



SHELTER REPORT ²⁰/₁₅



Less Is More: Transforming Low-Income Communities Through Energy Efficiency



On the cover, from left: U.S. volunteer Sumner McCallie cuts insulation for Habitat for Humanity Mongolia's Blue Sky Build in 2010. Second from left: Volunteer Kurt Newton, from Trinity, Colorado, helps to rehabilitate the home of the Csapó family in Vac, Hungary, as part of Habitat for Humanity Hungary's thermal insulation program. Third from left: Double-paned windows help conserve energy in the 29 houses built for Habitat Mongolia's Blue Sky Build. At right: Dan Santa Lucia, 57, a volunteer from Habitat for Humanity Trenton, installs insulation in one of the many homes in Ocean Beach, New Jersey, damaged by Superstorm Sandy in 2012.

Background photo: Morguefile, **Inset photos,** left to right: ©Habitat for Humanity/Mikel Flamm, Ezra Millstein, Mikel Flamm, Bob Longino

Cover page photo: Jessica McGowan



Shelter Report 2015

LESS IS MORE:
TRANSFORMING LOW-INCOME COMMUNITIES
THROUGH ENERGY EFFICIENCY

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Numerous experts in the energy and housing sectors were consulted throughout the writing and researching of this report. We're especially grateful to Jeffrey Genzer, counsel to the National Association of State Energy Officials; Dr. Lowell Ungar, senior policy adviser for the American Council for an Energy-Efficient Economy; and Rodney Sobin, director of research and regulatory affairs for the Alliance to Save Energy, for their thoughtful and insightful review of the report.

We also are grateful for the numerous Habitat staff members who helped make the Shelter Report possible, especially Adam Smith, Brinda Moody, Christopher Ptomey, Derrick Morris, Elisabeth Gehl, Kevin Gobble, Michael Sutton, Pam Campbell and Piper Hendricks.

We also wish to thank the many Habitat-affiliated organizations for contributing examples and for their enduring partnership as we serve more communities in need.

This publication was generously supported by the RZ Foundation and the U.S. Green Building Council.

Habitat for Humanity International is a nonprofit, ecumenical Christian housing ministry that seeks to eliminate poverty housing and homelessness from the world and to make decent shelter a matter of conscience and action.

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U.S. volunteer Sumner McCallie cuts the insulation for a house during the 2010 Blue Sky Build in Mongolia. Over 100 international volunteers from the USA, Hong Kong, Australia, New Zealand, Korea, Philippines, Nepal, Great Britain and Thailand joined hands with local volunteers and home partner families to help build 29 houses. The 4.69-acre housing site will have its own water well provided by partner World Vision, and electricity from the local government.



Foreword

A home's long-term affordability depends on more than just a reasonably priced mortgage. Americans spend more than \$230 billion annually on home energy.

Low-income households typically face the greatest energy burden. Families in these communities often live in older homes that lack adequate insulation and energy-efficient appliances. Often they also have outdated heating and cooling systems that can contribute to health and safety issues. Low-income families spend more than 17 percent of their incomes on household energy, while other households spend on average just 4 percent. Most energy efficiency benefits do not reach this population, and more attention must be given to support the energy needs of distressed communities.

The federal government has tried to address this challenge through effective programs such as the Weatherization Assistance Program, which has weatherized millions of homes occupied by low-income families. However, there is still a substantial need for more innovative approaches in the residential market to adequately address the energy needs of underserved families. We need more cutting-edge initiatives at the state level, such as the programs in Maine and California, and more public-private partnerships between utility companies and local governments, such as Energy Smart in New Orleans.

Habitat for Humanity has recognized the importance of integrating energy efficiency into our work and has increased the efficiency and durability of our homes to ensure that families live in healthy environments that will be affordable

into the future. We do this by using the best construction products and services available to build energy-efficient homes and by improving the efficiency of homes through weatherization services.

Every dollar low-income families save on energy usage can go toward their home mortgages or other necessities. Habitat was a pioneer in demonstrating that healthy, energy-efficient homes aren't only for the wealthy. We have partnered with thousands of families whose total cost of ownership is lower even if they pay a slightly higher mortgage. We have built net zero Habitat homes, but our standard and belief is that every family should have a healthy, energy-efficient place to live.

Still, too many families face the challenge of energy costs that are excessive compared with their overall incomes. We will bring energy efficiency to everyone only through innovation, reform and bipartisan support. By becoming an advocate for low-income families and affordable, sustainable housing, you can bring us closer to a world where everyone has a decent place to live.

In partnership,

Jonathan T.M. Reckford
CEO, Habitat for Humanity International

Introduction

Audrey Spann still lives in the same 100-year-old row house in Philadelphia that was her parents' home and her birthplace. The house suffered from a combination of factors common to older buildings, such as a complete lack of insulation and significant deterioration, including a broken water heater. Before Spann applied for significant repairs and upgrades through Habitat for Humanity's Weatherization and Home Repair program, she was boiling water in her kitchen and carrying it upstairs for her bath.

Weatherization helps reduce the waste of heated or cooled air by sealing and insulating a home, and improves the comfort, ventilation, indoor air quality and energy efficiency of the home. Habitat performed dozens of repairs and upgrades to Spann's home, including installing a new roof, adding insulation, caulking doors and several windows, replacing some windows entirely, cleaning and sealing air ducts, removing mold and lead paint from the basement, and installing a new water heater and stove.

Energy efficiency means using less energy to provide the same or greater service.

"It's such a blessing," Spann said. "Before I got the insulation, (the house) got really cold in the winter. Now I don't have to run my furnace as much. My water bill is lower, my electric bill is lower, and my gas bill is lower even though we had a really

rough winter. It's really energy-efficient now."

For the cost of building one new home, Habitat Philadelphia can serve 14 families by making critical repairs and weather-

ization upgrades to their current homes. Spann is one of many people whose lives have been enhanced by residential energy efficiency.ⁱ Unfortunately, those who would benefit the most from efficiency in their homes are often the least able to make the necessary upgrades.

This report unpacks this paradox. Many of our fellow citizens face energy costs that are excessive compared with their overall incomes, yet they cannot afford to invest in the energy efficiency measures that would reduce their energy cost burden. Families nationwide are often forced to choose between necessities such as food or medications and paying their energy bills to heat and cool their homes.ⁱⁱ Private and public resources are available to help Americans like Audrey Spann, but these resources reach only a small percentage of underserved households.

The numbers tell the stark reality. Across America, 45.3 million people are living in poverty,ⁱⁱⁱ and all of these families are struggling with the cost of energy in some way. Low-income families spend anywhere from 17 percent to more than 50 percent of their incomes for household energy, while other households spend 4 percent on average.^{iv}

Energy efficiency, or "EE" as it is commonly referred to, is an important element of a sensible national energy policy. It is also a part of a much larger, global solution. Reducing demand through energy efficiency at all income levels is a global necessity: The Energy Information Administration's International Energy Outlook 2013 projects that world energy consumption will grow by 56 percent between 2010 and 2040.^v

Greater efficiency in communities where “fuel poverty” — defined as paying more than 10 percent of total income for energy needs — is prevalent is a low-risk investment whose dividends include both energy and non-energy benefits to all members of society. Further, energy efficiency decreases energy consumption and carbon emissions, reducing the environmental footprint of residences.

The implementation of energy efficiency measures in distressed communities faces a number of barriers, whether in newly constructed homes or retrofitted homes. New homes are unaffordable for many Americans, and owners of rental units are unlikely to invest in energy improvements if the tenant bears the responsibility for utility costs.

Funding the initial costs of installing energy efficiency upgrades is a critical barrier that can be addressed by a variety of public and private approaches, all of which should be enlarged and strengthened. Funding for existing federal and state resources needs to be increased and more effectively supported, and the availability of energy efficiency and related resources must be more effectively promoted through national, state and local public awareness campaigns.

This report examines these barriers and provides recommendations for change. Further, it illustrates the need for greater national commitment to support both public- and private-sector efforts to increase residential home energy efficiency. Finally, the report outlines the associated benefits for all Americans, especially those living in low-income communities, as a part of our national energy strategy.

Energy upgrades, or “retrofits,” can include:

- Better insulation (roof, ceiling, attic and secondary walls).
- Upgrading heating and cooling equipment (e.g., replacement of an old boiler).
- HVAC tune-up.
- Plugging air leaks.
- Switching to LED or CFL light bulbs.
- Installation of energy-efficient appliances.

1

Why energy efficiency matters

This chapter outlines the importance of energy efficiency to our overall economy at all income levels and residential building types, including single-family, multifamily and manufactured housing. It then turns to the opportunity presented by residential energy efficiency, which not only can deliver energy savings and healthier, safer homes, but also will save money and generate new jobs. Energy efficiency can also contribute to innovation in technology and energy management.

Since the first oil embargo in 1973, the adoption of energy efficiency has been responsible for 60 percent to 75 percent of the increase in our national energy productivity.^{vi} Running today's economy without the efficiency improvements that have taken place since 1973 would require 55 percent more energy supplies than we are currently using.^{vii} Although efficiency lacks the natural political constituency that solar and wind energy

possess, its impact on the U.S. economy is enormous.

Energy efficiency is a major business globally, and in the United States, the industry includes direct jobs, such as energy engineers and contractors, energy auditors and consultants, project managers, and installers, and indirect jobs, such as retailers, vendors, suppliers and manufacturers of efficiency equipment and supplies. All are part of the economic impact of the energy efficiency supply chain.

A 2012 report by Deutsche Bank estimates that \$39.2 billion was spent nationwide on residential energy upgrades in 2004,^{viii} and a report by the American Council for an Energy-Efficient Economy, or ACEEE, estimates that annual investment in energy efficiency technologies supports 1.6 million jobs.^{ix} The data, however, do not show the amount invested and the jobs created specifically in low-income communities, and this is an important area for further research.

The "invisible resource"

As the Alliance to Save Energy chart shows, coal, petroleum, natural gas and nuclear are the four main fuels used each day in America. Increasingly, there is recognition of a "fifth fuel" — energy efficiency — which implies that energy saved is as good as energy used.^x Energy efficiency differs from our other fuels, though. As Daniel Yergin observed in his

Houston's Energy Star homes

"Houston is greener than you think," said Allison Hay, executive director of Houston Habitat for Humanity. The biggest city in Texas is home to plenty of oil companies, many of whom sponsor homes and partner with the affiliate, but it's also home to many alternative energy companies.

Helped by those connections, every single home built by Houston Habitat is energy-efficient and sustainable. The affiliate earned the Energy Star Award in 1996, 1998, 2007, 2008, 2009, 2010, 2011, 2013 and 2014. (An Energy Star home has to meet strict criteria set by the U.S. Environmental Protection Agency.) It has built more than 500 of these homes since 2003.

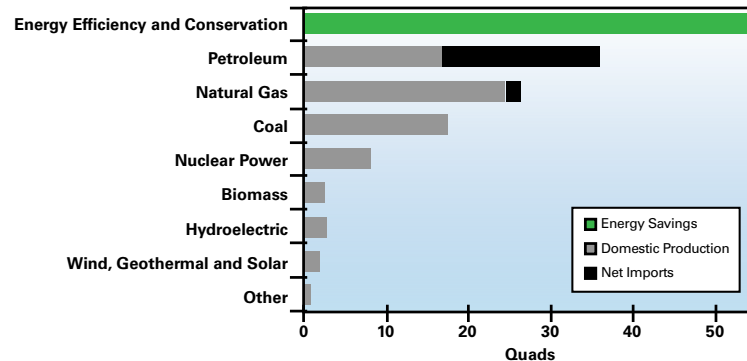
Building green in Houston means every home has double-pane windows, high-efficiency air conditioning units, Radiant Barrier roof decking that blocks heat from entering the attic, and nontoxic paints.

Twenty-seven Habitat homes are powered by solar panels, with an estimated savings of more than \$14,000 over 20 years on the families' utility bills.

"The house may cost a little more this way," Hay said, "but the long-term expenditures for our homeowners come out to their benefit. It's very much about not just helping our homeowners with the house, but helping them over the long run."

Energy Efficiency: America's Greatest Energy Resource

U.S. Energy Resources Used in 2012



Alliance to Save Energy, 2014



Houston Habitat for Humanity has built 27 homes with solar panels; the homeowners will save more than \$14,000 on their utility bills over 20 years.

Courtesy of Houston Habitat for Humanity

2011 book “The Quest,”^{xi} energy efficiency cannot be seen, touched, or neatly captured in a photo opportunity or ribbon cutting.^{xii} This can alter the public’s perception or diminish energy efficiency’s importance.

Despite its intangible nature, energy efficiency remains our greatest single energy resource, generating more available energy than oil, natural gas, coal and nuclear.^{xiii} Indeed, it might be more appropriate to consider energy efficiency as our “first fuel” rather than our fifth.

U.S. ranks 13th worldwide in energy efficiency

Despite gains since the first oil embargo more than 40 years ago, the United States lags far behind many other industrialized nations in energy efficiency performance. In 2014, the American Council for an Energy-Efficient Economy released its survey of the top 16 countries in terms of energy efficiency policies and programs. The United States ranked near the bottom, placing 13th and scoring a disappointing 42 out of a possible 100 points on the survey, which measured four categories: commercial and residential buildings, industry, transportation, and national effort.^{xiv}

A 2013 report by the United Nations Economic Commission for Europe emphasized that political will and commitment are the driving forces to advance

housing energy efficiency.^{xv} Political will is highlighted by the incentives and regulatory standards that are required for affordable housing policies and residential efficiency. Commitment is needed to support a sustained campaign to address residential energy efficiency and reduce energy consumption for years to come.

One reason the United States has fallen behind is the relatively little attention paid to residential energy efficiency compared with large projects such as the recent retrofit of the Empire State Building in New York City. Making a home energy efficient might seem like a small action, but residential energy use represents 22 percent of total energy consumption in the United States, and Americans spend \$230 billion annually on home energy.^{xvi}

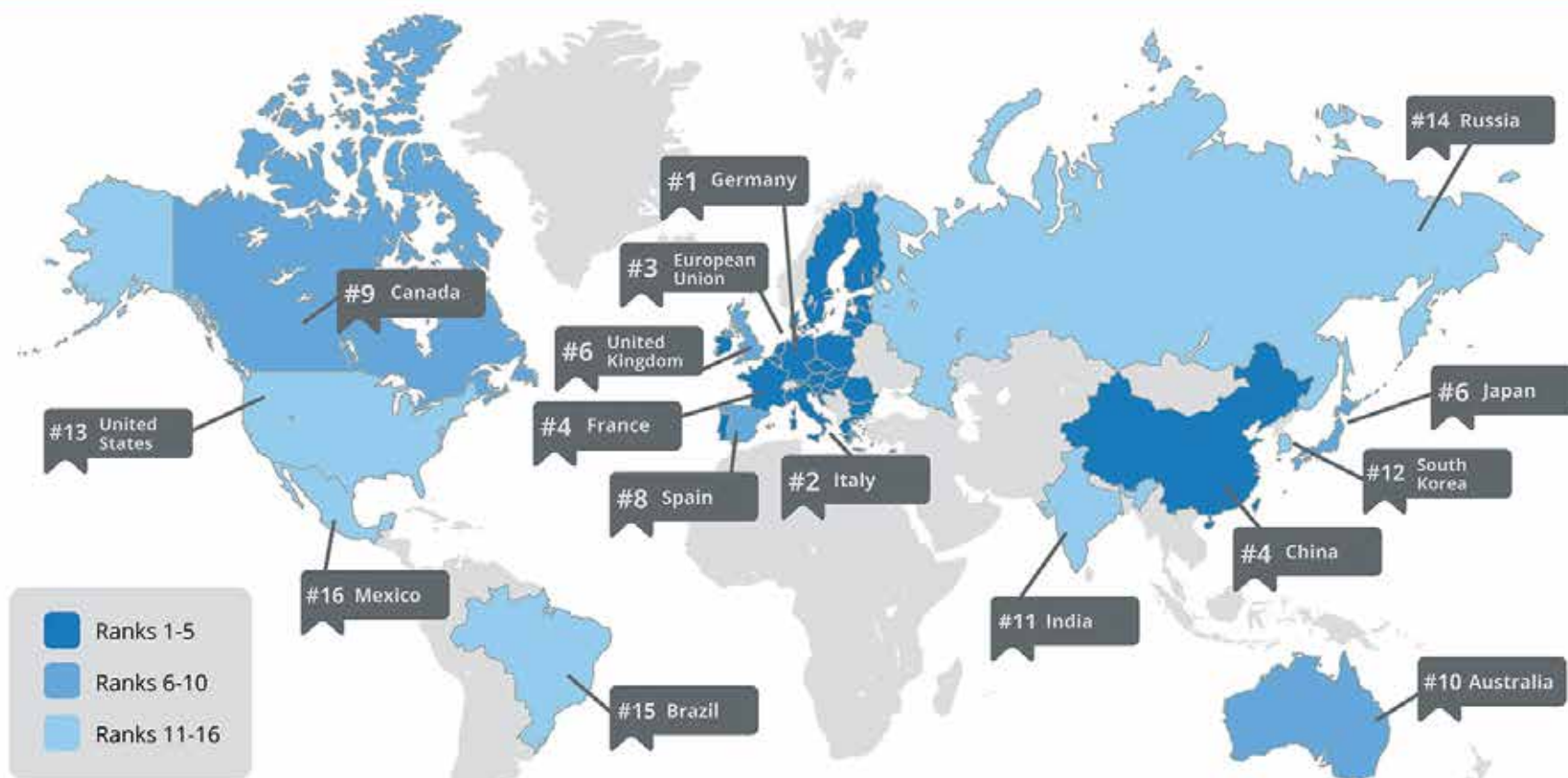
Billions of dollars of energy savings potential exist in American households. According to McKinsey & Co., “Energy efficiency is a vast, low-cost energy resource for the United States — if the nation can craft a comprehensive and innovative approach to unlock it.”^{xvii} If we succeed in scaling up residential energy efficiency, we help produce a trifecta of energy gains as a result of creating new work skills and jobs, promoting the deployment of new technologies, and helping to reduce carbon emissions.

Individual choices also contribute to residential energy efficiency,^{xviii} and changing the mindset of energy consumers can

make a great difference.^{xix} Homeowners can elect to purchase or build an energy-efficient residence at the time of construction, or owners can choose to make energy upgrades to existing homes. Upgrades range from low-cost weather stripping and new light bulbs to deep retrofits, such as upgrading insulation and heating and cooling equipment. For renters, the process is more difficult, as incentives are split with owners, and financing poses significant challenges.

Despite the “payback” provided by energy efficiency that justifies the initial capital investment, the financing equation has yet to be solved. Energy-efficient new homes are more expensive, and installing energy-efficient equipment upgrades in existing homes can cost as much as \$50,000.^{xx} Financing is a major barrier for middle-class families seeking to make energy upgrades, and for low-income families, it can be entirely out of reach.

2014 International Energy Efficiency Scorecard



**THE U.S. RANKS # 13
OUT OF 16**

The United States — long considered an innovative and competitive world leader — has allowed other nations to surpass it.



American volunteers from Habitat for Humanity International's Global Village program attach thick blocks of insulation to the exterior walls of a house in a small town north of Budapest, Hungary.

A worldwide issue

Although this Shelter Report focuses mainly on advocating for policies to improve residential energy efficiency in the United States, the issue is an international one, and is even more dire in other countries. In Hungary, for example, about 1 million people, or more than 10 percent of the population, are unable to properly heat their homes in the winter. This is frequently due to poor construction materials and techniques that were widely used during the Communist era, along with high energy costs. The average Hungarian family spends 30 percent of its income maintaining a home, and among those living in poverty, that rises to 50 percent.

One such homeowner was Zsafia Vaali, a religious education teacher in the village of Dunakeszi, an hour north of Budapest. Divorced and raising four children, she sometimes had her gas or electricity cut off for failure to pay, and in the winter she would close off one bedroom in her house to save money on heating.

Habitat for Humanity Hungary created the Fuel Poverty Program to help families like Vaali's. Teams of volunteers, many of them paying their own way from the United States on Habitat Global Village trips, worked with Hungarian construction workers to attach large, dense blocks of Styrofoam insulation to the outside walls of her home, then stucco over the new walls. When the work was finished in 2013, Vaali's heating bill went down \$375 a year.

"It was a constant struggle before," she said. "One of my daughters used to not be able to sleep in her own room on the coldest nights of the winter. Last winter, she did not have to leave her room at all."

Since its founding in 1996, Habitat for Humanity Hungary has built 150 homes, but increasingly it puts its resources into helping families like Vaali's make their existing homes more affordable. It also has trained more than 1,500 families in energy efficiency and household management.

"The essential condition of a decent life is a decent home," said András Szekér, national director of Habitat Hungary.



© Habitat for Humanity International/Phil Klier

Hanga Vaali, age 4, plays outside her home in Dunakeszi, Hungary. Habitat for Humanity Global Village volunteers helped insulate her family home so that it would be more energy efficient. The house used to be cold and drafty in the winters, and now is more comfortable, with lower heating bills.

2

The energy burden on low-income America

Low-income households share an uneven burden of energy prices, and existing programs reach only a small percentage of affected populations. Subsequently, the initial cost of energy efficiency is beyond the means of many residents. As we will see below, solid financial tools and increased public awareness must be part of the solution.

Raising the baseline

Energy efficiency delivers many societal benefits. In addition to energy savings, the many “non-energy” benefits include improved health and safety in the home, community revitalization, pollution mitigation, and enhanced energy reliability through reduced stress on electric and natural gas supplies. And yet, energy efficiency’s potential in low-income communities has not been fully realized. This is in part due to the baseline condition of many existing properties and the limited availability of federal and state resources such as the low-income Weatherization Assistance Program.^{xxi}

Americans in distressed communities, defined under the Community Reinvestment Act based on rates of poverty, unemployment and population loss, typically live in older homes (44 percent of homes in the U.S. today were built before 1970)^{xxii}, meaning the households lack adequate insulation; have older, less energy-efficient appliances and outdated heating and cooling systems; and may have significant health and safety problems,

such as lead paint.^{xxiii} Many of these older properties are in such bad condition that they do not qualify for the Weatherization Assistance Program. Additionally, many Americans are living in poverty because of health-related problems, which can be worsened by prolonged cold spells or lengthy heat waves. These households are also more likely to use heating methods such as electric space heaters, kerosene heaters, wood stoves or gas stoves that are left on when the house is not adequately warmed, creating health and safety hazards.

The problem is not unique to those living below the federal poverty level. The Census Bureau says that in 2012, 14.7 million people had family incomes up to 1.25 times the poverty level threshold and are classified as “near poor.”^{xxiv} Many of these families live on a fixed income in aging, poorly insulated housing built before 1980. Although these families fall above the poverty level, their energy burden and lack of access to energy efficiency services are a big part of the problem of disproportionate energy burden on both the poor and “near poor” in our society.

Manufactured homes are least efficient

Prefabricated manufactured homes (also known as “mobile homes”) are the largest source of unsubsidized affordable housing, accounting for 7 percent of the housing stock in the United States, according

The most energy-efficient house in Wisconsin

Never in her wildest dreams did Sara Zugschwert think she would own her own home. “When Habitat called me to tell me I was approved, I had a pretty loud reaction,” she recalled. “I’m getting a house? Oh my God!”

But she wasn’t just getting any Habitat house. Zugschwert was the first person to move into the new Eco-Village in River Falls, Wisconsin, a community built by a visionary partnership that includes the St. Croix Valley Habitat affiliate; the city of River Falls; the University of Wisconsin, River Falls; St. Croix Institute for Sustainable Community Development; and Frisbie Architects.

Zugschwert’s home has walls that are 8 inches thick, and her roof is topped with solar panels, which supply all of the home’s electricity. “When I moved in, my monthly electric bill was \$60,” she recalled, “but then they got the solar panels hooked up, and they went down to \$34, to \$25, then negative \$10, and the bill I just got was for negative \$28.” The panels supply more power to the grid than she consumes in some months, so she gets a rolling credit, which will be applied to her utility bills when her demands on the grid increase in the winter.

“Sara has the most energy-efficient house in all of Wisconsin, based on utility bills and testing,” said Dave Engstrom, executive director of St. Croix Valley Habitat.

The Eco-Village recently completed its 14th house and is headed toward its goal of 18 homes.





Sara Zugschwert has the most energy-efficient house in Wisconsin.
Courtesy of Sara Zugschwert

to the Environmental and Energy Study Group, and provide homes for 17 million Americans. The occupants of manufactured homes are primarily low-income and living in rural areas where nearly 20 percent of the housing stock is manufactured.^{xxv} In 2009, the last year for which data are available, the median annual income for those living in manufactured homes was \$30,000, and 73 percent of the households earned less than \$50,000 annually.

The construction and standards of manufactured housing are governed by a code written by the U.S. Department of Housing and Urban Development in 1976. Before that, there were no federal standards. Today, 2 million pre-1976 manufactured homes remain, which are the most energy-inefficient form of housing and the most expensive to heat and cool. Residents in manufactured housing spend nearly twice as much on energy per square foot of living space as site-built homes.^{xxvi} Many of the pre-1976 units also pose health and safety issues. Updating this regulation is long overdue, and remedies have been proposed in recent years in federal legislation.

Vulnerability to rate increases

Another problem confronting residents of low-income communities is the impact of utility rate increases, which are at an all-time high in most parts of the United States. The Edison Electric Institute reports that, since 2000, electricity prices

have risen at an annual rate of 2.5 percent, which is above the inflation rate for the same period (1.9 percent).^{xxvii} According to the Bureau of Labor Statistics, the electricity price index hit a new high in January 2014, with the largest month-to-month increase in four years.^{xxviii} Starting in 2011, American households spent an average of \$300 annually more for electricity over a five-year period, representing the highest sustained increase since the 1970s.^{xxix} As a result, electricity is consuming a greater share of household budgets, and for Americans in distressed communities, the impact is exacerbated by rising food and health care costs.

Multifamily offers potential

One problem in low-income communities is that inadequate attention has been paid to multifamily energy upgrades, which offer significant potential for energy efficiency savings. Thirty percent of the U.S. population lives in multifamily dwellings^{xxx}, which tend to be older and generate \$18 billion in energy bills annually.^{xxxi} Studies have shown that \$3.4 billion in annual utility bills could be saved through energy efficiency upgrades in multifamily housing, and ACEEE estimates that a comprehensive strategy could reduce energy use by 15 to 30 percent, thereby averting 50 million tons of carbon emissions.^{xxxii}

Split incentives and lack of financing are key barriers

There are two main barriers to energy efficiency for low-income Americans: the “split incentive” problem and lack of financing.

Low-income Americans are more likely to rent than to own a home. According to the Joint Center for Housing Studies, 35 percent of all U.S. households — approximately 43 million people — are renters.^{xxxiii} The great majority of renters earn less than \$50,000 annually, leaving little or no room in their budget for energy upgrades. Further, tenants have less reason than homeowners to spend their own money on efficiency (beyond small measures such as weather stripping or new light bulbs), as they are less likely to live in the unit long enough to derive lasting benefits from their investment. Further, tenants in multifamily units may or may not have individual meters in their units. Meanwhile, building owners lack the incentive or motivation to make energy efficiency upgrades if tenants pay the cost of utility bills.

The challenge, therefore, is to align the incentives for building owners and tenants to invest in energy efficiency. This can be done through “green” or energy efficient leases, in which the tenant and landlord jointly pursue energy upgrades.^{xxxiv} Green building codes provide another option, though codes typically apply only to new construction, and new regulatory measures can be politically challenging.

An emerging financing mechanism is called an energy service agreement, which is a contract that uses energy efficiency as a service for which building owners pay through energy efficiency savings. Typically, there is no upfront cost, thus creating an incentive for the building owner to enter into the agreement with the utility. Energy service agreements are a “pay for performance” model, as a third party agrees to pay a building’s utility bills for a fee and guarantees energy savings over time.^{xxxv} Application of these agreements to multi-family housing poses strong opportunity for savings, and new approaches like these are needed to align incentives of all parties and spur building owners to invest in efficiency.

On-bill financing and residential property-assessed clean energy, or PACE, financing, two other options to address the split incentive problem, are discussed below.^{xxxvi}

On-bill financing

Lack of discretionary income is a major barrier for low-income Americans, who are unable to afford conventional energy upgrades in the range of \$6,000-\$7,000,^{xxxvii} let alone “deep” retrofits that can cost as much as \$50,000.^{xxxviii}

The increasing availability of on-bill financing and on-bill repayment is a promising development for residential energy upgrades. According to ACEEE, on-bill financing and on-bill repayment are loan programs that allow utility customers to invest in energy efficiency improvements and repay the cost through additional

charges on their bill, amortized over time to minimize the impact of an initially higher bill. With on-bill financing, the local utility makes the loan directly to the property owner. With on-bill repayment, a bank or other financial institution makes the loan, and the utility collects the payments on behalf of the lender.

The goal of these two mechanisms is to reach quickly a point where the energy savings cover the additional monthly charges and eventually the total utility charge is less than the pre-investment billing amount. On-bill financing has been well-received by consumers since it was first tried in Wisconsin, because it mitigates the initial cost of energy upgrades.

There are barriers, though, to making on-bill financing and on-bill repayment more widely available. State legislation may be required. Many utilities are reluctant to get into the lending business and are unfamiliar with consumer lending laws, which vary from state to state. Utilities can be resistant to changing their complicated billing systems. Up-front loan funding for the cost of the upgrades and reasonable payback terms are needed to motivate the tenant to commit to on-bill financing in a property he or she does not own. A good on-bill financing project should relieve the customer’s cash flow burden through savings from reduced energy use. But there are legal issues, such as how to prioritize the current utility bill vs. paying down the upgrade.

One solution is “bill neutrality,” meaning energy efficiency savings must be

greater than or equal to the customer’s loan payments, thus providing efficiency upgrades at no added cost. Default rates are typically lower than for other loans, as customers are more likely to make payments if they appear monthly as part of their utility bill.

For addressing low-income needs, on-bill financing can be challenging because of the need for a funding mechanism for the energy upgrades. Two energy experts, Stephen Bird and Diana Hernandez, have proposed using “systems benefits charges” that are assessed on utility bills in many states to create a fund for on-bill financing for low-income tenants.

Bird and Hernandez point out that another source could be carbon trading markets such as the Regional Greenhouse Gas Initiative or the Western Carbon Initiative, which permit carbon auction funds to be used for efficiency programs. Some states, such as New York, have “green banks” — public institutions that finance low-carbon projects — that could be used. A few examples below illustrate how on-bill financing works in practice.

New York State enacted legislation in 2011 authorizing low interest on bill loans implemented by the New York State Energy Research Authority together with local utilities. While not specifically targeting the low-income sector, the New York law has a two-tiered underwriting system, with Tier I loans subject to more traditional underwriting standards, and Tier II loans subject to lower credit requirements and utility bill payment history. The New York loans must be bill-neutral, with a

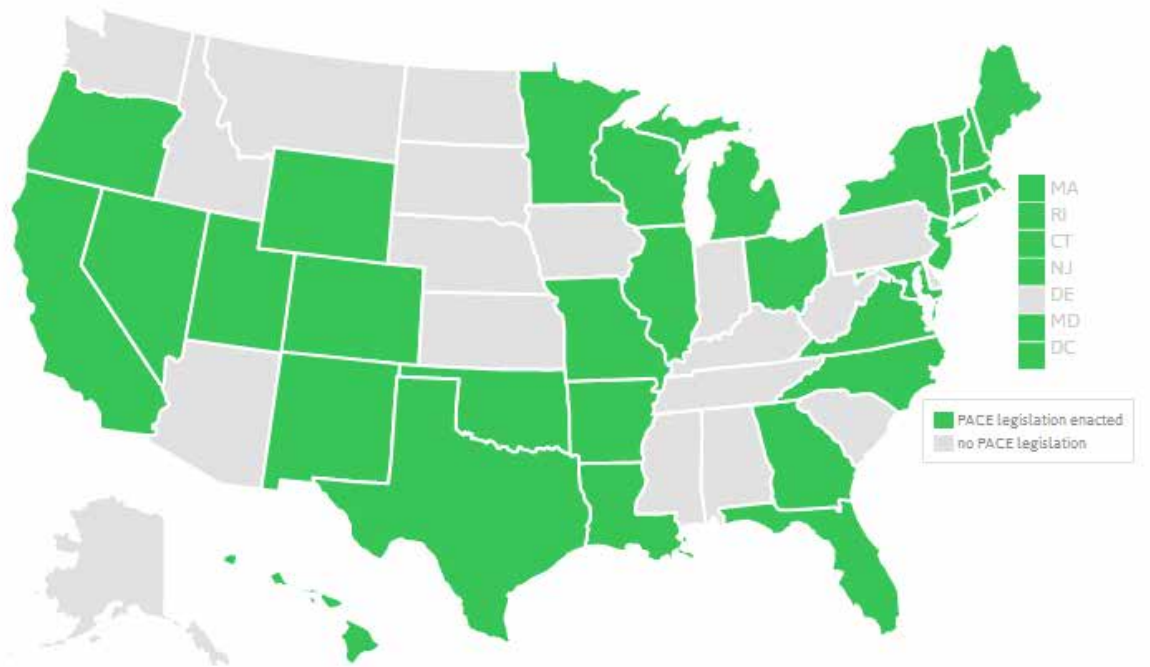
minimum loan amount of \$3,000 and a maximum of \$25,000 if the repayment period is 25 years or less. Eligible measures include insulation and air sealing, furnaces, boilers, water heaters, air conditioners, lighting fixtures, and appliances.^{xi}

In South Carolina, two utility cooperatives, Central Electric Power Cooperative Inc. and Electric Cooperatives of South Carolina, have developed a “Help My House” model program that has demonstrated the feasibility of on-bill financing.^{xii} In the South Carolina pilot, a total of 125 low-income residents received 10-year loans for efficiency improvements, provided at a 2.5 percent interest rate. The average loan amount was \$7,700. Nearly every home participating in the pilot experienced savings that exceeded or came within \$10 of their monthly loan payment, and all homes will receive savings in excess of their total loan payments (savings are averaging a reduction of 34 percent monthly in energy bills).^{xiii}

The potential of PACE

Property-assessed clean energy financing keeps the repayment obligation with the property. PACE obligations can be repaid through the property tax bill or, in some cases, the water bill. PACE programs require state enabling legislation; to date, 31 states and the District of Columbia have PACE enabling laws.^{xiiii} On-bill financing is a more flexible means of serving low-income communities, but owners of rental property might wish to increase the resale value of their property through a residential PACE loan.

The experience with residential PACE loans is more limited than on-bill financing, though residential programs are underway in California, New York and Maine.^{xliv} In the District of Columbia, a \$340,000 PACE pilot project is underway through the HOPE VI program administered by the U.S. Department of Housing and Urban Development. Units within multifamily properties are individually metered, and the tenants’ electricity bills are subsidized through the HUD utility allowance.^{xlv} Legislation was introduced in the 113th Congress to spur residential PACE loan activity.^{xlvi}



PACE programs and legislation at a glance

Source: <http://www.pacenow.org/pace-programs/#map>

Increasing public awareness

A central problem cutting across many of these efforts is the lack of public awareness around the benefits and available resources to facilitate upgrades and financing. Studies have shown that many low-income households are either unaware of existing programs, wary of getting involved with government agencies, or unwilling to take on the considerable paperwork burden of applying for weatherization or other available resources.^{xlvii}

There is an urgent need for outreach to these communities through public relations channels and networks such as community action agencies, churches, and faith-based and community-based organizations. It is clear that no breakthrough in energy efficiency will take place without new and more creative strategies to persuade households that energy efficiency is both accessible and affordable. A national “Energy Efficiency Works!” public awareness and education campaign aimed at lower-income citizens would make a tremendous difference. A well-known national figure or actor should be recruited using the model of

the Alliance to Save Energy’s campaign in the 1970s with actor Gregory Peck.^{xlviii}

Gregory Peck was the voice of “Don’t Blow It America.”

In summary, the poor quality of housing in low-income communities, vulnerability to rate increases, split incentives, inadequate financing and a lack of awareness of energy efficiency resources are all major roadblocks. These challenges

must be overcome before the “win-win” opportunities represented by energy efficiency are accessible and affordable for low-income Americans.

But as entrenched as the problems are, they are not intractable. In fact, there are great opportunities for energy efficiency to transform distressed communities by producing lasting benefits in energy savings; job creation; improved health, safety and comfort for residents; and avoided carbon emissions.



**Let's not
blow it...
America.**

1978

The Alliance mounts its first national TV public service advertising campaign. Gregory Peck promotes energy conservation by declaring "Don't Blow it America."

Source: Alliance to Save Energy. <http://www.ase.org/about/history-mission>

3

Existing federal and state resources

Effective residential efficiency resources are currently available from both the federal and state governments. The problem is that these resources are not reaching a large enough segment of distressed households. The challenge all federal and state programs face is the increasing scarcity of dollars, as human services programs compete for an ever-shrinking share of the overall budget.



Department of Energy and the Weatherization Assistance Program

The federal government is responsible for the largest residential energy program in the United States: the Weatherization Assistance Program. WAP retrofits approximately 100,000 homes annually,^{xlix} not counting funding leveraged by public and private utilities and from the Low-Income Heating Energy Assistance Program, or LIHEAP.^l WAP is an outgrowth of the oil embargo of 1973-74, and is operated today in all 50 states, the District of Columbia, Native American tribes and U.S. territories. More than 7.4 million homes have been weatherized by the program since its inception. The program is estimated by the Department of Energy to save between \$250 and \$450 annually for 20 to 30 years

in weatherized units, depending on housing type and location.^{li}

The program operates on a formula basis through state, territorial and tribal agencies that channel funding through a network of approximately 900 community action agencies, which use their own work crews. Additionally, there are approximately 100 other nonprofit agencies that provide WAP services, along with a small number of local housing agencies that do weatherization. In some states, private contractors are hired by the state agencies together with or in lieu of using community action or nonprofit agencies.

An inherent problem with WAP, however, is that the “split incentive” tilts the program in the direction of owner-occupied units, because the permission of the owner must be secured before retrofit upgrades can occur in rental units.

WAP employs more residential energy efficiency professionals than any other energy efficiency program or organization in the U.S. The program’s impact has included industrywide technical and policy resources, such as work quality specifications, training resources and professional certifications. The more than 30 weatherization training centers, in particular, have made an impact by teaching whole-house-building science, and the training is widely recognized as the best state-of-the-art training for the residential energy efficiency workforce.

Dr. Kathleen Hogan, deputy assistant secretary for energy efficiency, reflects on importance of weatherization

“Weatherization is a key program for low-income seniors and families, and has benefited more than 6.4 million households over the lifetime of the program. Energy savings and creating new, marketable skills are the hallmark of Weatherization. The department is proud of the recent successes of the program, including the 1.4 million homes that were weatherized between April of 2009 and September of 2013. That success is a huge credit to those responsible for implementing the program at the state and local levels, as is the great improvement in WAP program accountability and quality standards over the past several years. Because of the continued pressure on the federal budget, what is needed now for Weatherization is greater involvement from other government and nongovernment organizations who can play a key role in supplementing the federal investment in the program. The administration remains fully committed to supporting Weatherization and other energy-saving programs benefiting low-income Americans, such as the DOE Better Buildings Neighborhood Program, which has helped more than 40 competitively selected state and local governments work with community-based organizations to develop sustainable programs that upgrade the energy efficiency of homes.”



Dr. Kathleen Hogan, deputy assistant secretary for energy efficiency in the U.S. Department of Energy's Office of Energy Efficiency and Renewable Energy.

Under the American Reinvestment and Recovery Act, or ARRA, enacted in 2009 as a stimulus program during the recession, \$5 billion was allocated to WAP and more than 15,000 new jobs were created. Between February 2009 and September 2013, more than 1.4 million homes were weatherized, demonstrating the surge impact of the program when funding levels are high. Unfortunately, since the end of the ARRA program, federal funding has diminished significantly and today remains at a minimum level — \$174.5 million in FY2014 — needed to keep WAP functioning in all states and territories.^{lii}

As significant as the achievements of the weatherization program have been, especially considering the wide fluctuations

in federal funding over the past five years, there remain many areas where the programmatic results have been disappointing. There was an expectation that the jobs created through the ARRA funding would carry over into jobs in the residential market after the recovery act was over, and this did not happen. The continuing slow growth of the economy, and the lack of available cash flow for homeowners, blocked growth in the residential market, and consequently most workers trained in the ARRA-funded training centers did not go on to jobs in the residential sector.

This development underscores the need for more innovative approaches to the low-income residential market, such as wider deployment of on-bill financing and other methods that provide stronger markets beyond the limited base of households that receive weatherization assistance. Stronger consideration should be given to relying on the expertise of private-sector resources and nonprofits. There is strong interest and support for a provision broadening the weatherization program to include more nonprofits. Given that WAP results have been inconsistent throughout the country, bringing in new providers and strategies could improve the program's impact.

This provision, the Weatherization Innovation Pilot Program, was funded through the Department of Energy's competitive grants in fiscal year 2010. Habitat was one of the 16 WIPP grantees that were nonprofits or state or local entities.^{liii} A bill to reauthorize WAP and the State Energy Program for the next five years was introduced in the

113th Congress and contains a provision to make the innovative competitive grants initiative permanent.^{liv} If the bill is enacted, and robust enough appropriations for the measure follow, Habitat and other multistate nonprofits engaged in energy efficiency will be key future partners in the nation's largest residential energy efficiency program.

In addition to the Weatherization Assistance Program, Department of Energy resources include the Residential Buildings Integration Program, which has a number of smaller programs, including the Better Buildings Neighborhood Program.^{lv} Most of the current programs are primarily oriented to research and development or aim to provide industry best practices, such as the Home Performance with Energy Star Program.



Department of Housing and Urban Development

The Department of Housing and Urban Development administers an Energy Action Plan that seeks to improve en-

ergy efficiency in HUD-assisted housing. Improving energy efficiency in government-assisted housing makes sense for the residents and the taxpayers: approximately 5 percent of Americans live in subsidized housing, and HUD's annual energy bill is \$4 billion.^{lvi} Reducing HUD's energy bill would free up funding that could be used for other capital improvements benefiting low-income residents of assisted housing.

An interesting option for public housing and HUD-subsidized housing involves using energy service or energy savings companies (frequently referred to as ESCOs) to implement energy savings performance contracts. The ESCO designs, installs and maintains energy efficiency solutions for the project, with the savings in energy used to pay back the cost of the ESCO, typically over a five- to 15-year period. If the project does not produce energy savings, the ESCO is typically responsible for the project costs.

A good example of what can be accomplished involves an ESCO (in this case Siemens Building Technologies) working with the Rochester (New York) Housing Authority to implement energy performance improvements in 3,200 public housing units. The New York State Energy Research and Investment Authority provided \$571,000 toward a total project cost of \$6.5 million. Annual guaranteed energy savings were \$630,000, and the Housing Authority will realize a profit as soon as the initial investment cost is repaid. Improve-

ments in public housing included new boilers, insulation, new refrigeration equipment, natural gas dryers, efficient lighting and low-flow toilets.^{lvii} Public housing, as the Rochester example demonstrates, is a significant source of efficiency savings; 1.2 million households — 5 percent of Americans — live in public housing.

Low-income housing tax credits

The low-income housing tax credit is an indirect federal subsidy through HUD that is used to help finance the development of affordable rental housing for low-income households in underserved communities. It is the largest affordable rental housing finance program, having provided financing for more than 2.6 million affordable rental units.^{lviii} The program can be a driver for energy efficiency in low-income housing if there are "green" selection criteria for the projects.

Under the program, the tax credits go to the developers of qualified projects, and the developers sell the credits to investors to raise capital for the projects. State housing agencies then develop "Qualified Allocation Plans" to meet the affordable housing needs of distressed communities. The program is an example of public-private partnerships, as projects are built by private investors who meet the criteria for affordable housing, and should include selection criteria such as energy efficiency.^{lix}



Department of Agriculture

Rural energy efficiency is also under-resourced. According to the Housing Assistance Council, approximately 8 million Americans in nonmetropolitan areas live in poverty.^{lx} The U.S. Department of Agriculture is very active in promoting rural energy efficiency through the Rural Energy for America Program. In October 2014, USDA announced \$540 million in REAP funding for 540 energy projects. Under this initiative, rural borrowers will receive assistance in paying for energy efficiency upgrades and converting to renewable energy sources, with the government loans offsetting the upfront cost of the energy improvements.

States are leading the way

U.S. Supreme Court Justice Louis Brandeis once referred to the states as "laboratories of democracy^{lxi}," and in fact the states have proved to be an ideal laboratory for residential energy efficiency, as in so many other areas. Many states have adopted policies that exceed federal programs as far as incentives for greater investment in energy

efficiency, and many have adopted “lead by example” programs for retrofitting state buildings. The most effective state initiatives may be the energy efficiency resource standards, commonly referred to as EERS. These resource standards require that energy providers in a given state meet a specific portion of their electricity demand through energy efficiency (various states also have natural gas utility energy efficiency programs). Twenty-five states have efficiency resource standards that require that a portion of electricity demand be met using energy efficiency within a particular time frame.^{lxiii} Energy efficiency can also be included within a State Renewable Portfolio Standard or Alternative Energy Performance Standard, which requires a portion of power generation be met by renewable and, in some cases, other qualifying sources (in which case energy efficiency is eligible).

Most states have used utility ratepayer programs as an effective means of deploying low-income energy efficiency. These programs also serve other sectors, such as commercial, industrial and public institutions. Utilities, prompted by local regulators and legislators, have recognized the role played by efficiency in saving customers money for the past 35 years, and ratepayer-funded programs have produced significant energy benefits and job growth.^{lxiii} State regulations provide utility incentives, and, since utility deregulation in the 1990s, some states have used non-utility organizations (third-party

administrators) to administer ratepayer-funded efficiency programs in several states. Low-income rate subsidies have been used to fund low-income programs, although a recent study by ACEEE found a low participation rate in these programs by low-income households. The ACEEE study released in the summer of 2014 called for “targeted messaging” to persuade low-income customers to participate.^{lxiv} Some states have set long-term energy savings goals through their utility commissions, focusing on ratepayer-funded programs.

A number of states have public benefits funds for energy efficiency (sometimes called “systems benefits charges” as discussed above), which are utility surcharges used by states for energy efficiency projects (such as on-bill financing), and many states use these charges to fund their EERS or similar policies. Funds are typically created by levying a small surcharge on customers’ electricity rates. Another state-level initiative that does not target low-income communities is the use of building codes to establish energy efficiency standards for residential



Morguefile

Exchanging old light bulbs for compact fluorescent or LED lights is one simple way to improve energy efficiency.



Blowing insulation in Philadelphia, Pennsylvania.

buildings, thereby locking in the energy savings at the time of new construction or renovation.^{lxv} Additionally, a number of states have adopted state appliance standards, setting minimum energy efficiency levels for appliances and other energy-consuming products and typically prohibiting the sale of less efficient models.^{lxvi}

Several states in particular are leading the way.

New York has long been a leader in residential energy efficiency through its state energy office, the New York State Energy Research and Development Administration, or NYSERDA. NYSERDA has many programs that help New Yorkers reduce energy consumption in their homes, most notably the “EmPower” program, which has provided more than 75,000 income-eligible New Yorkers with improved insulation, upgrades to lighting, and replacement of inefficient refrigerators and freezers, all at no cost to participants.^{lxvii} Additional incentives are available to low-income New York customers through Assisted Home Performance with ENERGY STAR and Assisted New York ENERGY STAR Homes.^{lxviii} New York State has also recently announced the initial transactions of the New York Green Bank. The bank is a \$1 billion program designed to accelerate clean energy projects. It provides a business model for encouraging investors to enter the clean energy market.

Efficiency Maine’s residential programs support residents with energy improvements ranging from lighting updates to whole-house retrofits. Rebates are available for Maine residents upgrading to qualified heat pump water heaters and other home insulation or heating equipment through the state’s Water Heater Rebate Program and the Maine Home Energy Savings Programs. Homeowners can get up to \$1,500 in incentives toward improving the efficiency of their home, and can finance energy efficiency projects through state loan programs.^{lxix}

Efficiency Vermont has long been a leader in energy efficiency programs, and President Obama and the Wall Street Journal have recognized Vermont’s leadership in all aspects of efficiency. Vermont’s programs do more than just supplement weatherization, achieving widespread energy savings at little cost. One initiative in Vermont works with manufacturers and retailers to lower the cost of qualifying efficient light bulbs, providing consumers and businesses with discounts at the point of sale without going through the process of rebate forms and reimbursements.

The California Energy Commission’s energy efficiency standards have saved Californians more than \$74 billion on their electricity bills since 1977. The success of California’s standards and other efficiency initiatives are major factors in the state’s keeping its per capita electricity use flat over the past 40 years.^{lxxi}

Social impact bonds

A recent financing development at the state level has been the emergence of “social impact bonds,” a tool to enable state governments to pay for specific programs that deliver quantifiable results. The concept originated in the United Kingdom and has been used on a small scale in the United States through government and foundation grant programs. The potential uses extend well beyond energy, and experience with energy-related projects is limited. With a social impact bond, the government sets a specific outcome that it wants achieved, such as a 20 percent increase in the number of weatherized housing units in the state, and the state agrees to pay a third-party organization only if the organization accomplishes the outcome.^{lxxii} This concept has been referred to as “pay for success” financing.^{lxxiii}

The mechanics for social impact bonds are complicated,^{lxxiv} but the concept is a potentially powerful tool to expand services such as energy efficiency to underserved communities, particularly at a time of shrinking government budgets and increasingly resource-conscious state governments.

4

Going beyond the financial benefits

As discussed previously, most residents in low-income communities live in older homes that were built before energy performance standards existed. Many older homes have little insulation, contain single-pane windows and use outdated heating and cooling equipment. Older appliances and incandescent lighting also contribute to greater electricity use. Energy efficiency in these households produces multiple benefits, the largest being the ongoing energy savings, which last between 20 and 30 years after upgrades are installed.^{lxxv}

There are numerous co-benefits of energy efficiency.^{lxxvi} Energy upgrades for households in underserved communities can improve health, safety and job opportunities and reduce carbon emissions.

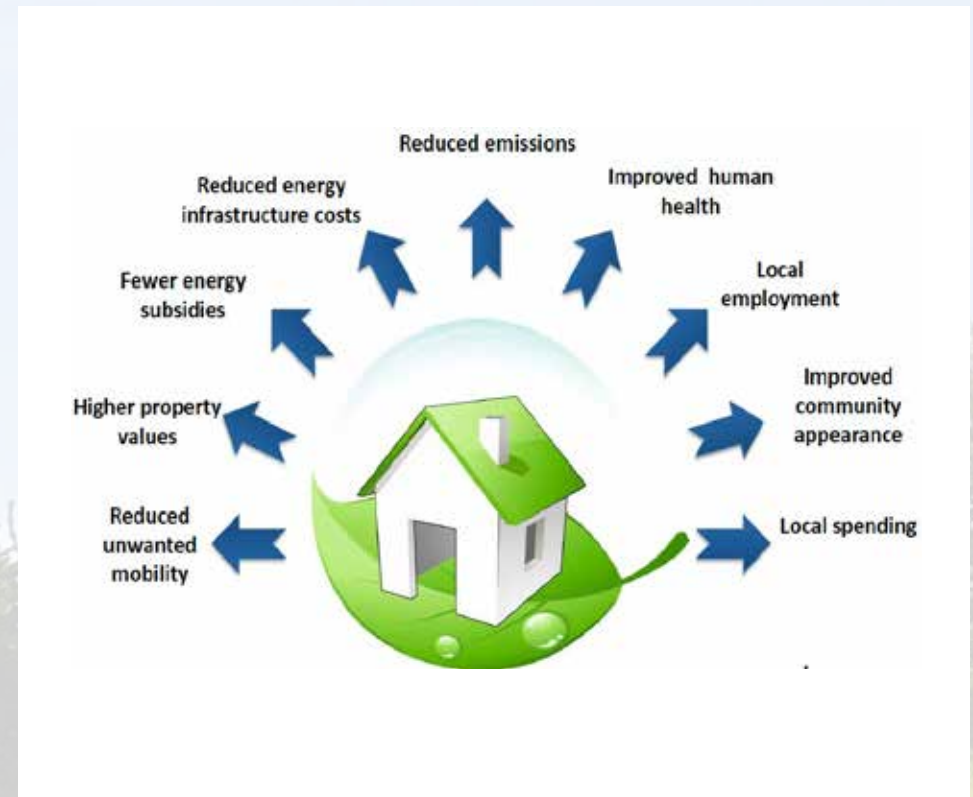
Health

Energy efficiency retrofits provide an opportunity — in many instances the only opportunity — for trained professionals to enter a home and identify health and safety problems that can become life-threatening, such as carbon monoxide or fire hazards. Trained energy efficiency professionals can also identify other issues relating to mold and moisture (as seen through infrared cameras used in energy retrofits), lead paint, and radon.

Americans in low-income communities have a much higher than average incidence of asthma and respiratory problems that are frequently linked to

issues with indoor air quality. Studies have demonstrated that residents in homes with good ventilation are less likely to suffer from cardiac and pulmonary ailments that are aggravated by poor indoor air quality.^{lxxvii} An American Medical Association study found that indoor air quality problems result in \$15

billion in productivity losses each year, including missed workdays.^{lxxviii} Beyond physical health, studies in the United Kingdom have shown that mental health is also improved by installation of energy efficiency measures in residential buildings, with tenants reporting that anxiety or depression fell by 50 percent.^{lxxix}



This chart^{lxxx} depicts the many co-benefits of energy efficiency.

Enterprise Green Communities shows benefits of green building

Green construction helps reduce housing costs and improves the quality of the building experience for developers, residents and maintenance staff. Since 2004, Enterprise Green Communities has helped bring the health, economic and environmental benefits of green building to low-income communities nationwide. Enterprise's cornerstone, the Enterprise Green Communities Criteria, is the first national framework of comprehensive green building guidelines designed to address the needs of all construction types – from single-family homes to towering apartment buildings. Today, the Green Communities Criteria are referenced in 21 states and seven major cities.

The benefits of the criteria extend beyond reduced resource use. The criteria have a wide range of standards, from carpet location and building ventilation to active design principles that blend together architecture and urban planning to make daily physical activity and healthy foods both accessible and inviting, thus ensuring that green criteria buildings aren't just planet-friendly but people-friendly too.

A good example of Enterprise's work and the ways that green construction and well-being can fit together is Seattle's Breathe Easy Homes, located within Seattle's High Point Neighborhood, a 120-acre mixed development. Breathe Easy Homes is a housing development of mostly single-family homes built with the express purpose of improving the well-being of residents with asthma. The homes were designed within Green Communities Criteria standards to reduce exposure to indoor allergens and irritants that are known to contribute to the development and exacerbation of asthma. The result was housing that was more energy- and water-efficient, and a 40 percent increase in the number of asthma-free residents. The homes helped residents breathe easier financially and physically.



The Westphall family relaxes in their Enterprise Green Communities Criteria-certified apartment complex in Spokane, Washington.

Courtesy of Enterprise Community Partners.

Economic growth

Another co-benefit of energy efficiency is economic growth. Energy efficiency upgrades can lead to higher property valuation and tax revenues and potentially lower government outlays on programs such as the Low-Income Energy Heating Assistance Program or utility energy subsidies.^{lxxxix} Saving on energy bills also means having additional disposable income to spend in the community. Energy efficiency can also lead to jobs.

One example is Rod Williams, who started his career on a weatherization crew in Washington State, learning new, marketable skills. When the 2009 American Reinvestment and Recovery Act brought new opportunities, Williams was ready to act. Always wanting to start his own business, Williams started a new weatherization company and hired two dozen employees. After several years, Williams moved into the residential efficiency market, which became the foundation for

his business.^{lxxxii} He has since turned the business over to his daughter to manage in Washington, Oregon and Alaska. Williams and his daughter spoke at a 2012 White House event discussing the jobs created by the weatherization supply chain.

Community reinvestment

In addition to better health and economic growth, energy efficiency can become part of community reinvestment. Take for example Murray City, a small town in southwestern Ohio, where 75 percent of the homes were weatherized, which in turn leveraged business resources, including utility matching funds, for construction of a community center, parks and other community projects.^{lxxxiii} Community organizers played a big role in signing up residences for weatherization and recruiting businesses to participate.

There are many benefits beyond energy savings, and more can be done to systematically measure these co-benefits. They often are not considered when an energy efficiency program is evaluated to determine whether it is cost-effective. Typical energy efficiency evaluations only compare utility bill reductions to how much money was spent on the program. This limitation significantly undervalues the benefits of energy efficiency. Oak Ridge National Laboratories is one institution seeking to address this. In a pilot project, teams are installing measurement equipment for carbon monoxide, radon, indoor air quality and other measures.



Washington Gov. Jay Inslee (right) congratulates Rod Williams on the weatherization company he started in 2009. The company, now run by Williams' daughter, serves the residential efficiency market in Washington, Oregon and Alaska.

Caption:
Courtesy of

Courtesy of Rod Williams

Homes will be tested before and after weatherization for health and energy outcomes. It would be a great step forward if all energy efficiency investment programs were evaluated to include these non-energy benefits.



Mason Hanson, field superintendent for Kaw Valley Habitat for Humanity in Kansas City, Kansas, now Heartland Habitat for Humanity, explains the benefits of using insulated concrete forms, or ICF, blocks on houses built by the affiliate. The blocks are energy-efficient, saving homeowners money on their utility bills, and houses built with the blocks are considered safer against tornadoes than those built with wooden two-by-fours.

5

Energy efficiency
in the 21st century

Through innovation, energy efficiency can produce benefits that exceed just energy savings. In this chapter, let's expand our thinking about energy efficiency and consider, as Albert Einstein observed, that "imagination is everything. It is the preview of life's coming attractions."^{lxxxiv} We will look at developments already underway, along with future possibilities, including technology advances that could benefit low-income communities.

Public-private partnerships

In a complex industry, effective partnerships are key to leveraging resources and expertise. In 2010, for example, Baltimore, Maryland, received a grant from the Living Cities Foundation to increase coordination and build a network so that eligible clients deferred from weatherization could receive health and safety services from partner organizations while waiting for weatherization services.^{lxxxv} This led to the establishment of Leading Innovation for a Green & Healthy Tomorrow, a partnership of government, nonprofit and private-sector organizations that coordinate resources to combine energy, health and safety interventions in homes.^{lxxxvi} Services include asthma reduction, lead paint abatement, injury prevention and home safety modifications.^{lxxxvii}

Ultimately, Baltimore Housing reorganized its services into a Division of Green, Healthy, and Sustainable Homes,

Reducing vulnerability in Eastern Europe through energy efficiency

Large, Soviet-style block housing built during the Cold War continues to dominate the landscape of Eastern Europe and Western Asia. Emphasizing quantity over quality, these quickly constructed communal structures were never properly insulated. Energy was previously free, and now costs are rising rapidly. Subsequently, many low-income residents are left vulnerable to the increased cost of heating their homes, in addition to adverse side effects that harm their health.

To respond to these challenges, Habitat for Humanity – in partnership with USAID – is implementing the Residential Energy Efficiency for Low-Income Households project, which seeks to demonstrate how the private sector, public sector and communities can work together to leverage resources and promote investments to retrofit individual apartments and common spaces for energy efficiency. One objective of REELIH is to align market actors to provide services for individual residents as well as for homeowners' associations.

In both Armenia and Bosnia and Herzegovina, Habitat plays a market facilitator role by engaging various actors, including:

- Homeowners' associations — to improve governance, management, decision-making and negotiation to support improvements for individual units and common spaces.
- Financial institutions — to support the development of affordable loans and financial products.
- Maintenance and construction companies — to participate in retrofits and prevent further deterioration.
- Governments — to improve policies and subsidy allocations that can best trigger investments.

In addition to engaging these actors, Habitat will create a regional platform to support knowledge exchange and promote research to inform ongoing reforms, policies and regional financing mechanisms.

which oversees weatherization, housing rehabilitation and lead abatement. This move also realigned energy upgrades with critical health and safety investments. Upgrading the data collection

and management support necessary to achieve the integration of services was an important outcome in the Baltimore initiative.^{lxxxviii}

Another example of an innovative public-private partnership is the Energy Smart program developed by the New Orleans City Council and administered by Entergy New Orleans. This program brought a unique approach to combining residential retrofits in traditionally underserved communities with financing assistance and, to develop a green workforce, with a training and certification program administered by a local community college. The Energy Smart program emphasized public relations and marketing of services to potential clients as the pathway to influencing consumer decision-making and behavior change, along with a means of leveraging new partnerships with nongovernmental, faith-based and community-based organizations.

In support of the need for financing in New Orleans, the Southeast Energy Efficiency Alliance funded a “one-stop shop” for residents to identify contractors for both residential audits and retrofits, in addition to identifying financing options for any energy efficiency program. A partnership was formed with a community-based organization to identify neighborhoods to initiate the Energy Smart program, with the one-stop shop helping residents navigate the multiple steps needed for home retrofits by aligning the energy audit, financial assessment, construction process and other steps to completion. Other partners, including Conservation Services Group, Green Coast Enterprises and Henry Consulting, provided seed funding for homeowners to use in leveraging bank loans. The Energy Smart program was uniquely

successful because of the broad range of public- and private-sector partners serving the needs of distressed communities in New Orleans.

A further example of the private sector taking the lead is an innovative nonprofit organization called Grid Alternatives, which is the largest private installer of solar panels on low-income housing. The program uses volunteers (over 10,000 to date) and job trainees (who receive marketable training as solar panel installers), and has recently completed a project involving 10 new Habitat for Humanity homes in Washington, D.C. The project received a \$2 million grant from Wells Fargo and donations from a number of solar manufacturers, including SunEdison, SunPower and Enphase.^{lxxxix} Grid Alternatives, which started in California, says the homes it outfits with PV panels achieve an average of an 80 percent reduction in energy bills. Like Habitat, Grid Alternatives counts on volunteers and cash and equipment donations from solar panel and inverter manufacturers.^{xc}

Integrating technologies

Energy efficiency also has an important link to future innovations in technology that can benefit low-income communities, including the fast-growing area of aging in place. “Healthy Homes” can serve as a bridge to “Smart Homes” and aging in place, which will enable seniors to safely remain in their own homes with electronic monitoring of their health. Emerging interconnection of computing devices with the existing Internet structure,^{xci} will allow connectivity of devices, applications

and services such as heart-monitoring implants, built-in sensors, or programs to remind seniors when to take their medication and physician alerts when prescription refills are needed.

These technology developments could build on what is already happening in the Weatherization Assistance Program to enable seniors to safely remain in their homes while their medical and safety status is remotely monitored, along with the energy management of their unit. Current examples of energy monitoring systems include smart thermostat systems and washers and dryers that use Wi-Fi for remote monitoring.^{xcii} ABI research estimates that more than 30 billion devices will be wirelessly connected by 2020.^{xciii} Energy efficiency can thus be a vanguard for technology innovation in households, especially for an aging population that can overwhelm existing care facilities.^{xciv}

Engaging the financial community

One of the most interesting new opportunities involves engaging the banking community to invest in the potential savings of energy efficiency. The Deutsche Bank/Living Cities program has developed innovative approaches to address the lack of capital needed up front for upgrades, which brings about lasting changes in the market. The key is the ability of banks to underwrite against energy efficiency savings potential. Conventional lenders point to the lack of data, or third-party verification practices to measure and evaluate energy savings.

Several banks have shown a willingness to partner, but the proponents of residential energy efficiency must demonstrate that the savings are attributable to the energy efficiency investments.^{xv} Directly engaging with banks will require a sufficient scale of investment, along with financial performance data needed for banks to ascertain the performance risk of projects. Nonprofits and philanthropic organizations are also needed to support the process of “proving the concept” of efficiency upgrades as a standard element of lending practice.

These three opportunities — partnerships, technology and new financial tools — are just a few areas where the energy efficiency sector has room to grow. The challenge is to build on some of these innovative examples and create models and methodologies to help achieve scale.

Delivering the benefits of green building to all ►



We see advances in buildings all around us. We’ve built bigger and higher and stronger and smarter. We’ve improved form and function, size and shape. But we’ve learned that our buildings are so much more than their dimensions. Buildings, especially our homes, represent our values, our inspiration and aspirations, and our very character. In that respect, buildings are like bridges to something better — bridges to the future.

Nowhere is that more evident than in our nation’s affordable housing, where the benefits of green building best practices are needed most. That’s why the green building community and nonprofit groups such as the U.S. Green Building Council are working diligently to deliver the benefits of efficient, healthy buildings to the affordable housing market.

The challenges we face are clear and persistent. Financial, technical and policy barriers often stifle the uptake of affordable green housing. Yet we know this sector has the most to gain. For example, low-income households spend on average 19.5 percent of their annual income on home energy costs, while the average for median-income households is just 4.6 percent, according to one report. High utility bills can be just one part of the issue for these households. Many also contend with health issues associated with asthma, allergies and other chronic problems that are often exacerbated by exposure to harmful materials in their homes. Green and affordable housing helps address these challenges and advance better homes that we all deserve.

At USGBC, where one of our core values is green building for all people, we have long sought to develop solutions and partnerships that accelerate affordable green homes. That work is best reflected in how we’ve been able to support green projects through our LEED Green Building Rating System, a voluntary leadership benchmark for green building. During 2011, 60 percent of the homes certified through the LEED for Homes program were identified as affordable projects, and nearly 40 percent of all the LEED-certified housing units in existence today provide affordable housing. Third-party-verified green building rating systems such as LEED and Enterprise’s Green Communities program help move the market by motivating affordable housing developers to design and build green homes that are more energy- and water-efficient, that have healthier indoor air, that reduce waste and that save homeowners and tenants money.

USGBC is proud to be part of this growing and vibrant green affordable housing community, and is dedicated to showing how green buildings can enable healthy homes that cost less to operate while also reducing the strain on natural resources and the environment.



The 27 homes in this focus neighborhood of Habitat for Humanity Saint Louis, including those built by the affiliate, were all built to meet LEED Platinum standards, the highest level of certification for the Leadership in Energy and Environmental Design program.

© Habitat for Humanity International/Kevin Gobble

6

Conclusion and recommendations

Accessible and affordable energy efficiency can be transformative for low-income communities. The energy burden is widespread, and too many people are forced to choose between paying their energy bills to heat and cool their homes or paying for medicine, food and other necessities. Excellent federal, state and utility resources exist to help underserved communities with their energy needs, but these programs do not reach a sufficient number of low-income households.

There are significant barriers to bringing efficiency to all income levels. The split incentive and financing issues have been problematic, but developments involving on-bill financing, residential PACE programs and engaging the banking community to invest based on energy savings potential provide new approaches to removing longstanding barriers to low-income energy efficiency. Greater awareness of the opportunities for low-income energy efficiency is needed across the board. At its foundation, energy efficiency, with the proper strategies and sufficient stakeholder engagement, can bring energy savings and new jobs to low-income communities while significantly improving the environment.

Energy efficiency is our greatest energy resource and has only begun to address the challenges and opportunities of residential efficiency in low-income communities. With a commitment to innovation and to expanding our thinking about how efficiency can be deployed, we can achieve the goal of making America's first fuel the bedrock for energy savings and new economic opportunities in low-income communities.

We recommend the following to benefit residential energy efficiency generally and low-income communities in particular:

Innovations focused on the immediate needs of distressed communities:

- **MAKE FINANCING AVAILABLE:**

The key is to enable all measures that help residents handle the “cash flow” requirements of energy efficiency upgrades. One effective way to achieve that is by supporting funding and incentives for the adoption of utility-sponsored “on-bill financing” (or “on-bill payment”), which offers the greatest near-term potential for low-income households to take advantage of energy efficiency (and offers utilities repayment through the meter as part of the customer's regular bill). States should consider social impact bonds as a means of financing energy efficiency services to distressed communities. Stakeholders should support enabling legislation for on-bill financing, and other financing mechanisms, such as green leases and energy services agreements, should be encouraged.

- **EXPAND PUBLIC-PRIVATE**

PARTNERSHIPS: Collaborations with the private sector, including foundations and NGOs, should build on models such as those in Baltimore and New Orleans and seek to combine energy, health and housing services to benefit distressed communities.

- **IMPLEMENT ENERGY EFFICIENCY IN MANUFACTURED HOUSING:**

Update the HUD Code and provide incentives to replace all mobile homes constructed before 1976. There are

6.9 million mobile homes in America. Most occupants of mobile homes have low incomes, and many “manufactured homes” (including all manufactured before 1976) are energy-inefficient and unsafe for their occupants.

- **TARGET ENERGY EFFICIENCY IN MULTIFAMILY AND PUBLIC HOUSING:**

Multifamily and public housing present opportunities for big returns from investments in energy efficiency.

- **PREPARE LOW-INCOME COMMUNITIES FOR NATURAL DISASTERS:**

Support studies on the impact of extreme weather events such as Hurricane Sandy on low-income communities and ways low-income housing is considered in the development of national strategies on the resiliency and reliability of the power grid. Low-income residents experience disproportionate losses from extended power outages and property destruction from extreme weather events, and their needs should be a prominent part of national planning for grid-related emergencies. Make energy efficiency an integral part of rebuilding after natural disasters.

Broader reforms:

- **SUPPORT ENACTMENT OF ENERGY EFFICIENCY FINANCING PROGRAMS**

such as Property Assessed Clean Energy, or residential PACE loans, which are financial tools

that help owners finance energy-efficiency and renewable energy projects for their properties. Under a residential PACE program, a local government helps homeowners finance the initial cost of energy improvements. The property owner repays the cost over 20 years, usually through an assessment on the property tax, which is tied to the property for repayment. Stakeholders should support PACE-enabling legislation.

- **ALLOW HOME BUYERS TO RECEIVE A LARGER MORTGAGE FOR PURCHASING AN ENERGY-EFFICIENT HOME:** Enact legislation such as the SAVE Act for energy-efficient mortgages, which enables buyers to get credit for energy-efficient features when they apply for a mortgage, thereby qualifying for a larger mortgage, and require energy-efficient improvements to be included in all home appraisals for purchase or refinancing.
- **SUPPORT “ENERGY PERFORMANCE LABELING” STRATEGIES:** Strategies such as building labeling (at the time of purchase) and labeling for all energy-related products increase the value of home energy upgrades.
- **SUPPORT STATE PROGRAMS TO STRENGTHEN BUILDING CODES,** including compliance and enforcement for all types of residential buildings.

- **ENCOURAGE “ENERGY USE DISCLOSURE” TO ALL HOMEBUYERS:** Allowing homebuyers to see the energy bills for the previous five years is currently standard practice in Europe. Support incentives for the installation of “smart meters” that enable residents to manage their energy usage, such as by using dishwashers and washing machines during off-peak hours.

Support greater public awareness:

- **IMPLEMENT PUBLIC INFORMATION CAMPAIGNS:** Provide greater awareness of energy-efficient products through federal, state and local public information and awareness campaigns and public education. Promote programs that emphasize energy efficiency as a behavioral issue.
- **LAUNCH A NATIONAL ENERGY EFFICIENCY CAMPAIGN:** There is a need for a national energy efficiency campaign on the theme of “Energy Efficiency Works.” This campaign would target residents of distressed communities who are unaware of energy efficiency resources and would be based on the Alliance to Save Energy’s successful “Don’t Blow It America” campaign featuring Gregory Peck, which drew nationwide attention to energy efficiency 35 years ago. The campaign should be run in conjunction with community-based organizations.

Bolster existing resources:

- **CREATE A COMPETITIVE, FEDERAL, RESIDENTIAL ENERGY EFFICIENCY RETROFIT PROGRAM** for nonprofits to provide energy-efficient retrofits to homes of low-income families.
- **EXPAND EFFORTS TO BUILD STRONGER BIPARTISAN SUPPORT FOR REFORM AND DEPLOYMENT OF PROGRAMS** including the State Energy Program; the Weatherization Assistance Program, or WAP; and the Low-Income Heating Assistance Program, or LIHEAP. Weatherization provides \$250 to \$450 annually to program recipients in energy savings, on average, and the savings continue for 20 years after the upgrade. LIHEAP has provided \$2.5 billion to weatherization during the past 30 years. Stakeholder support is needed for enlarging the scope of weatherization to address health and safety issues in the home and for bringing more nonprofit organizations into the program.
- **SUPPORT THE PERMANENT EXTENSION OF THE LOW-INCOME HOUSING TAX CREDIT** and the extension of provisions in the tax code for the construction of new energy-efficient rental homes, along with incentives for retrofitting existing residences.

END NOTES

ⁱ Energy efficiency has been defined by Lawrence Berkeley National Laboratory as “using less energy to provide the same or greater service,” eetd.lbl.gov/ee/ee-1.html.

ⁱⁱ Families who pay more than 10 percent of their total incomes for energy needs may be said to be suffering from “fuel poverty.” Brenda Boardman, professor emerita at Oxford University, coined the term. The term “energy poverty” has been used to define lack of access to energy services. Boardman, Brenda, “Fuel Poverty: From Cold Homes to Affordable Warmth,” Belhaven Press, London 1991. This report will use the term “fuel poverty.”

ⁱⁱⁱ census.gov/hhes/www/poverty/about/overview/.

^{iv} “Low-income households typically spend 17% of their total annual income on energy, compared with just 4% for other households” waptac.org/data/files/web-site_docs/briefing_book/wap_programoverview_final.pdf.

^v eia.gov/todayinenergy/detail.cfm?id=12251.

^{vi} Mims, Bell, and Doig, “Assessing the Electric Productivity Gap,” quoted on page 3 of Alliance to Save Energy Commission on National Energy Efficiency Policy’s “The History of Energy Efficiency” ase.org/sites/ase.org/files/resources/Media%20browser/ee_commission_history_report_2-1-13.pdf.

^{vii} Alliance to Save Energy Commission on National Energy Efficiency Policy, “Doubling U.S. Energy Productivity by 2030,” ase.org/sites/ase.org/files/full_commission_report.pdf.

^{viii} livingcities.org/blog/32-deutsche-bank-living-cities-data-study-released-the-benefits-of-energy-efficiency-in-multifamily-affordable-housing.

^{ix} aceee.org/press/2008/05/invisible-us-energy-efficiency-boom-aceee-report-finds-u.

^x Energy efficiency has been referred to variously as the “fifth fuel” or, as the American Council for an Energy-Efficient Economy refers to it, the “first fuel.” aceee.org/about/programs/utilities.

^{xi} Yergin, Daniel, “The Quest: Energy, Security, and the Remaking of the Modern World,” Penguin Press, 1981, page 614.

^{xii} Yergin, op. cit., page 625.

^{xiii} ase.org/resources/energy-efficiency-americas-greatest-energy-resource.

^{xiv} aceee.org/press/2014/07/germany-italy-eu-china-and-france.

^{xv} unece.org/fileadmin/DAM/hlm/documents/Publications/good.practices.ee.housing.pdf.

^{xvi} ccc.unc.edu/contentitems/home-energy-efficiency-and-mortgage-risks-executive-summary/; www1.eere.energy.gov/library/pdfs/48098_weatherization_assisprog_fsr4.pdf; epa.gov/greenbuilding/pubs/gbstats.pdf.

^{xvii} “Energy Efficiency: A Compelling Global Resource,” McKinsey & Co., Sustainability and Resource Productivity, ©2010 McKinsey & Co.

^{xviii} See discussion of the ACEEE’s Behavior & Human Dimensions Program for consumer decision-making on energy efficiency, aceee.org/about/programs/behavior.

^{xix} “Understanding human behavior is critical for achieving the goals of energy efficiency. Whether we are purchasing goods, using energy to service our homes and workplaces, or responding to the constraints placed upon us by technology and systems that surround us, human behavior is the key.” aceee.org/portal/behavior.

^{xx} www2.buildinggreen.com/article/challenge-existing-homes-retrofitting-dramatic-energy-savings.

^{xxi} The U.S. Department of Energy’s Weatherization Assistance Program provides grants to states, territories and some Native American tribes to improve the energy efficiency of the homes of low-income families. These governments, in turn, contract with local governments and nonprofit agencies to provide weatherization services to those in need using the latest technologies for home energy upgrades. energy.gov/eere/wipo/weatherization-assistance-program.

^{xxii} aceee.org/files/proceedings/2014/data/papers/7-287.pdf; census.gov/hhes/www/housing/housing_patterns/pdf/Housing%20by%20Year%20Built.pdf.

^{xxiii} www2.epa.gov/sites/production/files/documents/r95-004.pdf.

^{xxiv} census.gov/prod/2014pubs/p60-248.pdf. Other accepted definitions of “near poor” are incomes up to 133 percent or 150 percent of the poverty level.

^{xxv} prb.org/Publications/Articles/2004/ManufacturedHomesaBigFactorinRuralHomeownershipinUS.aspx.

^{xxvi} aceee.org/sites/default/files/publications/researchreports/a124.pdf.

^{xxvii} Since 2000, electricity prices have increased at a 2.5 percent annual rate, which is slightly higher than the 1.99 percent rate of inflation. eei.org/whatwedo/PublicPolicyAdvocacy/StateRegulation/Documents/rising_electricity_costs.pdf.

^{xxviii} The electricity price index soared to a new high in January 2014 with the largest month-to-month increase in almost four years, according to the Bureau of Labor Statistics. cnsnews.com/news/article/terence-p-jeffrey/electricity-price-index-soars-new-record-start-2014-us-electricity.

^{xxix} Electric bills have skyrocketed in the past five years, a sharp reversal from a quarter-century when Americans enjoyed stable power bills even as they used more electricity. usatoday30.usatoday.com/money/industries/energy/story/2011-12-13/electric-bills/51840042/1.

^{xxx} benningfieldgroup.com/docs/Final_MF_EE_Potential_Report_Oct_2009_v2.pdf, page 3, prepared for the Energy Foundation.

^{xxxi} benningfieldgroup.com/docs/Final_MF_EE_Potential_Report_Oct_2009_v2.pdf.

^{xxxii} aceee.org/files/pdf/resource/mn_dnr_mf_best_practices_12.pdf;
greentechmedia.com/articles/read/multifamily-housing-a-3.4b-u.s.-energy-efficiency-opportunity; newbuildings.org/multifamily.

^{xxxiii} “From 31 percent in 2004, the renter share of all US households climbed to 35 percent in 2012, bringing the total number to 43 million by early 2013.” jchs.harvard.edu/sites/jchs.harvard.edu/files/jchs_americas_rental_housing_2013_1_0.pdf.

^{xxxiv} For experience with green leases, see greenleaselibrary.com; experience is thus far primarily with commercial properties.

^{xxxv} www4.eere.energy.gov/alliance/sites/default/files/uploaded-files/Service%20Agreement%20Financing%20Summary.pdf.

^{xxxvi} academia.edu/2900824/Policy_Options_for_the_Split_Incentive_Increasing_Energy_Efficiency_for_Low-Income_Renters.

^{xxxvii} “Contractors who perform energy retrofits say most people spend around \$6,000 or \$7,000, and the payback time is around 5 years.” money.cnn.com/2010/02/04/news/economy/energy_retrofits.

^{xxxviii} hgtvremodels.com/home-systems/the-benefits-of-deep-energy-retrofits/index.html.

^{xxxix} For an example of a proactive organization using innovation to address financing issues for low-income efficiency, see the work of Global Green USA, global-green.org.

^{xl} aceee.org/sector/state-policy/toolkit/on-bill-financing.

^{xli} forbes.com/sites/justingerdes/2013/07/22/novel-program-shaves-electricity-bills-by-34-in-south-carolina/; eesi.org/projects/rural-energy-savings-program.

^{xlii} Other successful OBF models for low-income customers are the Connecticut Small Business Energy Advantage program and the Clean Energy Works program in Oregon.

^{xliii} pacenow.org/pace-programs/.

^{xliv} pacenow.org/residential-property-assessed-clean-energy/ provides an excellent overview of efforts to promote residential PACE loans.

^{xlv} pacenow.org/c-pace-case-studies/#sthash.BQb1oVF2.dpuf.

^{xlvi} On March 24, 2014, Rep. Mike Thompson (D-CA) introduced HR 4285. The bill, commonly known as the PACE Assessment Protection Act, has 10 co-sponsors.

^{xlvii} money.cnn.com/2012/10/24/news/economy/americans-poverty/.

^{xlviii} “The Alliance mounts national TV public service advertising campaign. Gregory Peck promotes energy conservation by declaring ‘Don’t Blow It America.’ Donated air time of \$175 million gets the message into millions of American living rooms.” lobby.la.psu.edu/_107th/126_CAFE_Standards_2/Organizational_Statements/ATSE/ATSE_Three_Decades_on_the_World_Stage.htm.

^{xlix} energy.gov/eere/wipo/what-weatherization.

ⁱ The Low-Income Energy Heating Assistance Program, or LIHEAP, was established in 1980 and is a federal block grant program administered by the Department of Health and Human Services. LIHEAP assists low-income families with their heating and cooling bills. The program also funds weatherization services in most states. On Oct. 1, 2014, the HHS Office of Community Services awarded \$3.05 billion to the states, territories and tribes for LIHEAP assistance, under the first Continuing Resolution for FY2015.

ⁱⁱ nascsp.org.

ⁱⁱⁱ The DOE Weatherization Assistance Program is funded at \$174 million for FY2014, \$171 million for formula distribution and \$3 million for training and technical assistance, National Association for State Community Services Programs, nascsp.org; funding dipped to a low of \$68 million in FY2012 and historically averaged between \$210 million and \$230 million in the decade before ARRA in 2009.

ⁱⁱⁱⁱ waptac.org/data/files/website_docs/government/guidance/2011/wpn%2011-08%20weatherization%20innovation%20guidance.pdf.

^{lv} S. 1213, introduced in the 113th Congress by Sens. Chris Coons (D-DE); Susan Collins (R-ME); and Jack Reed (D-RI), “Weatherization Enhancement and Local Energy Efficiency Investment and Accountability Act.”

^{lv} energy.gov/eere/better-buildings-neighborhood-program/better-buildings-neighborhood-program.

^{lvi} A complete listing of efficiency-related programs at HUD can be found at hud.gov/local/shared/working/r9/cpd/guide.pdf. See also efficientwindows.org/LIHToolkit.pdf.

^{lvii} efficientwindows.org/LIHToolkit.pdf.

^{lviii} enterprisecommunity.com/policy-and-advocacy/issues/tax-incentives/low-income-housing-tax-credits#sthash.3Y1Vzf2n.dpuf.

^{lix} globalgreen.org.

^{lx} ruralhome.org/storage/documents/info_sheets/povertyamerica.pdf.

^{lxi} *New State Ice Co. v. Liebmann*, U.S. Supreme Court decision, 285 US 262 (1932).

^{lxii} aceee.org/files/pdf/policy-brief/eers-07-2013.pdf; see ACEEE map of states with EERS, aceee.org/topics/eers.

^{lxiii} aceee.org/sector/state-policy/utility-policies.

^{lxiv} aceee.org/files/proceedings/2014/data/papers/7-287.pdf.

^{lxv} See the Building Codes Assistance Project (BCAP) map of states that have adopted a residential energy code that meets or exceeds the International Energy Conservation Code (IECC). energycodesocean.org/code-status-residential.

^{lxvi} See the Appliance Standards Awareness Project (ASAP) map of states with appliance standards and energy savings. appliance-standards.org/states.

^{lxvii} nysderda.ny.gov/Energy-Efficiency-and-Renewable-Programs/Residential/Energy-Efficiency-Programs/Home-Energy-Efficiency-Upgrades/EmPower-New-York.aspx.

^{lxviii} nysderda.ny.gov/Energy-Efficiency-and-Renewable-Programs/Residential/Energy-Efficiency-Programs/Home-Energy-Efficiency-Upgrades/Assisted-Home-Performance-with-ENERGY-STAR.aspx.

^{lxix} efficiencymaine.com/at-home/.

^{lxx} vtdigger.org/2014/06/02/obama-points-vermont-model-carbon-reduction/; efficiencyvermont.com/About-Us/News/Efficiency-Vermont-in-the-News/2014/10/01/efficiency-vermont-a-model-of-successful-program-design-and-consumer-engagement.

^{lxxi} americannewsreport.com/hinewsnetwork/new-solutions-in-hvac-technologies-reduce-energy-usage-costs/.

^{lxxii} The Center for American Progress has published a detailed and very comprehensive treatment of social impact bonds in one of its issue briefs. The document, americanprogress.org/issues/open-government/report/2014/03/03/85106/networking-for-success/, is an excellent discussion of a complex issue.

^{lxxiii} payforsuccess.org/learn-out-loud/pfs-101.

^{lxxiv} americanprogress.org/issues/open-government/report/2014/03/03/85099/investing-for-success/.

^{lxxv} energy.gov/eere/wipo/what-weatherization.

^{lxxvi} "Evaluating the Co-Benefits of Energy Efficiency Programs: Results of Dublin Workshop" edited by Nina Campbell, 2011. iea.org/publications/freepublications/publication/low_income_energy_efficiency.pdf.

^{lxxvii} cpsc.gov/en/Safety-Education/Safety-Guides/Home/The-Inside-Story-A-Guide-to-Indoor-Air-Quality/.

^{lxxviii} greenbuilding.com/knowledge-base/indoor-air-quality.

^{lxxix} pewtrusts.org/en/~media/Assets/External-Sites/Health-Impact-Project/Good_housing_and_good_health.pdf.

^{lxxx} solarenergy.net/News/energy-efficiency-offers-18-trillion-benefits-u-s-20-years/.

^{lxxxi} iea.org/publications/insights/ee_improvements.pdf.

^{lxxxii} commerce.wa.gov/media/commerce-connections/Lists/Posts/Post.aspx?ID=22.

^{lxxxiii} forbes.com/sites/justingerdes/2013/01/29/small-town-big-energy-savings-retrofitting-block-by-block-in-murray-city-ohio/.

^{lxxxiv} spoken.ly/detail.php?pid=5X6sMUeJW2urPc16Jg3H055r57xgdIhN.

^{lxxxv} stateenergyreport.com/2011/12/22/spotlight-on-baltimore-city-weatherization-assistance-program-and-healthy-homes/.

^{lxxxvi} baltimorehousing.org/ghsh_light.

^{lxxxvii} apha.confex.com/apha/141am/webprogramadap/Paper287173.html.

^{lxxxviii} baltimorehousing.org/eclips_detail.aspx?id=3237.

^{lxxxix} gridalternatives.org/headquarters/news/grid-dc-spotlight-solar-policy-low-income-families.

^{xc} energy.gov/eere/articles/sunshot-installs-solar-energy-system-local-habitat-humanity-home.

^{xci} Wigmore: "Internet of Things (IOT)." Tech Target, June 2014.

^{xcii} moneyshow.com/articles.asp?aid=GURU-41109.

^{xciii} emc.com/leadership/digital-universe/2014iview/internet-of-things.htm.

^{xciv} The percentage of the population that is 65 or older has increased from 6 percent in 1940 to 13 percent today. With increased life expectancy, the rapidly growing population of people 85 and older is expected to double between now and 2030, and then double again between 2030 and 2050, reaching 19 million people. metlife.com/assets/cao/mmi/publications/studies/2010/mmi-aging-place-study.pdf; nhc.org/media/files/AgingReport2012.pdf.

^{xcv} States currently use a variety of inconsistently applied tools for measuring the cost-effectiveness of energy efficiency programs. Greater standardization in cost-effectiveness screening is central to both the future of state-funded programs and engaging the banking community to lend against the savings potential of energy efficiency.

NOTES

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NOTES





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