



## HOME PERFORMANCE WITH ENERGY STAR®— A COST-EFFECTIVE STRATEGY FOR IMPROVING EFFICIENCY IN EXISTING HOMES

State Energy Offices, utilities, and energy efficiency advocates have long recognized that existing homes represent a significant opportunity to reduce **energy consumption and peak demand**. In the past, many program implementers pursued low-cost energy audits and/or single-product rebate strategies. However, with increases in the standard efficiency of many consumer products and an increasing body of evidence that audit programs alone don't lead to meaningful energy savings, implementers need new solutions to meet their mandated savings goals. **The time is right for a new approach that promotes whole-house energy improvements** that deliver significant energy savings and peak demand reductions.

Home Performance with ENERGY STAR (HPwES), a program from the U.S. Environmental Protection Agency (EPA) and U.S. Department of Energy (DOE), offers a new strategy that encourages comprehensive energy improvements in existing homes. The package of improvements made through Home Performance with ENERGY STAR typically save homeowners 20 percent or more on energy bills, while also improving the indoor air quality, comfort, and safety of their homes. Common home improvements performed include: sealing air leaks and adding insulation, improving heating and cooling systems, sealing ductwork, and upgrading lighting and appliances.

### WHOLE-HOUSE STRATEGIES DELIVER RESULTS

**Over the past eight years, EPA and DOE have worked with states, utilities, and others to implement Home Performance with ENERGY STAR in more than 25 markets with significant results. By the end of 2008, more than 50,000 homes had been retrofitted through voluntary HPwES programs. Early adopters of the HPwES strategy include:**

- Austin Energy, who in 2008, had over 87 contractors participating in its HPwES program, improving over 2,400 homes with a peak demand savings of 3.9 MW.<sup>4</sup>
- NYSERDA, whose 150 participating contractors have improved the energy efficiency of more than 22,000 homes and saved over 18,000 MWh of electricity and 800,000 MMBtu of fossil fuels between 2001 and 2008.<sup>5</sup>
- National Grid, who helped 2,300 of its customers collectively save 67,000 MMBtu of energy in 2008. Participating contractors completed more than 980 insulation and/or air sealing upgrades, 950 high efficiency heating system installations, 525 high efficiency domestic hot water system installations, and 200 ENERGY STAR window replacement projects. Most customers also received direct installation of compact fluorescent bulbs.<sup>6</sup>
- Wisconsin Focus on Energy, who estimates that its HPwES program saved over 280,000 therms, 520,000 kWh, and 220,000 kW in 2008. Since 2001, over 10,000 customers' homes have undergone home performance audits, with about half resulting in whole-house energy improvement projects.<sup>7</sup>

Owners of older homes are particularly vulnerable to rising energy costs. Homes built prior to the 1970s oil embargo are often much less energy-efficient than newer units.<sup>1</sup>

More than half of the 80 million single-family homes in the United States were constructed before modern energy codes existed.<sup>2</sup>

Many are poorly insulated, have high levels of air infiltration, inefficient heating and air conditioning systems, and inefficient water heaters and appliances.

About 40% of households report at least some winter drafts<sup>2</sup> and 60% complain of a room that is too warm in the summer.<sup>3</sup>

## HOW HOME PERFORMANCE WITH ENERGY STAR WORKS

The experience of many administrators who have implemented energy audit programs is that recommended improvements are seldom completed if the homeowner does not know who to trust to complete the work or is unable to afford the improvements. While Home Performance with ENERGY STAR starts with a comprehensive audit, the hallmark of the program is linking consumers with contractors who can offer a comprehensive package of improvements and the financing to get the work done.

The program administrator is responsible for establishing a network of contractors who are qualified to perform a comprehensive energy audit and complete the recommended improvements or work closely with other contractors who can.

During the audit, the contractor looks at the heating and cooling systems, windows, insulation, and flow of air into and out of the house, and offers solutions to fix comfort problems and address high energy bills. Upon completion of the work, the contractor must test the home to document that home's performance was improved and is operating safely. The program administrator provides an additional level of quality assurance by spot-checking the work of participating contractors and verifying homeowner satisfaction.

### THREE STEPS TO START A PROGRAM

#### Step 1: Conduct Market Research

Start by establishing an advisory group made up of key stakeholders to assess market conditions and make preliminary plans for developing the program and marketing plan.

#### Step 2: Prepare A Plan

Prepare a Program Implementation Plan that documents how national program requirements will be met. The plan should address home performance protocols, contractor recruitment, marketing, incentives, quality assurance, and evaluation.

#### Step 3: Partner with ENERGY STAR

Submit a signed Partnership Agreement and Program Implementation Plan to ENERGY STAR.

## PROGRAM DESIGN AND IMPLEMENTATION

There are several common barriers that potential program administrators need to address during program design and implementation:

### Contractor Participation

One common market barrier is a limited supply of qualified contractors with the skills to diagnose and implement whole-house energy efficiency improvements. Even if homeowners receive recommendations from an energy audit to improve their home, most homeowners don't know who is qualified to make the improvements. A key strategy to overcoming this barrier is workforce development. Offering technical training to participating home improvement trade contractors is one place to start.

**Training**—Training should include classroom and field sessions and cover building science principles, diagnostic testing, and installation best practices. It is not necessary for training to happen all at once. Time and cost are two factors that typically limit contractor participation in training. Program administrators need to find the right balance to ensure that training is accessible to contractors who are serious about adding home performance contracting to their existing home improvement business.

In addition to technical training, sales and business training will help contractors succeed in selling and delivering quality work. Some program administrators help contractors create internal procedures for quality assurance and assist in processing program incentives or financing applications. The inclusion of such elements can help programs achieve quality and reach goals.

**Certification**—Written exams and field tests should be used to ensure that contractors are skilled to perform work associated with the program. Professional certification from the Building Performance Institute (BPI) or a similar organization with equivalent standards can be used to measure contractor competence at the conclusion of training.

For several years, Austin Energy has been providing training to participating contractors to develop an extensive network of qualified home performance contractors in the area. Austin Energy has offered discounted training; cooperative advertising; public recognition awards; and monthly meetings to discuss the program improvements, new technologies, and strategies for resolving problems. Austin Energy has also started to encourage professional technician certification by the Building Performance Institute.

**Mentoring**—Establishing in-field mentoring opportunities is a valuable way to ensure that contractors are skilled to

In New York, NYSERDA has offered financial assistance to new participating contractors to help them purchase necessary diagnostic equipment (e.g. blower doors, infrared camera) and become accredited through the Building Performance Institute. Each of these actions can help increase the number of qualified contractors in the chosen market and build a sustainable network of professionals who can deliver whole-house energy improvements.

offer whole-house improvements. Mentoring helps contractors gain confidence during their initial jobs as they work with seasoned professionals. Program administrators typically bring in experts to guide participating contractors through their initial projects and help them transition from their existing business

model to home performance contracting.

**Incentives**—Some programs have reimbursed contractors for the cost of training. This approach encourages contractor participation—however, incentives should be contingent on completing specific milestones (such as passing a certification test or completing and reporting a specific number of jobs). In addition to financial incentives, awards and public recognition for a contractor’s achievement (i.e., completing 100 jobs) is a good way to encourage participation.

## ALTERNATIVE WORKFORCE STRATEGY

Rather than training and mentoring a broad group of businesses, HPwES program administrators may want to consider awarding contracts to a handful of contractors who are qualified to deliver home energy retrofit services. Contractors interested in delivering comprehensive energy audits and energy efficiency retrofits respond to a competitive solicitation. Selection is based on qualifications (e.g., license, insurance, certifications) and other factors that demonstrate the ability to deliver results. The program administrator and each contractor sign an agreement that specifies a minimum number of qualified leads, monetary awards, completed projects, and performance standards. The goal is to establish a small, but strong infrastructure that can quickly deliver energy savings.

## Consumer Financing

Another common barrier to whole-house energy efficiency improvements is the initial cost to the homeowner. Typical improvements (e.g., adding insulation, air sealing, new heating or cooling equipment, duct repair, and new windows) can easily cost more than most homeowners can pay out-of-pocket. For example, in New York the average cost of projects ranges from \$5,600 to \$8,500. Although these improvements can increase the value of the home and provide benefits beyond energy savings, many homeowners will delay making the home improvements unless they have a convenient way to pay for them. Financing is one strategy that can help make a difference.

If the monthly cost to finance improvements is less than the estimated savings in energy costs, the decision to improve the home can be easy. Program administrators have often partnered with financial institutions that offer homeowner financing. Their experience has shown that the availability of financing and a quick loan approval process can serve as the “tipping point” for homeowners to decide to make comprehensive home energy improvements. In addition to financing, some sponsors have offered cash rebates to homeowners. Rebates help generate consumer interest in the program and offset some costs, especially when the rebates are contingent on the purchase of a comprehensive package of improvements from participating contractors.

## Consumer Awareness

Many homeowners are not aware that a whole-house assessment can uncover their home’s performance problems. Program administrators can use a variety of marketing and media activities to overcome this barrier. For example, Web sites, bill inserts, advertising, contests, and events can help educate homeowners about the program’s benefits and the availability of qualified contractors. Many early adopters have offered incentives for contractors to participate in cooperative advertising. This shared advertising encourages contractors to play an active role in the program and leverages marketing resources to reach more customers.

One innovative strategy to increase consumer awareness is a Home Energy Makeover Contest. Contest organizers award a whole-house energy efficiency retrofit to the winning contestant in a highly visible demonstration. The home, chosen for its inefficiency, produces dramatic energy savings. Because the Energy Makeover Contest can be designed to specifically attract consumers to a whole-house approach, it is a promising promotional tool for launching a Home Performance with ENERGY STAR program.

## Quality Assurance

Quality assurance of contractors’ work is a required component of any Home Performance with ENERGY STAR program and essential to maintain a good

reputation. Quality assurance reassures homeowners that participating contractors will be held accountable for the work they perform. Program administrators agree to review all projects completed by each contractor, conduct on-site spot checks, and solicit customer feedback. A good quality assurance plan will specify what information contractors report and how it will be reviewed. This information is a valuable source for verifying energy savings and other program impacts.

## MEASUREMENT AND VERIFICATION

Program administrators are required to track the number of participating contractors, the number of projects completed, and the number of projects inspected. Mandatory reporting can be a condition for program participation or processing of rebates or financing. Information for measurement and verification must be detailed enough to allow program sponsors to independently review the contractors work, verify energy savings, and improve program delivery, but minimize duplication of effort for participating contractors.

## ENERGY STAR SUPPORT

To take full advantage of the Home Performance with ENERGY STAR marketing graphic and other benefits, programs sign a partnership agreement with EPA and DOE. ENERGY STAR provides program sponsors with assistance in program planning, promotion, and contractor participation. EPA and DOE have established a national network of experienced program implementers, building scientists, marketing and ad firms, and contractors that can serve to advise and assist in program start-up, as well as program direction.

Both DOE and EPA have funded work to establish a set of national standards that define the protocols for performing work properly.

Benefits of partnering with ENERGY STAR:

- **Assistance with Market Assessment and Program Design**—Our team is ready to walk potential program administrators through the steps to assess their market and design a program. We have tapped into a variety of experts so that start-up programs can benefit from the lessons others have learned. Our team can also guide you through developing a Program Implementation Plan.
- **HPwES Logo**—ENERGY STAR is one of the premier logos recognized by consumers for energy efficiency.
- **Marketing Toolkit**—This Web-based tool allows program administrators and contractors to create highly customized marketing materials using ENERGY STAR graphics and important language that best describes Home Performance with ENERGY STAR. Available templates include magazine and newspaper advertisements, yellow page ads, web banners, and flyers.

- **Promotional Video**—This 7-minute video explains the value of Home Performance with ENERGY STAR to homeowners. Program sponsors and participating contractors can download the entire video or individual sections to show during house calls, at local home shows, and on their Web sites.
- **Home Performance House Graphics**—These detailed graphics demonstrate the common problems found in many homes, and how Home Performance with ENERGY STAR can help to solve them. Program administrators and contractors can use these graphics to show homeowners the trouble spots in their homes and how a whole-house approach works to fix them.
- **Banner Stands**—Exhibit banners provide a simple way to communicate about Home Performance with ENERGY STAR at public events, home shows, stakeholder meetings, hearings, or other venues. Retractable banner stands, in a hard case, are loaned to program sponsors on a first-come-first-serve basis. Electronic files are also available to allow sponsors and contractors to add their own logos and contact information.
- **Sales Training**—This training course, available to all program administrators, helps home improvement contractors learn to effectively sell home performance services to homeowners.
- **Contractor Business Development Guide**—Written by experienced contractors, this guide helps home improvement contractors transition to the home performance business model.
- **Case Studies**—Contractor and homeowner success stories from all major climate zones provide insight on the benefits of Home Performance with ENERGY STAR.
- **National Web Site**—[energystar.gov](http://energystar.gov) is a key vehicle for communicating with homeowners and program sponsors. Homeowners use the Web site to understand what to expect from Home Performance with ENERGY STAR and to authenticate this service as part of the nationally recognized and trusted ENERGY STAR Program. It is through the national Web site that program sponsors access the latest tools, policy information, logos, and marketing materials.
- **National Symposium on Home Performance with ENERGY STAR**—This national meeting for stakeholders provides updates on policy, marketing efforts, program tools, and best practices. The Symposium is an excellent venue to share lessons among program sponsors and provide feedback to ENERGY STAR program staff. The Symposium is usually held in the spring, during the national ACI Home Performance Conference.
- **National Campaigns**—Participate in the annual Change the World, Start with ENERGY STAR campaign that encourages Americans to join with millions of others to take small, individual steps to save energy and fight global warming.
- **Financing Guidebook**—Provides an overview of the market trends and financial issues that affect homeowner expenditures on home improvement, and outlines the role that efficiency programs and special financing can play in encouraging greater investment in energy efficiency.
- **Directory of Funding Sources**—Several federal grant and loan programs can be used to support local HPwES programs.

For more information visit [www.energystar.gov/hpwessponsors](http://www.energystar.gov/hpwessponsors).

**Table 1. Potential per Home Energy Savings by Climate Zone**

	NORTHEAST	MIDWEST	SOUTH	WEST
<b>Electricity (kWh)</b>	1400	1700	4600	1400
<b>Natural Gas (Therms)</b>	400	400	200	200
<b>Typical Improvements</b>	Increasing attic insulation; insulating crawl spaces or rim joists; duct sealing, repair and insulation; air sealing; and installing programmable thermostats, energy-efficient replacement water heaters, heat pumps, air conditioners, furnaces, boilers, lighting or windows.			

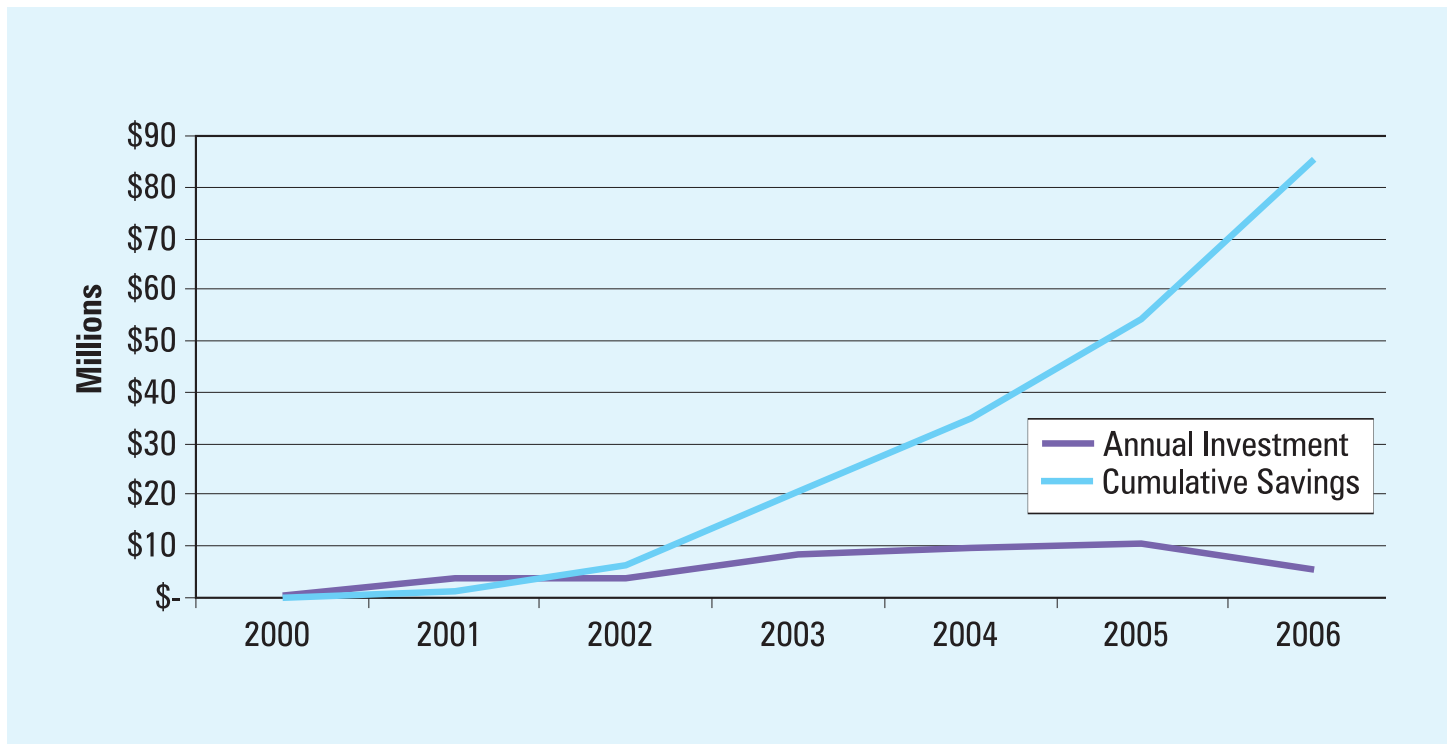
## PROGRAM COST EFFECTIVENESS

Building a network of qualified professionals to deliver whole-house services requires substantial resources, particularly during the first year. Many program administrators choose to start with a pilot program in a target market to work out the details of efficient program design and delivery. Once the infrastructure is established in the pilot market, the investment to maintain and expand the program decreases and the cumulative savings increase (Graph 1). Evaluating this program over a 5-year cycle is recommended so that both the start-up challenges and the long-term benefits are recognized.

For a mature Home Performance with ENERGY STAR program, a levelized cost of conserved energy (CCE) of about 0.05 \$/kWh is estimated. Programs that can count both gas and electric savings will be most cost effective because whole-house improvements through HPwES typically deliver both. Table 1 shows the potential per home energy savings and typical improvements.

Energy savings from Home Performance with ENERGY STAR will vary based on the region of the country and type of improvements completed, but an average per home estimate of 20% is realistic to achieve. EPA estimates a peak electricity demand savings of 1.6 kW per home in the summer and 0.9 kW per home in the winter, with some projects achieving even better results. For example, Austin Energy’s 2005 results estimated a deemed savings per participant of more than 2500 kWh of electricity and 2 kW in peak demand.<sup>4</sup>

**Graph 1. New York Home Performance with ENERGY STAR Program Investment and Customer Savings (15 yr life cycle)**



## RESOURCES FOR ADDITIONAL INFORMATION

- Home Performance with ENERGY STAR Web site:  
<http://www.energystar.gov/hpwessponsors>  
(available resources include: a HPwES Sponsor Guide, Program Plan Outline, and Financing Guidebook)
- EPA's Clean Energy-Environment Guide to Action: Policies, Best Practices, and Action Steps for States  
(<http://www.epa.gov/cleanenergy/energy-programs/state-and-local/state-best-practices.html>)
- National Action Plan for Energy Efficiency  
(<http://www.epa.gov/cleanenergy/actionplan>)
- Links to innovative technologies for existing homes via DOE's Building America Web site: [www.buildingamerica.gov](http://www.buildingamerica.gov)
- Database of state incentives for renewables and efficiency:  
<http://www.dsireusa.org/>

## SOURCES

- <sup>1</sup> Harvard, Foundations for Growth in the Remodeling Industry, (2007), page 17, Joint Center for Housing Studies
- <sup>2</sup> Energy Information Administration, 2005 Residential Energy Consumption Survey
- <sup>3</sup> Decision Analyst, 2008 American Home Comfort Study
- <sup>4</sup> Austin Energy, communication with Matthew Phillips
- <sup>5</sup> New York State Energy Research and Development Authority, 2009 ENERGY STAR Awards application
- <sup>6</sup> National Grid, 2009 ENERGY STAR awards application
- <sup>7</sup> Wisconsin Energy Conservation Corporation, 2009 ENERGY STAR awards application

ENERGY STAR<sup>®</sup>, a program sponsored by the U.S. EPA and DOE, helps us all save money and protect our environment through energy efficient products and practices. Learn more. Visit [www.energystar.gov](http://www.energystar.gov).

