovative pilot programs, and additional public support and funding.

- **Improved market data**—Data sources for understanding and segmenting the home energy upgrade market are scattered, incomplete, and somewhat outdated, in part because they were designed for other purposes. Periodic surveys and industry reports prepared by the U.S. Census Bureau, Department of Commerce, Department of Energy, Department of Housing and Urban Development, and Fannie Mae and Freddie Mac could be revised to better inform the home energy upgrade market. The addition or honing of a few questions could provide information that would be very useful to the market and to policymakers.

- **Additional research on financing products**—Research is needed into which financial products have had the greatest impact in the home energy upgrade market and in identifying new financing products that could reach more households and open larger pools of capital to the market.

- **Education and training for appraisers and realtors**—The value of energy efficiency is often not integrated into the value of a residential building. This is a multifaceted problem with potentially large implications. Appraisers serve a pivotal market role between lenders and home buyers and sellers; the appraisal is a foundation for equity financing. Appraisers usually are not trained to evaluate the energy component of home operating costs, even though these costs often are second only to mortgage payments. More fundamentally, the appraisal profession relies on empirical evidence that the values of homes in the same market are higher with energy efficiency improvements, and the paucity of these higher comparative values frustrates integration of energy savings into more current valuations. Bringing the value of efficiency into the market will require education and training—but these are insufficient without home-specific data that reflect energy savings and illustrates the impact of energy efficiency investments on utility costs.

- **Disclosure and labeling programs and improvement-on-sale pilots**—It is difficult for homeowners to assess the impact of energy efficiency investments due to their lack of visibility (e.g., wall insulation) and the fact that high-efficiency components are often not separately observable (e.g., a more efficient fan in a refrigerator), which contributes to limited awareness. Home energy labels can improve access to information about energy performance, and labeling programs should expand nationwide. If these programs are successful, they will provide an informational tool to demonstrate the energy savings that can be expected from home energy upgrades. Ultimately, a

well-accepted and widely utilized home energy label is a critical element and building block for a voluntary or mandatory program that supports energy efficiency upgrades in residential buildings at the time of sale.

VII. Roadmap Goal and Priorities

This chapter draws on the analysis above and identifies an overall goal for the market and a set of policy initiatives and programmatic activities needed to transform the residential energy efficiency market. Where possible, the working group attempts to identify potential roles for various actors (e.g., federal government, state and local governments, regulatory commissions, utility customer-funded program administrators, and product and service providers). The working group also identifies a set of near-term activities that it will focus on and which support several of the high-priority initiatives. The working group considers this process to be iterative—the group will continually learn from its efforts and refine the group's priorities based on this learning—but this is the working group's best thinking on what needs to be done, given what the group has discovered to date.

Roadmap Goal

The working group's goal is to significantly increase the number of comprehensive, durable, performance-based home energy upgrades. The scenario analysis illustrates the potential impact of federal, state, and local policy and programmatic initiatives on home energy upgrade market activity and investment. The Moderate or Aggressive scenarios suggest potential pathways that could result in 1.9 to 3 million upgrades completed annually by 2020 compared to the Base Case scenario of about 500,000 homes per year.

Roadmap Priorities

Reaching the market activity goal and investment levels in the Moderate (or Aggressive) scenario will require significant activity on many fronts. The working group has identified four primary areas of activity, with specific priorities and actions for each (Figure 15).

Improve Residential Energy Efficiency Program Design

1.Improve the quality of home energy upgrade program design and implementation.

1a. Monitor and evaluate existing and new home energy upgrade programs (e.g., innovations being tested in the Better Buildings programs) to better understand best practices.

1b. Share lessons learned among program administrators and industry partners.

1c. Create tools and resources to support ongoing program improvement.

1d. Further analyze strategies and approaches to reach under-served markets—multifamily, manufactured homes, rental properties, and low- and moderate-income households.

1e. Review the opportunity and costs associated with more comprehensive upgrades (>40% savings per home) and support these foundations for deeper future savings.

2.Quality assurance standards and workforce training.

2a. Establish standards and develop high-quality, accessible training to support a qualified workforce.

2b. Improve and standardize quality assurance for home energy upgrade programs.

Enable Access to Capital

3.Improved access to credit for both product and service providers.

3a. Assess need for startup capital and lines of credit for new and growing home energy upgrade businesses.

3b. Provide needed capital access to these businesses directly or through financial partners.

4.Improve access to financing for customers.

4a. Acquire a better understanding of credit needs and alternative underwriting methods for low- and moderate-income households.

4b. Increase the availability and affordability of financing for home energy upgrades, including considering how to extend terms to match the cost and savings of more comprehensive upgrades, and ways of attaching loans to property rather than property owner.

4c. Sustain state and local revolving loan funds (RLFs) for the residential sector, eliminate 20% cap on RLF allocations, and consider reprogramming RLFs to more credit-challenged sectors.

4d. Analyze on-bill financing pilots and replicate or expand if they are promising.

4e. Consider ways of packaging loans across multiple programs or states for sale into secondary markets, providing greater liquidity to home energy upgrade program financing.

4f. Consider ways of linking financing to rigorous quality assurance standards (e.g., third-party or national work specifications).

Increase the Market Value of Home Energy Upgrades

5.Increase the market value of home energy upgrades through labeling, disclosures, education, and data collection.

5a. Consider public disclosures on energy performance through home energy performance labeling.

5b. Track and analyze the impact of home energy labeling on property value.

5c. Educate and inform real estate agents, appraisers, and home buyers about the value of home energy upgrades.

5d. Consider merging federal energy efficiency programs under a single national brand that states and localities may adopt, with uniform testing and quality assurance to increase coherence, brand recognition, and market confidence.

5e. Consider requiring cost-effective home energy upgrades at time of sale.

Bolster Energy Efficiency Funding and Policy Support

6.Increase state utility customer funding for home energy upgrade programs.

6a. Increase the number of states with utility customer-funded home energy upgrade programs. Share legislative and regulatory solutions from states with long-standing efficiency programs.

6b. Expand the size of existing and new utility customer-funded home energy upgrade programs.

6c. Address policy or regulatory issues that limit home energy upgrade programs (e.g., strategies to address nonenergy benefits; balancing cost-effectiveness tests, allowing energy efficiency for multiple fuels)

7.Maintain or increase funding for state and local energy efficiency programs.

7a. Consider continued availability of SEP and EECBG funding and competitive federal grants for home energy upgrade programs.

7b. Increase state and local funding for home energy upgrade programs. Continue support by the DOE and the National Association of State Energy Officials (NASEO) for entities that encourage states to develop home energy upgrade programs.

7c. Consider additional funding sources such as funds for improving home health, safety, and structural integrity.

8.Offer federal rebates and/or increase tax credits for energy efficiency.

8a. Establish and fund a federal rebate program (e.g., Home Star-type program).

8b. Create a rural utility loan program (e.g., Rural Star) for comprehensive home energy upgrades to channel affordable federal credit to utilities, especially those with a small rate base.

8c. Preserve the federal Residential Energy Efficiency Tax Credit at no less than 10% and consider modifications, e.g., coverage of labor, tiered credits for fuller upgrades, and linkages to work standards.[27]

9.Consider making energy efficiency eligible under any Clean Energy Standard or other comparable state or federal policies.

9a. Establish new state policy commitments in energy efficiency resource standards, (e.g., Energy Efficiency Resource Standards [EERS], Renewables Portfolio Standard[RPS]), utility resource plans, demand-side management plans, and mandates for acquiring all "cost-effective energy efficiency savings."

9b. If a federal resource standard is enacted (e.g., a Clean Energy Standard), allow energy efficiency as an eligible resource for compliance.

10.If federal climate legislation is enacted that prices carbon, provide incentives for states and utilities to use a fraction of the funds generated to support the home energy upgrade market and programs.

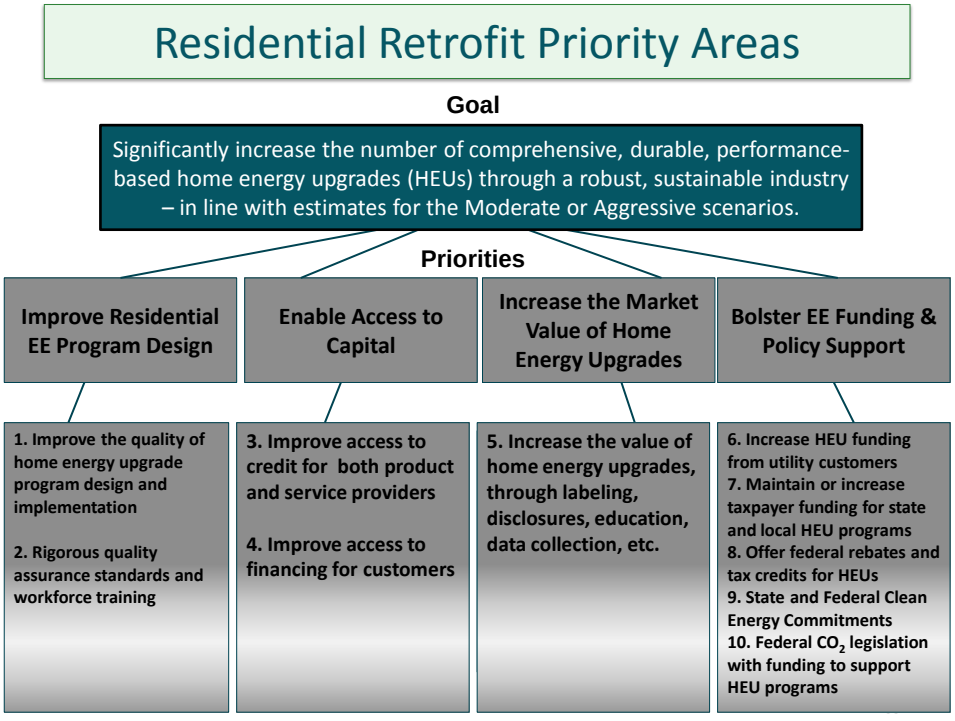


Figure 15. Residential retrofit roadmap goal and priority areas

[27] If labor costs are included in tax credits, consider capping labor costs at a multiple of materials and equipment to allay concerns over fraud and abuse.

The working group's market assessment only incorporates some of the priorities (Figure 15; bolster energy efficiency funding and policy support as shown in Priorities 6 through 10). Tackling these other priority areas (Priorities 1 through 5), however, is crucial to successfully achieving the market activity goals that are shown in the Moderate or Aggressive scenario. For each of the priority areas, the working group identifies specific actions needed and indicates potential roles for stakeholders (i.e., major or minor role) in each priority area (Figures 16-19).

Priorities			Federal Govt	State Govt	Local Govt	Regulatory Commissions	Utility Customer-Funded Administrators	Product & Service Providers & Industry Groups	National and Regional NGOs
Improve Residential EE Program Design	**1. Improve the quality of home energy upgrade program design and implementation**	1a. Monitor and evaluate existing and new HEU programs (e.g. innovations piloted in BetterBuildings programs) to better understand best practices	√	√	√	√	√	√	√
		1b. Share lessons learned among program administrators and with industry partners	√	√	√	√	√	√	√
		1c. Create tools and resources to support ongoing program improvement	√	√			√	√	√
		1d. Further analyze strategies for reaching hard to serve markets, e.g., multifamily, manufactured homes, rental properties and low/moderate income households	√	√	√	√	√	√	√
		1e. Review the opportunity and costs associated with more comprehensive upgrades (>40% savings/home) and support initiatives in this area	√	√	√	√	√	√	√
	2. Rigorous quality assurance standards and workforce training	2a. Establish standards and develop high-quality, accessible training to support a qualified workforce	√	√			√	√	√
		2b. Improve and standardize quality assurance for home energy upgrade programs	√	√			√	√	√

Figure 16. Roadmap priorities and key stakeholder groups (1 of 5)

Priorities			Federal Govt	State Govt	Local Govt	Regulatory Commissions	Utility Customer-Funded Administrators	Product & Service Providers & Industry Groups	National and Regional NGOs
Enable Access to Capital	**3. Improved access to credit for product and service providers**	3a. Assess need for startup capital and lines of credit for new and growing home energy upgrade businesses	√	√	√			√	
		3b. Provide needed capital access to these businesses directly or through financial partners	√	√	√			√	
	4. Improve access to financing for customers	4a. Acquire a better understanding of credit needs and alternative underwriting methods for low/moderate-income households	√	√	√	√	√	√	√
		4b. Increase the availability and affordability of financing for home energy upgrades; including considering how to extend terms to match the cost and savings of more comprehensive upgrades, and ways of attaching loans to property rather than property owner.	√	√	√	√	√	√	√
		4c. Sustain state and local revolving loan funds (RLFs) for the residential sector, eliminate 20% cap on RLF allocations and consider reprogramming RLFs to more credit-challenged sectors.	√	√	√				
		4d. Analyze on-bill financing pilots and replicate if they are promising	√	√		√	√		
		4e. Consider ways of packaging loans across multiple programs or states for sale into secondary markets, providing greater liquidity to HEU program financing	√	√	√		√		√
		4f. Consider linking financing to rigorous quality assurance standards, e.g., third-party or national work specifications	√	√	√		√		

Figure 17. Roadmap priorities and key stakeholder groups (2 of 5)

Priorities			Federal Govt	State Govt	Local Govt	Regulatory Commissions	Utility Customer-Funded Administrators	Product & Service Providers & Industry Groups	National and Regional NGOs
Increase the Value of Upgrades	**5. Increase the value of home energy upgrades**	5a. Consider public disclosures on energy performance through home energy performance labeling	√	√	√			√	√
		5b. Track and analyze the impact of home energy labeling on property value	√					√	√
		5c. Educate/inform real estate agents, appraisers, and home buyers about the value of home energy upgrades	√	√	√		√	√	√
		5d. Consider merging federal EE programs under a single national brand that states and localities may adopt, with uniform testing and quality assurance to increase coherence, brand recognition, and market confidence	√	√	√		√	√	√
		5e. Consider requiring cost-effective home energy upgrades at time of sale		√	√			√	√

Figure 18. Roadmap priorities and key stakeholder groups (3 of 5)

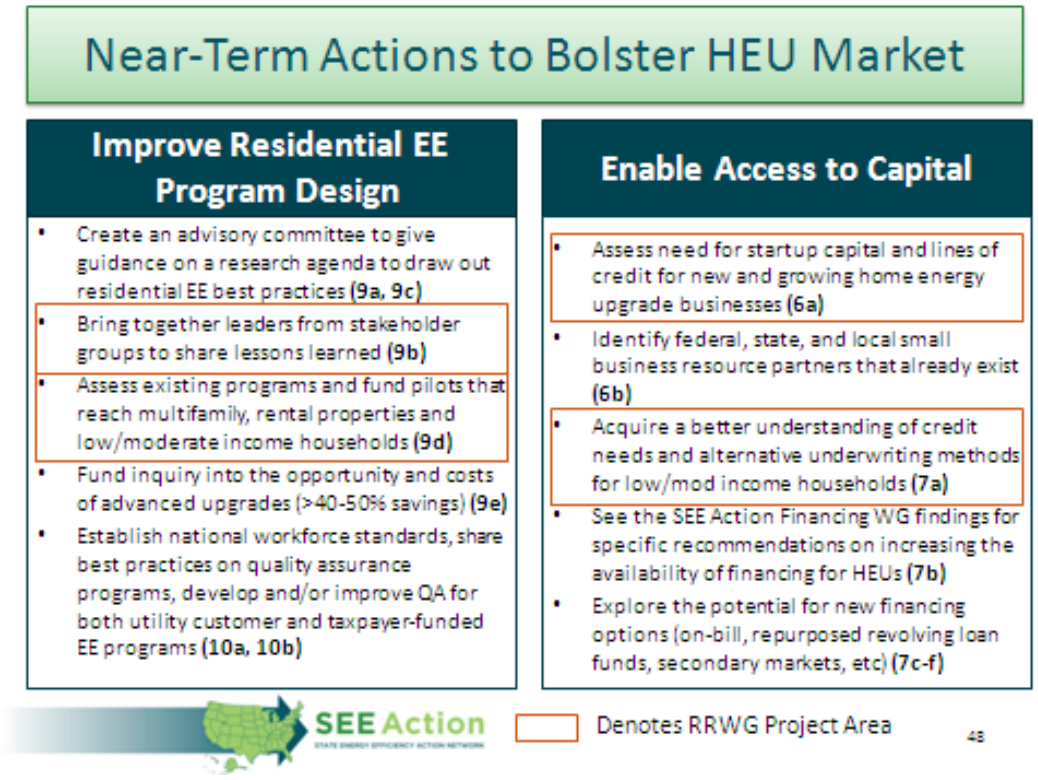
Priorities			Federal Govt	State Govt	Local Govt	Regulatory Commissions	Utility Customer-Funded Administrators	Product & Service Providers & Industry Groups	National and Regional NGOs
Bolster EE Funding & Policy Support (continued)	**6. Increase utility customer funding for home energy upgrade programs** [Some elements included in Base, Moderate and Aggressive cases]	6a. Increase the number of states with utility customer-funded HEU programs.		√	√	√	√		
		6b. Expand the size of existing and new utility customer-funded HEU programs		√	√	√	√		√
		6c. Address policy or regulatory issues that limit home energy upgrade programs (e.g. strategies to address non-energy benefits; balancing cost-effectiveness tests, allowing EE for multiple fuels)		√		√	√		√
	7. Maintain or increase taxpayer funding for state and local home energy upgrade programs [Some elements included in the Moderate and Aggressive cases]	7a. Consider continued availability of SEP and EECBG funding and competive federal grants for home energy upgrade programs	√	√	√		√		√
		7b. Increase state and local funding for home energy upgrade programs		√	√		√		√
		7c. Consider additional funding sources, e.g., funds for improving the home health, safety and structural integrity	√	√	√		√	√	√

Figure 19. Roadmap priorities and key stakeholder groups (4 of 5)

Priorities			Federal Govt	State Govt	Local Govt	Regulatory Commissions	Utility Customer-Funded Administrators	Product & Service Providers & Industry Groups	National and Regional NGOs
Bolster EE Funding and Policy Support	**8. Offer federal rebates and tax credits for HEUs** [Varying approaches included in the Moderate and Aggressive cases]	8a. Establish and fund a federal rebate program (e.g. HomeStar)	√	√	√	√	√	√	√
		8b. Establish and fund a rural utility loan program (e.g. RuralStar) for comprehensive home energy upgrades to channel affordable federal credit to utilities with	√	√		√	√		
		8c. Preserve the federal Residential Energy Efficiency Tax Credit at no less than 10% and consider modifications, e.g. coverage of labor, tiered credits for fuller upgrades and linkages to work standards	√				√	√	
	9. State and Federal Clean Energy Commitments [Included in the Moderate case]	9a. Establish new state policy commitments in energy efficiency resource standards, (e.g., EERS, RPS), utility resource plans, demand-side management plans, mandates for acquiring all "cost-effective energy efficiency savings"		√		√	√		√
		9b. If a federal resource standard is enacted (e.g., a Clean Energy Standard), allow energy efficiency as an eligible resource for compliance	√	√		√	√		
	10. Federal carbon legislation with funding to support home energy upgrade programs [Included in the Aggressive case]	10. If federal climate legislation is enacted that prices carbon emissions, provide incentives for states and utilities to use a fraction of the funds generated to support the HEU market and programs	√					√	√

Figure 20. Roadmap priorities and key stakeholder groups (5 of 5)

Appendix B provides a more complete description of each priority area, stakeholder roles, existing resources that are available and/or working in this priority area, resource gaps and needs going forward, and potential actions in the next year or two. Potential actions for all priority areas are summarized in Figure 21.



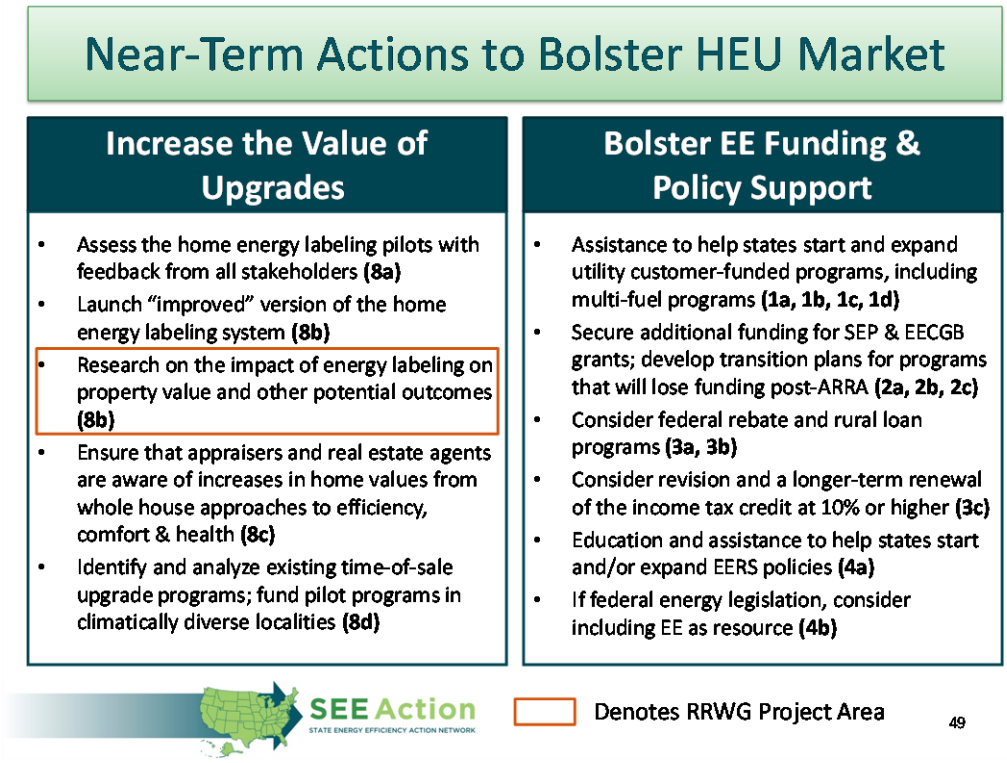


Figure 21. Summary of recommended actions for the near term (1-3 years)

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Appendix A: Membership of the Residential Retrofit Working Group

The Residential Retrofit Working Group (RRWG) of the State Energy Efficiency Action Network is committed to taking action to increase investment in cost-effective energy efficiency. This roadmap was developed under the guidance of and with input from the working group. The document does not necessarily represent an endorsement by the organizations of RRWG members.

Residential Retrofit Working Group Membership

Co-Chairs

Dian Grueneich Formerly of the California Public Utilities Commission (CPUC)	**Frank J. Murray Jr.** NY State Energy Research & Development Authority (NYSERDA)

Policymakers

Walt Auburn (MD Energy Administration)
Rick Hanson (City of Jamestown Housing & Community Devel. Dept.)
Tom Plant (formerly of the CO Governor's Energy Office)
Gerald Shechter (Kansas City Office of Environmental Quality)
Karen Villeneuve (NYSERDA)

Research / Academia

Loren Lutzenhiser (Portland State University)

Practitioners / Utilities

Diane Ferington (Energy Trust of Oregon)
Tom Hines (Arizona Public Service)
Sandy Hochstetter Byrd (Arkansas Electric Cooperative Corp.)
Steve Saenz (Austin Energy)
Theresa Spurling-Wood (Gainesville Regional Utility)
Ben Taube (Southeast Energy Efficiency Alliance)
John Tooley (Advanced Energy)

Industry

Rick Gerardi (New Dawn LLC)
Duncan McCulloch (Sears Home Improvements)
Keith Williams (Building Services & Consulting LLC)

Coordination / Organization / NGO

Jared Asch (Home Performance Resource Center)
Matt Golden (National Home Performance Council)
William Johnson (Green America Public Private Partnership)
Warren Lupson (AC, Heating, and Refrigeration Institute)
Kevin Reilly (Laborers' International Union)
Kara Saul-Rinaldi (National Home Performance Council)
Bob Scott (Natl. Assoc. of State Community Service Programs)
Ed Wisniewski (Consortium for Energy Efficiency)

Agency Co-Leads & Technical Support

Julie Hughes (DOE)
Ted Leopkey (EPA)
LBNL (C. Goldman, M. Fuller, I. Hoffman, M. Zimring)

Appendix B: Priorities and Actions Recommended by the Working Group

Priority 1a. Monitor and evaluate existing and new HEU programs (e.g. innovations piloted in BetterBuildings programs) to better understand best practices

Stakeholders	Key Actions
Federal Govt	Track the progress and impacts of federally-funded programs; make data and case studies available.
State Govt	Track the progress and impacts of state-funded programs; make data and case studies available; work with federal govt to track SEP-funded programs.
Local Govt	Work with federal govt to track EECBG-funded programs.
Regulatory Commissions	Track the progress and impacts of ratepayer-funded programs; make data and case studies available.
Utility Customer-Funded Administrators	Work with regulatory commissions to track the progress and impacts of ratepayer-funded programs; make data and case studies available.
Product & Service Providers & Industry Groups	Provide data on projects; provide feedback to program evaluators on effective program design.
National and Regional NGOs	Work between states, regions, and the federal govt to coordinate evaluation efforts as appropriate.

Existing Resources: Some data being collected from ARRA-funded grantees.

Additional Resources Needed: Funding for qualitative research on both ARRA-funded programs and ratepayer programs would further our understanding of how to scale up the residential market.

Near-Term Actions: Create an advisory committee drawn from key stakeholder groups to give guidance on a research agenda to identify residential EE best practices. Collect and make public program data. Plan and fund more rigorous experimental design to test what works.

Figure B–1. Collection of program best practices

Priority 1b. Share lessons learned among program administrators and with industry partners

Stakeholders	Key Actions
Federal Govt	Provide funding for peer-to-peer forums for exchange of lessons learned.
State Govt	Facilitate sharing among local govts, and pursue connections btw states to share learnings.
Local Govt	Participate in peer-to-peer forums.
Regulatory Commissions	Participate in peer-to-peer forums for regulators; encourage program administrators to seek out innovative models.
Utility Customer-Funded Administrators	Participate in peer-to-peer forums.
Product & Service Providers & Industry Groups	Provide feedback on what has worked from a product/service provider perspective.
National and Regional NGOs	Facilitate regional and national forums for exchange of lessons learned.

Existing Resources: Many "peer" organizations already exist (e.g., NASEO, NARUC, CEE, ICLEI, Efficiency First) that have relationships with many key players. DOE's Office of Weatherization and Intergovernmental Program and BetterBuildings also have started some of this work through support provided to ARRA grantees.

Additional Resources Needed: More attention and funding needs to be given to scaling up the residential sector; this will require deeper relationships with "peer groups" and new relationships across groups (e.g., between industry players and various levels of government).

Near-Term Actions: Increase the focus on the residential EE market at peer conferences and workshops (e.g. at the many annual/semi-annual meetings that already happen). DOE also should consider bringing together leaders from these various stakeholder groups to develop relationships and discuss lessons learned across stakeholder groups at least semiannually.

Figure B–2. Sharing lessons learned

Priority 1c. Create tools and resources to support ongoing program improvement

Stakeholders	Key Actions
Federal Govt	Fund the creation of tools and resources to support new and existing residential EE programs.
State Govt	Fund the creation of state-specific tools and resources to support new and existing residential EE programs.
Utility Customer-Funded Administrators	Provide templates, tools, and other resources that will speed program deployment and increase program impacts.
Product & Service Providers & Industry Groups	Help identify needed tools and resources.
National and Regional NGOs	Help identify needed tools and resources.

Existing Resources: Many tools and resources exist but are scattered and may not be tailored to a program implementer audience – need to assess existing resources. DOE's Office of Weatherization and Intergovernmental Program and BetterBuildings program have also started some of this work through the support they provide to ARRA grantees.

Additional Resources Needed: A range of tools and resources are needed, use the advisory committee drawn from key stakeholder groups to give guidance on specific resources needed.

Near-Term Actions: Assess existing resources; create and fund an advisory group to identify additional resources needed. Start creating tools and resources.

Figure B–3. Infrastructure for continuous improvement

Priority 1d. Further analyze strategies for reaching hard to serve markets, e.g., multifamily, manufactured homes, rental properties and low/moderate income households

Stakeholders	Key Actions
Federal Govt	Fund this research.
State Govt	Fund this research; experiment with programs to reach these audiences.
Local Govt	Experiment with programs to reach these audiences.
Regulatory Commissions	Fund this research.
Utility Customer-Funded Administrators	Experiment with programs to reach these audiences.
Product & Service Providers & Industry Groups	Experiment with products & services to reach these audiences.
National and Regional NGOs	Facilitate coordination of efforts to reach these audiences as appropriate.

Existing Resources: A few programs have had some success in these markets – first assess details of progress to date.

Additional Resources Needed: Funds to support pilot programs that focus on these markets.

Near-Term Actions: Assess existing programs that target these under-served markets. Identify and consider funding at least two or three new pilot programs that target these market segments. Launch pilot programs and track them closely.

Figure B–4. Strategies for hard-to-serve markets

Priority 1e. Review the opportunity and costs associated with more comprehensive upgrades (>40% savings/home) and support initiatives in this area

Stakeholders	Key Actions
Federal Govt	Fund this research.
State Govt	Fund this research; experiment with programs to increase savings per home.
Local Govt	Experiment with programs to increase savings per home.
Regulatory Commissions	Fund this research.
Utility Customer-Funded Administrators	Experiment with programs to increase savings per home.
Product & Service Providers & Industry Groups	Experiment with products & services to increase savings per home.
National and Regional NGOs	Facilitate coordination of efforts as appropriate.

Existing Resources: Work has been done by DOE, national labs, Affordable Comfort, and others on this topic.

Additional Resources Needed: Additional research and in-field experimentation needed. Inquiry into which advanced measures are – or could be – cost-effective is important.

Near-Term Actions: Assess research to date. Identify and consider funding demonstration programs and projects that test various "deep savings" strategies

Figure B–5. Support of deep retrofits

2a. Establish standards and develop high-quality, accessible training to support a qualified workforce

2b. Improve and standardize quality assurance for home energy upgrade programs

Stakeholders	Key Actions
Federal Govt	Establish national workforce standards for home energy upgrades. Facilitate the exchange of best practices for quality assurance programs. Provide funding for workforce training.
State Govt	Develop minimum quality assurance standards for state-funded programs
Utility Customer-Funded Administrators	Develop minimum quality assurance standards for ratepayer-funded programs
Product & Service Providers & Industry Groups	Provide insight and feedback to program implementors to design a system that is rigorous without being unduly burdensome on industry
National and Regional NGOs	Identify and share best practices in workforce training and quality assurance

Existing Resources: Multiple QA programs already exist and can be improved and replicated. DOE is currently developing workforce standards that will advance the industry.

Additional Resources Needed: Additional effort and funding will be required to improve workforce training as the industry scales up, and to improve and expand QA programs required to maintain high work quality.

Near-Term Actions: Establish national workforce standards; share best practices on quality assurance programs; develop and/or improve QA for both ratepayer and taxpayer-funded EE programs.

Figure B–6. Quality assurance standards

Priority 3a. Assess need for startup capital and credit for HEU businesses
Priority 3b. Offer affordable capital to these businesses directly or through financial partners

Stakeholders	Key Actions
Federal Govt	Fund an assessment of growth capital and working capital needed for home energy upgrade businesses; provide direct loans or other credit support through the SBA and other agencies as appropriate.
State Govt	Monitor the ability of firms to get access to capital; provide support through existing state economic development organizations.
Local Govt	Monitor the ability of firms to get access to capital; provide support through existing local economic development organizations.
Product & Service Providers & Industry Groups	Provide feedback about what type of access to capital barriers exist.

Existing Resources: Some federal, state and local small business resources exist, but have not been tailored for home energy improvement market.

Additional Resources Needed: A better understanding of the specific needs for this market is required. Additional start up capital and working capital probably are required for this market to scale up.

Near-Term Actions: Assess the capital needs in home energy improvement market. Identify state and local small business resource partners that already exist.

Figure B–7. Financing for service providers

Priority 4a. Acquire a better understanding of credit needs and alternative underwriting methods for low/moderate-income households
Priority 4b. Increase the availability and affordability of HEU financing. Consider matching terms to cost and savings of more comprehensive upgrades and ways of attaching loans to property rather than property owner.

Stakeholders	Key Actions
Federal Govt	Provide technical support (e.g. fund study) to assess the credit needs and alternative underwriting methods for low/moderate-income households; organize existing resources into an accessible online resource library.
State Govt	See the SEE Action Financing Working Group findings for specific recommendations.
Local Govt	See the SEE Action Financing Working Group findings for specific recommendations.
Regulatory Commissions	See the SEE Action Financing Working Group findings for specific recommendations.
Utility Customer-Funded Administrators	See the SEE Action Financing Working Group findings for specific recommendations.
Product & Service Providers & Industry Groups	See the SEE Action Financing Working Group findings for specific recommendations.
National and Regional NGOs	See the SEE Action Financing Working Group findings for specific recommendations.

Existing Resources: Multiple guidance documents created through ARRA-funded technical assistance work and through the many state and local governments and NGOs working on this topic

Additional Resources Needed: Templates and "How Tos" for the variety of financing options, access to lower cost capital, the development of a secondary market for loans

Near-Term Actions: See the SEE Action Financing Working Group findings for specific recommendations.

Figure B–8. Financing for households

Priority 4c. Sustain state and local revolving loan funds (RLFs) for the residential sector, eliminate 20% cap on RLF allocations, and consider reprogramming RLFs to more credit-challenged sectors, e.g., moderate-income households

Stakeholders	Key Actions
Federal Govt	Eliminate 20% cap on federal funds used for RLF allocations.
State Govt	Sustain RLF for the residential sector, and consider reprogramming RLFs to more credit-challenged sectors, e.g., moderate-income households.
Local Govt	Sustain RLF for the residential sector, and consider reprogramming RLFs to more credit-challenged sectors, e.g., moderate-income households.

Existing Resources: There are over $650 million in ARRA-funded RLF pools established.

Figure B–9. Sustain revolving loan funds

Priority 4c. Sustain state and local revolving loan funds (RLFs) for the residential sector, eliminate 20% cap on RLF allocations, and consider reprogramming RLFs to more credit-challenged sectors, e.g., moderate-income households

Stakeholders	Key Actions
Federal Govt	Eliminate 20% cap on federal funds used for RLF allocations.
State Govt	Sustain RLF for the residential sector, and consider reprogramming RLFs to more credit-challenged sectors, e.g., moderate-income households.
Local Govt	Sustain RLF for the residential sector, and consider reprogramming RLFs to more credit-challenged sectors, e.g., moderate-income households.

Existing Resources: There are over $650 million in ARRA-funded RLF pools established.

Near-Term Actions: Eliminate 20% RLF in future federal funding; consider reprogramming RLFs to more credit-challenged sectors

Figure B–10. Innovative financing models

Priority 4e. Consider ways of packaging loans across multiple programs or states for sale into secondary markets, providing greater liquidity to HEU program financing

Stakeholders	Key Actions
Federal Govt	Support the development of a secondary market.
State Govt	Facilitate the development of a secondary market. Adopt conforming underwriting and other standards for state programs.
Local Govt	Encourage local financing programs to adopt conforming underwriting and other standards.
Utility Customer-Funded Administrators	Adopt conforming underwriting and other standards for utility customer-funded programs.
National and Regional NGOs	Facilitate the development of a secondary market.

Existing Resources: Some early efforts to establish standards for a secondary market.

Additional Resources Needed: Funding to continue to develop standards and facilitate sales into a secondary market.

Near-Term Actions: Support efforts to create a secondary market. Adopt conforming underwriting and other standards.

Figure B–11. Access to secondary markets

Priority 4f. Consider linking financing to rigorous quality assurance standards, e.g., third-party or national work specifications

Stakeholders	Key Actions
Federal Govt	Provide guidance on how to link financing to rigorous quality assurance standards
State Govt	Link state financing to rigorous quality assurance standards.
Local Govt	Link local financing to rigorous quality assurance standards.
Utility Customer-Funded Administrators	Link ratepayer-funded financing to rigorous quality assurance standards.

Existing Resources: Work is underway on national work specifications that can serve as quality assurance standards for programs, households and lenders.

Near-Term Actions: Link existing financing programs to rigorous quality assurance standards where possible.

Figure B–12. Financing linked to quality assurance

Priority 5a. Public disclosures on energy performance through home energy scores
Priority 5b. Track and analyze the impact on home energy scores on property value

Stakeholders	Key Actions
Federal Govt	Develop a national rating system for energy performance (in process); fund research to track the impact of home energy scores on property value.
State Govt	Require public disclosure of energy performance at time-of-sale and time-of-rental.
Local Govt	Require public disclosure of energy performance at time-of-sale and time-of-rental, if not required at the state level.
Product & Service Providers & Industry Groups	Provide feedback and participate in testing of energy performance scores.
National and Regional NGOs	Advocate for implementation of energy performance scores.

Existing Resources: National home energy labeling pilots in process

Additional Resources Needed: Need to adapt home energy labeling based on feedback from the pilots; funding required to track the impact of the labeling program over time

Near-Term Actions: Complete a thorough assessment of the home energy labeling pilots with feedback from all stakeholders. Launch "improved" version of the home energy labels. Start research on the impact of the score on property value and other potential outcomes of labeling.

Figure B–13. Labeling and valuation of energy performance

Priority 5c. Educate/inform real estate agents, appraisers, lenders and home buyers about the value of home energy upgrades

Stakeholders	Key Actions
Federal Govt	Provide data from ARRA-funded residential retrofit programs and the home energy score pilot to key stakeholders.
State Govt	Ensure that appraisers, lenders and real estate agents are aware of increases on home values from whole-house approaches to efficiency, comfort &
Local Govt	Fill in gaps in state efforts as needed.
Utility Customer-Funded Administrators	Provide education to potential program participants about the value of home energy upgrades.
Product & Service Providers & Industry Groups	Provide case studies and data about the value of home energy upgrades to all stakeholders.
National and Regional NGOs	Facilitate communication about educational efforts across states and localities.

Existing Resources: Some educational materials exist for these audiences, especial for home buyers; EcoBrokers and other groups have started to organize real estate agents

Additional Resources Needed: Funding for a concerted effort to educate those professionals most influential in the home buying process

Near-Term Actions: Expand courses for real estate agents and appraisers on valuing the impact of efficiency on operating costs in existing homes. Identify the most effective practices (e.g. those that lead to action) for educating home buyers. Ensure information about efficiency-enhanced home values is distributed to the real-estate community.

Figure B–14. Informing market on the value of energy efficiency

Priority 5d. Consider merging federal EE programs under a single national brand that states and localities may adopt, with uniform testing and quality assurance to increase coherence, brand recognition, and market confidence

Stakeholders	Key Actions
Federal Govt	Merge federal EE programs under a single national brand, and promote this brand widely.
State Govt	Adopt national brand where appropriate.
Local Govt	Adopt national brand where appropriate.
Utility Customer-Funded Administrators	Adopt national brand where appropriate.
Product & Service Providers & Industry Groups	Adopt national brand where appropriate.
National and Regional NGOs	Adopt national brand where appropriate.

Existing Resources: Several brands currently exist, and some (ENERGYSTAR) have wide public recognition.

Additional Resources Needed: Funding to promote brand.

Near-Term Actions: Identify and analyze existing brands; simplify all brands into a single national brand where possible.

Figure B–15. Coherent branding

Priority 5e. Consider requiring cost-effective home energy upgrades at time-of-sale

Stakeholders	Key Actions
State Govt	Consider requiring the implementation of cost-effective home energy upgrades at time-of-sale or immediately after sale.
Local Govt	If state-wide law is absent, consider requiring the implementation of cost-effective home energy upgrades at time-of-sale or immediately after sale.
Product & Service Providers & Industry Groups	Provide feedback and case studies to support policy design.
National and Regional NGOs	Advocate for time-of-sale ordinances and statutes.

Existing Resources: A few time-of-sale programs currently exist

Additional Resources Needed: Support for new pilot policies, including analysis of impacts. Sharing of lessons learned.

Near-Term Actions: Identify and analyze existing programs. Consider funding several pilot programs in geographically/climatically diverse localities

Figure B–16. Time-of-sale upgrades

Priority 6a. Increase the number of states with utility customer-funded home energy upgrade (HEU) programs

Stakeholders	Key Actions
State Govt	Consider establishing ratepayer-supported efficiency programs.
Local Govt	Partner with utilities and tailor ARRA-funded programs for easy transition to ratepayer supported programs.
Regulatory Commissions	Support broad efficiency portfolios that include home energy upgrades.
Utility Customer-Funded Administrators	Propose portfolios that include comprehensive home energy upgrades; shifting mix of investments from lighting to HEU programs has a large effect on the pace of national upgrades and energy savings.

Existing Resources: Utility customer-funded EE programs are the most consistent driver of demand for home energy upgrades across all policy scenarios. Existing state policies and programs provide multiple models that can be adapted to individual state circumstances.

Additional Resources Needed: Many EECBG/SEP grantees offer programs and infrastructure of potential use to new utility customer-funded HEU programs.

Near-Term Actions: NARUC and NGOs can focus education and assistance on helping states modestly committed to efficiency and home energy upgrades specifically to understand the paths to full efficiency portfolios and consumer savings. The federal government can collect and share data and lessons learned.

Figure B–17. More states with utility-customer funded programs

Priority 6a. Increase the number of states with utility customer-funded home energy upgrade (HEU) programs

Stakeholders	Key Actions
State Govt	Consider establishing ratepayer-supported efficiency programs.
Local Govt	Partner with utilities and tailor ARRA-funded programs for easy transition to ratepayer supported programs.
Regulatory Commissions	Support broad efficiency portfolios that include home energy upgrades.
Utility Customer-Funded Administrators	Propose portfolios that include comprehensive home energy upgrades; shifting mix of investments from lighting to HEU programs has a large effect on the pace of national upgrades and energy savings.

Existing Resources: Utility customer-funded EE programs are the most consistent driver of demand for home energy upgrades across all policy scenarios. Existing state policies and programs provide multiple models that can be adapted to individual state circumstances.

Additional Resources Needed: Many EECBG/SEP grantees offer programs and infrastructure of potential use to new utility customer-funded HEU programs.

Near-Term Actions: NARUC and NGOs can focus education and assistance on helping states modestly committed to efficiency and home energy upgrades specifically to understand the paths to full efficiency portfolios and consumer savings. The federal government can collect and share data and lessons learned.

Figure B–18. Expanded utility customer-funded programs

Priority 6c. Address policy or regulatory issues that limit home energy upgrade programs (e.g., strategies to address non-energy benefits; balancing cost-effectiveness tests, allowing EE for multiple fuels)

Stakeholders	Key Actions
State Govt	Consider providing legislative support on EE policy guidelines, balancing cost effectiveness tests and other factors in considering HEU programs.
Regulatory Commissions	Consider EE policy guidelines, balancing among appropriate cost-effectiveness tests and other factors in screening HEU programs. Consider specific performance incentives for administrators that undertake such programs.
Utility Customer-Funded Administrators	Consider models for program administration and design that facilitate inclusion of whole house improvements that target all fuels to enhance cost effectiveness and obtain deeper savings.
National and Regional NGOs	Inform/educate stakeholders on factors that should be considered in analysis and screening of HEU programs.

Existing Resources: A number of pilot programs are being implemented that allow program administrators to provide comprehensive retrofits for all end uses served by multiple energy sources (e.g. electricity, gas, fuel oil).

Additional Resources Needed: Enabling regulatory and policy guidelines and funding sources are critical to including multiple fuels. ARRA-funded experiments in this area can be adopted by states.

Near-Term Actions: Assess existing multi-fuel programs. Fund and monitor at least two new experimental programs in these markets. Launch these programs and track them closely.

Figure B–19. Regulatory constraints

Priority 7a. Consider continued availability of SEP and EECBG funding and competitive federal grants for home energy upgrade programs

Stakeholders	Key Actions
Federal Govt	Consider tiered or performance-based funding keyed to investment in national policy goals for home energy savings programs.
State Govt	Consider investing federal funds into getting HEU programs past the initial cost barriers, making them more attractive for ratepayer support.
Local Govt	Consider shouldering community based HEU program components such as marketing & outreach that do not produce obvious energy savings for a program administrator.
Ratepayer-Funded Administrators	Seek out collaborations with SEP & EECBG recipients who might assume less cost-effective components of HEU programs and make ratepayer funds go farther.
National and Regional NGOs	Work among localities, states and regions to facilitate collaborations and divisions of labor betweenSEP& EECBG recipients and ratepayer program administrators.

Existing Resources: Dozens of local SEP- and EECBG-funded HEU programs exist, but funding is uncertain after ARRA.

Additional Resources Needed: Consider continuation of SEP & EECBG funding that can build off of lessons learned from BetterBuildings program grantees. Consider competitive grants that target HEU programs

Near-Term Actions: Devise transition plans for SEP & EECBG programs that target home energy upgrades and no longer will be funded post-ARRA. Monitor, analyze and disseminate lessons learned based on experiences designing and implementing current HEU and residential financing programs.

Figure B–20. Extension of federal funding

Priority 7b. Increase availability of state and local funding for home energy upgrade programs

Stakeholders	Key Actions
State Govt	Consider starting or increasing state funding for HEU programs to meet energy savings goals. Consider directing more of the estimated $1 billion in state revolving loan funds to home energy upgrade programs (now less than 1% devoted to HEU programs.)
Local Govt	Consider starting or increasing local funding for HEU programs.
Utility Customer-Funded Administrators	Consider advocating for these resources as complementary funding for ratepayer programs or joint endeavors.
National and Regional NGOs	Lend analysis and advocacy to state efforts at establishing HEU programs.

Existing Resources: Successful state and local HEU programs provide examples and serve as potential models for new or expanding programs. Existing revolving loan funds represent an opportunity for expanding financing opportunities in home energy improvement market.

Additional Resources Needed: Expansion of state and local HEU programs could provide states with direct means to achieve savings goals and efficient conduits for federal rebates or other policies.

Near-Term Actions: Monitor, analyze and disseminate lessons learned based on experiences designing and implementing current HEU and residential financing programs.

Figure B–21. Increased state and local funding

Priority 7c. Consider additional funding sources, e.g., funds for improving home health, safety and structural integrity

Stakeholders	Key Actions
Federal Govt	Work with federal agencies to ID other sources of complementary funds.
State Govt	Work with state agencies to ID other sources of complementary funds.
Local Govt	Work with local govt offices to ID other sources of complementary funds.
Utility Customer-Funded Administrators	Work with govt to ID other sources of complementary funds.
National and Regional NGOs	Support govt and administrators in to ID other sources of complementary funds.

Existing Resources: Sources of complementary funds for health, safety, and structural integrity may be paired with funds for EE, e.g., HUD and local housing grants and EPA lead abatement project funds.

Additional Resources Needed: Need to identify the range of funds available in the residential market and reduce barriers to joining those resources.

Near-Term Actions: Identify complementary funds and provide guidance to program administrators on how to pair these funds for greater impact.

Figure B–22. Complementary funding

Priority 8a. Establish a federal rebate program (e.g., Home Star)

Stakeholders	Key Actions
Federal Govt	Consider adoption of a federal rebate program of similar magnitude to the proposed Home Star program, potentially spread over more years.
State Govt	Consider models for optimizing the integration of federal rebates into existing programs to facilitate more and deeper home energy upgrades. Partner with retailers to intervene in major equipment replacements and ensure rapid rebating for programmatic and non-programmatic consumers.
Local Govt	Consider models for optimizing the integration of federal rebates into existing programs to facilitate more and deeper home energy upgrades.
Regulatory Commissions	Consider ways of integrating federal rebates into EE resources and plans.
Utility Customer-Funded Administrators	Consider models for optimizing the integration of federal rebates into existing programs to facilitate more and deeper home energy upgrades. Partner with retailers to intervene in major equipment replacements and ensure rapid rebating for programmatic and non-programmatic consumers.
Product & Service Providers & Industry Groups	Devise business models and sales strategies that integrate federal rebates.
National and Regional NGOs	ID and disseminate rebate integration models.

Existing Resources: A large-scale federal program providing financial incentives to support home energy improvement market has been proposed but does not exist. Some utilities offer these types of programs.

Additional Resources Needed: Large-scale federal rebate program could have significant impact on home energy improvement market activity and investment level(see Moderate and Aggressive scenario).

Near-Term Actions: Lay the groundwork for a federal rebate program, including debate over program structure and distribution of rebates over time.

Figure B–23. Federal rebate program

Priority 8b. Create a rural utility loan program (e.g., Rural Star) for comprehensive home energy upgrades to channel affordable federal credit to utilities, especially those with small rate base

Stakeholders	Key Actions
Federal Govt	Consider establishing a rural utility loan program for home energy upgrades similar to the RuralStar proposal. Provide technical support for coordination with ratepayer-funded programs.
State Govt	Consider designs that target households with difficulty accessing affordable financing. Consider how these new programs might leverage existing infrastructure for program delivery.
Regulatory Commissions	Consider regulatory actions for enabling on-bill financing.
Utility Customer-Funded Administrators	Consider designs that target households with difficulty accessing affordable financing. Consider coordination with existing or new ratepayer programs. Prepare billing systems for on-bill financing.

Existing Resources: None in many states

Additional Resources Needed: Funding to establish a rural utility loan program.

Near-Term Actions: Debate and consider passing the legislation. If passed, eligible utilities and state entities should begin establishing systems and infrastructure.

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Figure B–24. Rural utility loan program

Priority 8c. Preserve the federal Residential Energy Efficiency Tax Credit at no less than 10% and consider modifications, e.g. coverage of labor, tiered credits for fuller upgrades and linkages to work standards

Stakeholders	Key Actions
Federal Govt	Consider longer term renewal and elevation of the 25C tax credit for non-business energy property. Consider tiering the credit to reward more expansive upgrades on a performance basis; also consider ways of covering labor for less capital-intensive measures.
Utility Customer-Funded Administrators	Consider integrating the tax credits more seamlessly into offerings, including in upstream partnerships with retailers. Consider clear linkages to quality work standards and performance.
Product & Service Providers & Industry Groups	Consider sales techniques that capitalize on the credit, especially with performance-based tiers and quality-assurance requirements.

Existing Resources: The residential EE tax credit increases demand in home energy improvement market (supports private sector market activity and helps leverage program activity).

Additional Resources Needed: Research is needed into the market response to different levels and renewal periods for the tax credit, i.e. one year versus three to five years. Research also is needed into the efficiency impacts of including or excluding labor as an eligible expense.

Near-Term Actions: Debate and consider a longer-term renewal of the tax credit at 10% or higher. Longer term policy support for tax credit (3+ years) could reinforce market confidence and accelerate investment among contractors and their lenders.

Figure B–25. Federal tax credit

Priority 9a. Establish new state policy commitments in energy efficiency resource standards, (e.g., EERS, RPS), utility resource plans, demand-side management plans, mandates for acquiring all "cost-effective energy efficiency savings"

Stakeholders	Key Actions
State Govt	Consider statutes and actions needed to set and implement energy efficiency commitments.
Regulatory Commissions	Consider resources, strategies and guidelines needed to establish and implement new or higher commitments to energy efficiency.
Utility Customer-Funded Administrators	Devise and propose portfolios that should meet or exceed state and administrator commitments to efficiency targets - and that include HEU programs.
National and Regional NGOs	Disseminate models of state EERS approaches and case studies on outcomes.

Existing Resources: Multiple states already have an EERS and can serve as examples for regulatory approaches, funding and integration with other state objectives.

Additional Resources Needed: States without an EERS could use actionable information about efficiency and clean generation resources in their states, so they can set goals.

Near-Term Actions: States can begin evaluating their potential for energy savings and acquiring information from EERS states on considerations in setting targets and enabling compliance.

Figure B–26. New state policy commitments

Priority 9b. If a federal resource standard were enacted (e.g., a Clean Energy Standard), allow energy efficiency as an eligible resource for compliance

Stakeholders	Key Actions
Federal Govt	Consider energy efficiency as an eligible resource in a federal energy resource standard (e.g., in a federal CES, RPS, or EERS) or make efficiency more explicit as a reduction in baseline retail sales.
State Govt	Consider State Energy Office partnerships with utilities on strategic planning to meet a federal energy or efficiency standard.
Regulatory Commissions	Consider issues associated with implementing federal energy legislation that includes a CES.
Utility Customer-Funded Administrators	Consider issues associated with implementing federal energy legislation that includes a CES.

Existing Resources: More than 20 states have adopted an EERS

Near-Term Actions: Monitor debate on federal energy legislation (e.g. CES, RPS, EERS)

Figure B–27. New federal resource standards

Priority 10. If federal climate legislation were enacted that prices carbon, provide incentives for states and utilities to use part of the funds generated to support the home energy upgrade market and programs.

Stakeholders	Key Actions
Federal Govt	Consider climate legislation and emissions allowance allocations that promote residential efficiency and savings for residential consumers. Consider incentives for states to use allowance allocations for energy efficiency, including HEU programs. Provide modeling of future emissions intensities and projections of state allocations.
State Govt	Plan for integrating a large new funding stream into state energy policy. Consider what proportion of emissions reductions can or should come from existing housing stock and end uses.
Regulatory Commissions	Consider regulatory guidance that enables rapid scaling in HEU programs.
Utility Customer-Funded Administrators	Consider HEU program designs and delivery mechanisms that can scale very rapidly.

Existing Resources: Regional and state initiatives (e.g. RGGI) provide examples for allocation of funds from carbon allowances to support EE programs, including those targeted at home energy upgrades.

Figure B–28. Climate legislation

Appendix C: Home Energy Upgrade Market Assessment Model: Key Assumptions in Scenarios

Scenario Assumptions for Programs & Policies: Energy Efficiency Programs Funded by Utility Customers

A summary of assumptions for utility customer-funding across the three scenarios is detailed in Table C-1.

Table C–1. Energy Efficiency Programs Funded by Utility Customers: Home Energy Upgrade Program Budgets in the Base, Moderate, and Aggressive Scenarios

Policy & Program Levers	Base Case	Moderate Case	Aggressive Case
EECBG & BetterBuildings Programs	• ARRA funds spent by 2013 • After 2013, assume no budget for BetterBuildings & EECBG	• ARRA funds spent by 2013 • After 2013, EECBG/Better Buildings budget of $45M/year; increasing at 3% /year to 2020 • Assume ~20% of budget targeted to home energy upgrades	• EECBG & BetterBuildings budget at $500M • Assume 33% of budget targeted to home energy upgrades
State Energy Program (SEP)	• SEP returns to 2008 level for 2013-2020 ($45M) • Assume ~3% of SEP budget devoted to home energy upgrades	• SEP returns to 2008 level of $45M in 2013 • Budget increases at 3%/year after 2013 • Assume ~6% of SEP budget targeted at home energy upgrade market	• SEP budget of $500M/yr in 2013; 3%/yr increase to 2020 • Assume ~6% of SEP budget targeted at home energy upgrade market.

State and Local Government Energy Efficiency Programs Funded by Taxpayers

A summary of assumptions for taxpayer funding across the three scenarios is detailed in Table C-2.

Table C–2. SEP and EECBG Programs: Home Energy Upgrade Market Budgets in Base, Moderate and Aggressive Scenarios

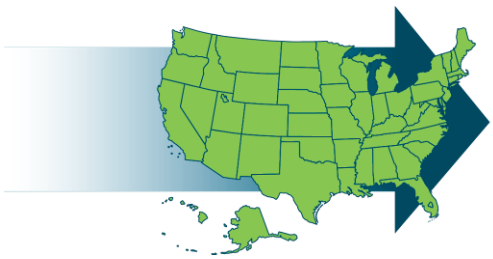
Policy & Program Levers	Base Case	Moderate Case	Aggressive Case
EECBG & BetterBuildings Programs	• ARRA funds spent by 2013 • After 2013, assume no budget for BetterBuildings & EECBG	• ARRA funds spent by 2013 • After 2013, EECBG/Better Buildings budget of $45M/year; increasing at 3% /year to 2020 • Assume ~20% of budget targeted to home energy upgrades	• EECBG & BetterBuildings budget at $500M • Assume 33% of budget targeted to home energy upgrades
State Energy Program (SEP)	• SEP returns to 2008 level for 2013-2020 ($45M) • Assume ~3% of SEP budget devoted to home energy upgrades	• SEP returns to 2008 level of $45M in 2013 • Budget increases at 3%/year after 2013 • Assume ~6% of SEP budget targeted at home energy upgrade market	• SEP budget of $500M/yr in 2013; 3%/yr increase to 2020 • Assume ~6% of SEP budget targeted at home energy upgrade market.

Other Federal Policies

Table C-3 provides a summary of key assumptions for a set of new and enhanced federal policies that are included in the Base, Moderate, and Aggressive scenarios.

Table C–3. Other Federal Policy Initiatives: Key Assumptions in Base, Moderate, and Aggressive Scenarios

Policy & Program Levers	Base Case	Moderate Case	Aggressive Case
Federal Tax Credits	• 2009-2010: Federal Tax Credit (25C) at ARRA levels (30%) • 2011: Drops to 10% • 2012-2020: No tax credit	• 10% tax credit extended through 2020 • No tax liability assumed for low-income households	• Tax credit maintained at 30% during 2010-2020 • No tax liability assumed for low-income households
Federal Rebate/Loan Program	*NOT IN SCENARIO*	• $3.3B total funding; 2-Yr ramp & 6 years at steady funding	• $6.6B total funding; 2-Yr ramp & 11 years at steady Funding
Rural Star	*NOT IN SCENARIO*	• $800M Utility Loans to historic USDA Rural Utility Recipients for HEU	Same as Moderate Case
Clean Energy Standard	*NOT IN SCENARIO*	• CES Target of 15% of retail sales in 2015; 20% in 2020 • Assume EE can provide 33% of target (i.e. 4.9% in 2015, 6.6% in 2020	*NOT IN SCENARIO – Targets assumed met or exceeded by market under carbon pricing*
Emissions Allowances from Federal Climate Legislation	*NOT IN SCENARIO*	*NOT IN SCENARIO*	• Large annual GHG allowance allocations to utilities, state energy offices, rural coops, based on CO_2 intensity



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