



The Building Technologies Program: Building Toward a Better Future

Roland Risser
February 9, 2012
NASEO

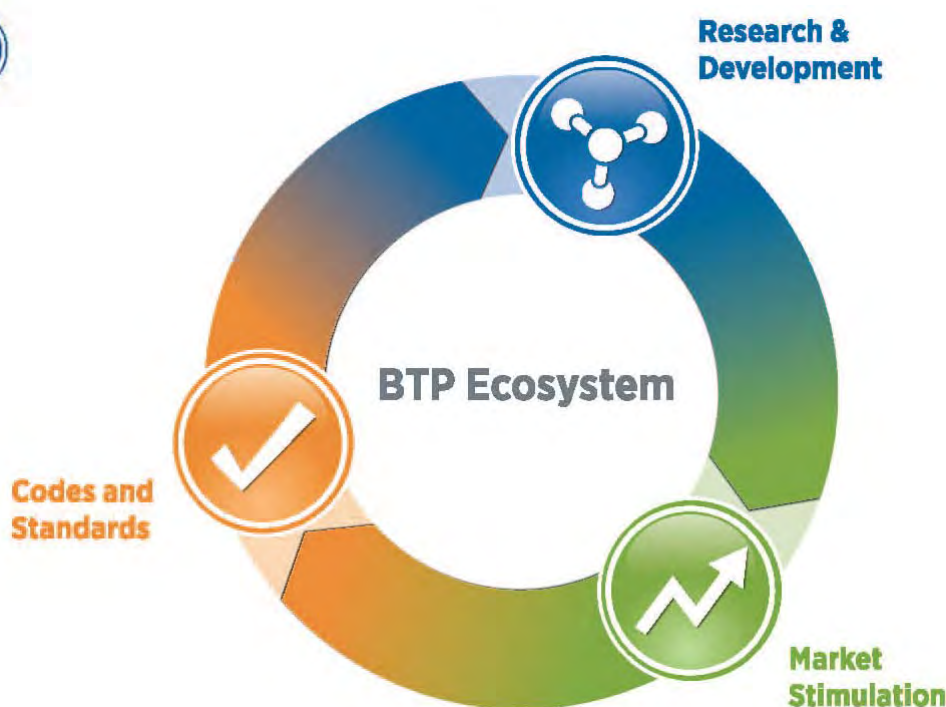
BTP's Buildings Program uses an Integrated Approach to Deliver Value

Research & Development

- Develop technology roadmaps
- Prioritize opportunities
- Solicit and select innovative technology solutions
- Collaborate with researchers and market performers
- Solve technical barriers and test innovations to prove effectiveness
- Measure and validate energy savings

Market Stimulation

- Identify barriers to “speed and scale” adoption
- Collaborate with industry partners to improve market adoption
- Increase usage of products and services
- Work through policy, adoption, and financial barriers
- Communicate the importance and value of energy efficiency
- Provide technical assistance and training



Codes and Standards

- Establish minimum energy use in a transparent public process
- Protect consumer interests
- Reduce market confusion
- Enhance industry competitiveness and profitability
- Expand portfolio of energy efficient appliances and equipment
- Raise the efficiency bar

Commercial Initiatives to Drive Energy Savings

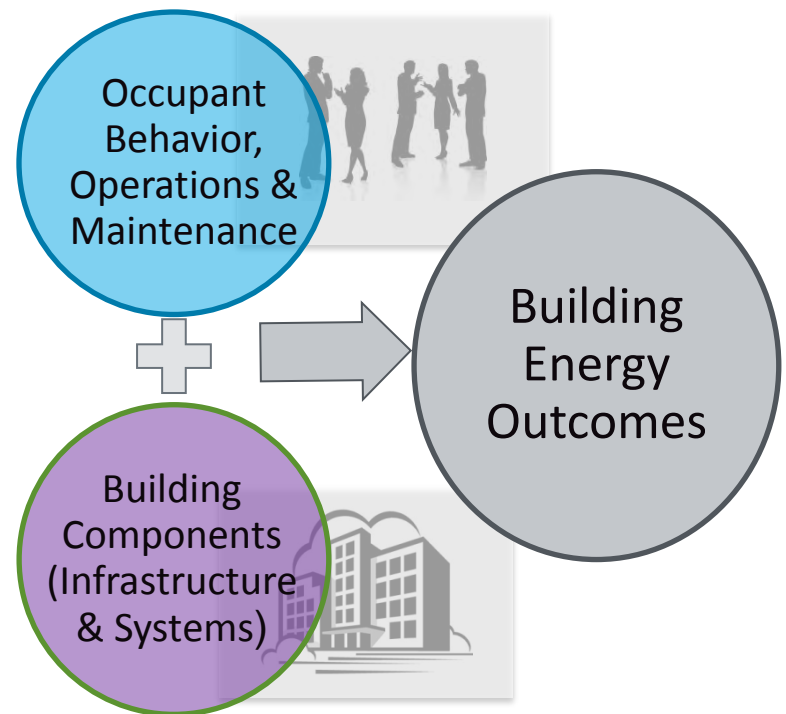
Building the Commercial Retrofit Industry: Better Information = More Demand

- ENERGY STAR Portfolio Manager has been widely adopted for tracking commercial building energy use
- DOE is working with EPA to create an Asset Rating program for commercial buildings that will allow:

Owners ➤ Quick identification of system-level opportunities for improvement

Appraisers ➤ Standardized metrics of energy performance for building's physical assets

Buyers ➤ An “apples to apples” comparison of similar buildings while controlling for operations, maintenance, and occupant behavior (all of which are unique to the operator/user)



September, 2011:
Request for public
input on program
design issues

Spring 2012: Pilot
testing of asset
rating program

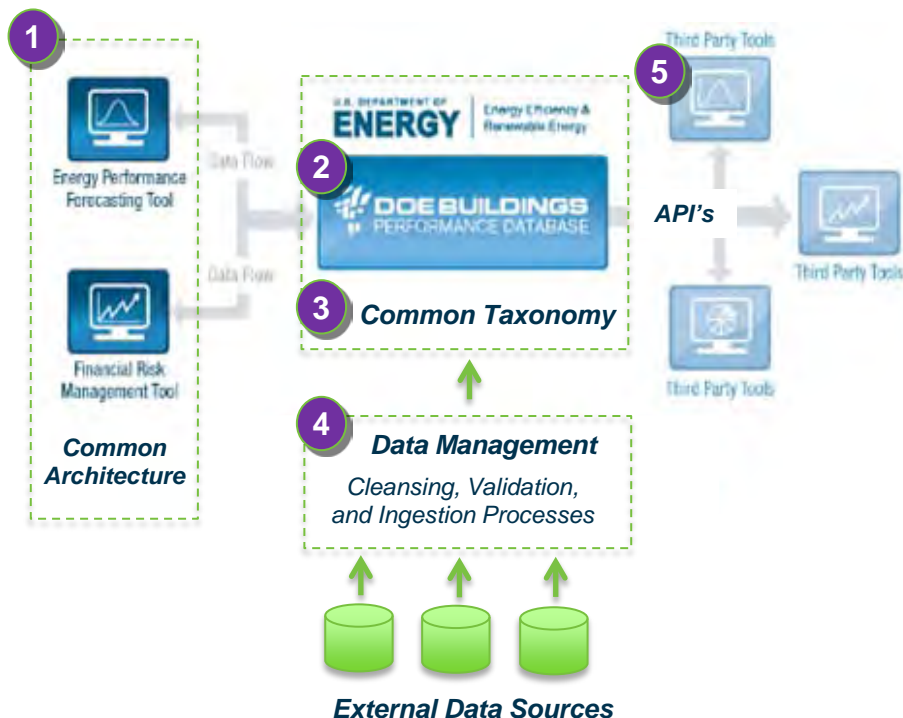
Fall 2012: Updated
asset rating made
more widely
available

DOE Building Performance Database (BPD)

- A **decision-support platform**, comprised of data from commercial and residential buildings and data analysis tools
- Initial tool set includes:
 - An **energy savings forecasting tool** that uses an actuarial based methodology to develop energy savings distributions
 - A financial tool that forecasts cash flows from these energy savings distributions
- Enables **risk based analysis** of energy efficiency projects
- Enables engineering and financial practitioners to evaluate energy efficiency products and services and make better informed decisions on completing and investing in these improvements

The DOE Building Performance Database (DBPD) Includes Five Key Components

DBPD System Overview



Key Components

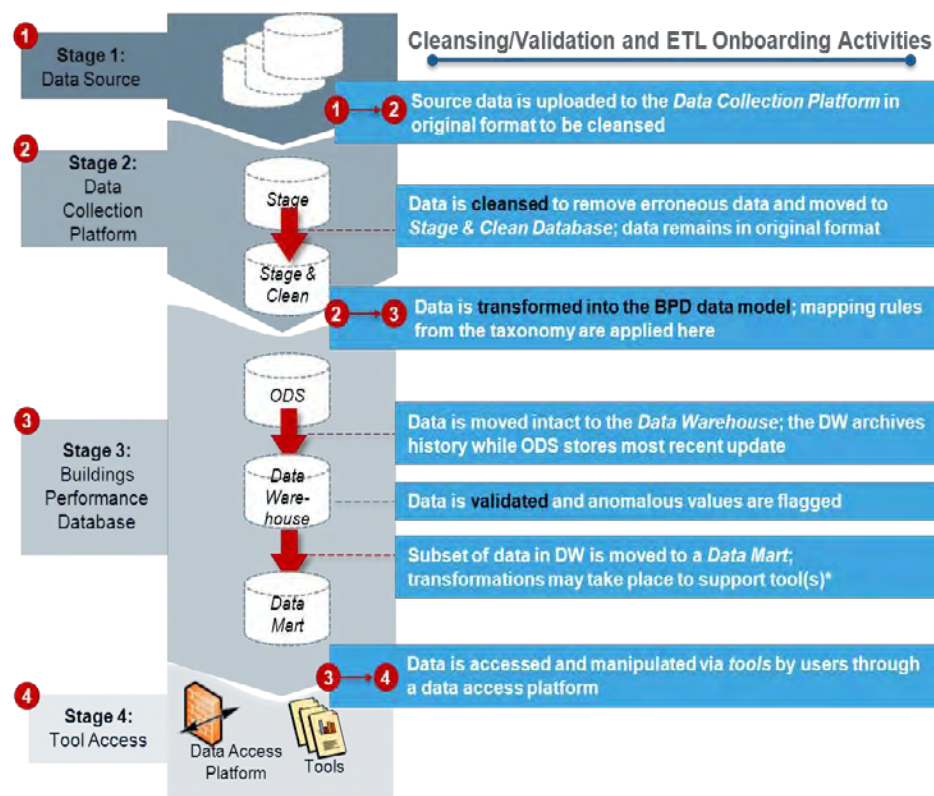
- 1 Applications** – Web-enabled tools that leverage data to forecast energy savings and related cash flows. As more use-cases are identified, additional tools will be created and released to the market.
- 2 Data Warehouse** – a platform to house the Energy data within the standard taxonomy.
- 3 Common Taxonomy** – a standardized “data model” to organize energy use and building characteristic data
- 4 Data Management** – processes and tools to support the on-boarding and validation of data from multiple sources
- 5 3rd Party Tool Support** – API's that allow 3rd Party developers to create applications that use the data within the DBPD

Data Collection Standardization is Important

The current data in the BPD (~50,000 buildings) comes from 6 data sources:

- ▶ CBECS
- ▶ RECS
- ▶ University of Dayton
- ▶ Energy Star
- ▶ GSA
- ▶ Gainesville Green

However, before the data on-boarding process even starts, these data sets required extensive work.



Going forward, standardized data collection and building descriptions will enable a much simplified process for importing data into the BPD **AND** enabling third party energy data related solution developments

The Standard Energy Efficiency Data Platform (SEED) is a software tool that allows state and local governments and building owners to quickly and easily create their own database using a standard building energy performance taxonomy, and easily share selected data with other parties as needed.

Key Accomplishments

- ▶ Extended DOE Buildings Performance Database taxonomy for SEED needs
- ▶ Integrated connection to Portfolio Manager
- ▶ Six cities/states (Seattle, San Francisco, Austin, NYC, DC, CA) helped design SEED
- ▶ Beta test launched (January 2012) with partner cities/states

Deployment in the Coming Months

- ▶ Partner cities/states load their data into SEED from Portfolio Manager and other systems
- ▶ Work with partners to shape data collection and data management for energy audit data
- ▶ Create API to allow public sharing of structured data
- ▶ Work with data analysts to encourage creation of tools
- ▶ Communicate value of standard taxonomy and SEED to larger audience

The SEED Platform is Customizable

SEED is:

A Database

- Building owners, governments, or other entities can use SEED to store building energy performance data according to a standardized, extensible taxonomy

A Data Transfer Mechanism

- SEED will allow data transfer into and out of Portfolio Manager, it will also allow data collection via customized web forms.
- SEED will include a standard API which a data owner can use to share selected data with third parties.

An Analysis Platform

- SEED provides a standard structure for building energy data to support a variety of analyses.
- Because it is open source and the database structure is publicly documented, third parties can build applications for SEED owners to use to analyze their data in new ways.

Benefits:

Open Source Platform

- Low or no cost for state/local government to design
- Set up in a matter of minutes
- Low cost to maintain
- Security and backup/redundancy in place

Flexible Input Mechanisms

- Portfolio Manager web services
- Spreadsheet upload
- *Additional web services in future*
- *Direct entry through web forms in future*

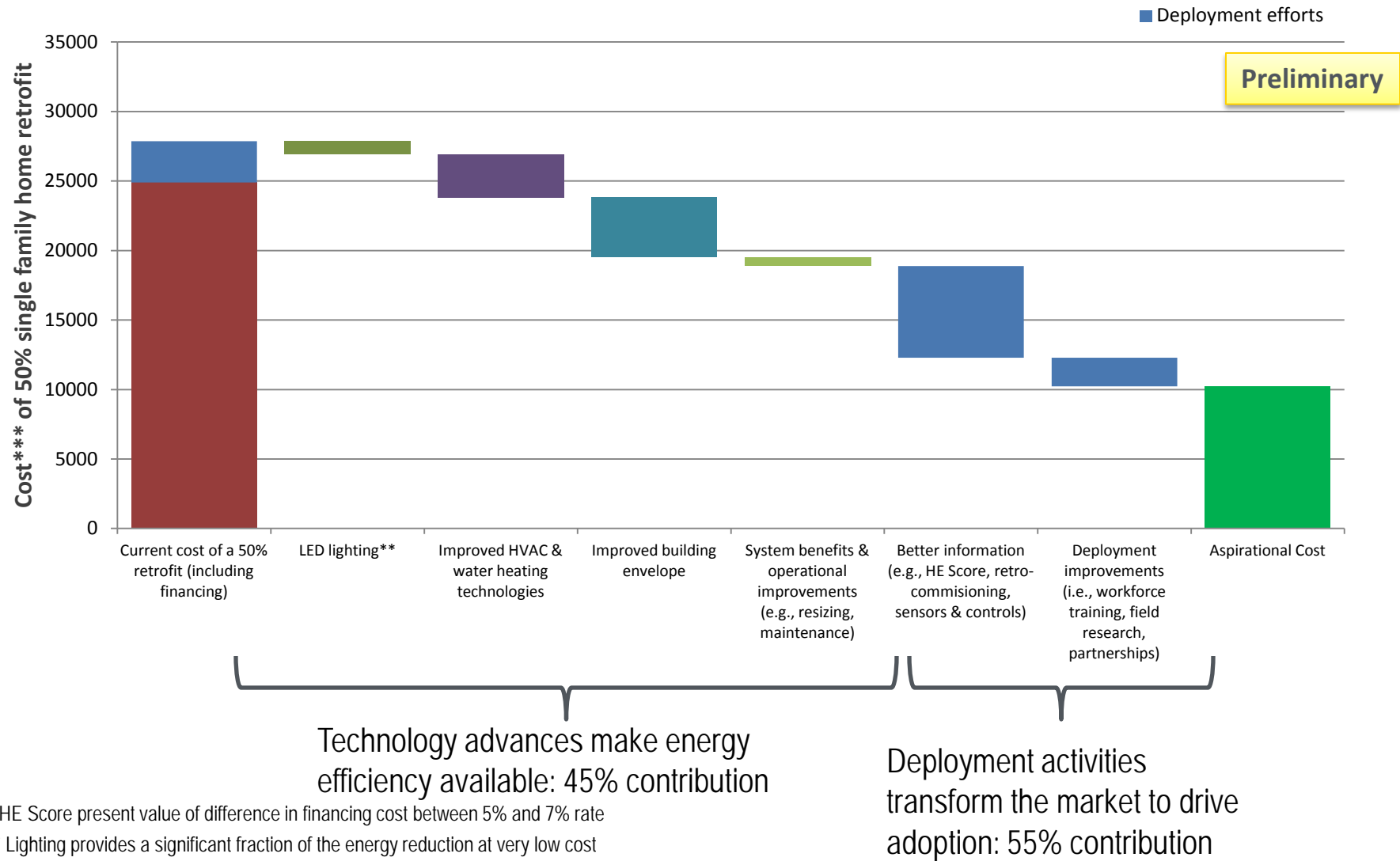
Standardization between jurisdictions

- Comparison of approaches & shared learning
- Sharing of resources
- Standardized analyses
- 3rd party creation of standardized apps

Residential Initiatives Drive Home Energy Efficient Ideas and Savings

Buildings' Technology, Deployment, and Standards Efforts Work Together to Reduce the Cost of Energy

Example: deep retrofits for single family homes



* HE Score present value of difference in financing cost between 5% and 7% rate

** Lighting provides a significant fraction of the energy reduction at very low cost

Source: BTP MYPP, NREL cost database, prioritization tool

Goal: Establish a self-sustaining energy efficiency market that meets the needs of American households

Market Priming Activities

- Promote market-driven business models and establish financing mechanisms for rapid adoption of effective, high quality, low-cost energy improvements;
- Give homeowners the information and tools to make smart energy decisions;
- Foster a trained and trusted workforce to implement energy improvements that address savings, comfort, health and safety; and
- Prepare builders to take advantage of the market differentiation associated with energy efficiency.

The Better Buildings Initiative Covers a Wide Variety of Residential & Commercial Building Programs



Energy Efficiency &
Renewable Energy



Better Neighborhoods

The Better Buildings
Challenge

Better Workforce

Vision: A self-sustaining market for building energy efficiency retrofits that results in economic, environmental, and energy benefits across the United States

- 41 recipients of \$508m;
- Focused on creating business models for EE upgrades in whole communities BetterBuildings.energy.gov/neighborhoods
- Engages CEOs and University Presidents, recognizing their organizations for making actionable commitments to improve energy efficiency in their facilities
BetterBuildings.energy.gov/challenge
- Training the next generation of commercial building technology workers
- Launching a Building Construction Technology Extension Partnership
- Providing more workforce training in areas such as energy auditing and building operations

This program hopes to save consumers approximately \$65 million per year on energy bills.

Goals

- Retrofitting 150,000 buildings (residential and commercial)
- 41 3-year grants of \$1.5 to \$40 million each – six grants to State Energy Programs
- Using over \$500 million in grants to leverage over \$3 billion in additional resources
- Creating or retaining approximately 30,000 jobs
- Reducing the cost of retrofit program delivery by 20% or more
- Achieving 15-30% energy savings from energy efficiency upgrades
- Saving consumers approximately \$65 million per year on energy bills
- Developing sustainable energy efficiency retrofit programs.

Driving Demand

→ *32 Different
Approaches*

Financing

→ *21 Combinations*

Developing
Optimal Service
Delivery
Business
Models

Workforce

→ *9 Models Being
Tested*

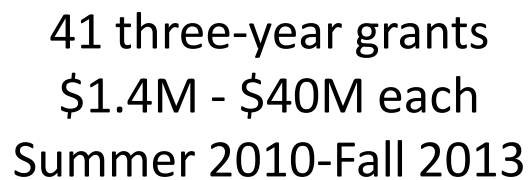
Data and Evaluation

→ *12 Evaluations
Being Performed*

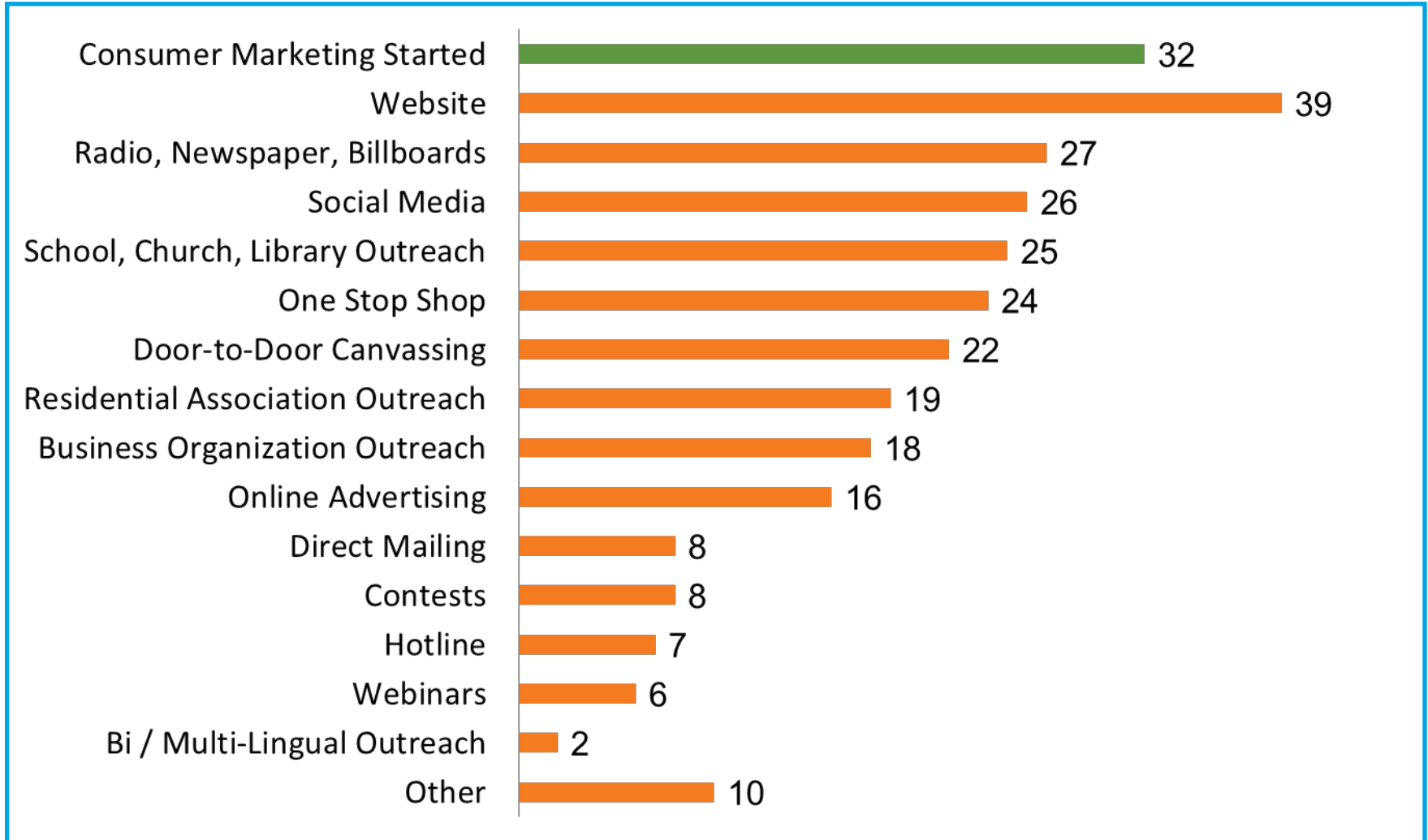
Accomplishments

- Thousands of building efficiency upgrades have already been completed through the Better Buildings program

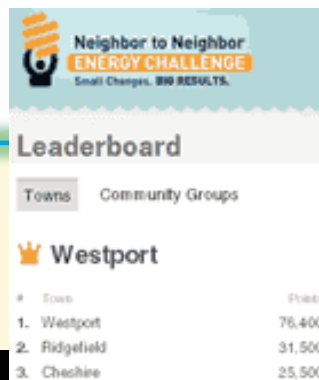
Energy Efficiency & Renewable Energy



Distribution of approaches

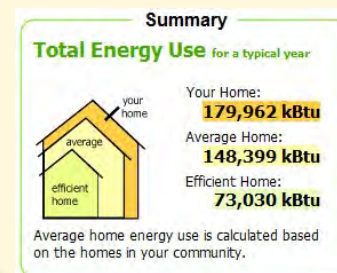


Connecticut has employed an **online leader board** to track energy upgrade progress, instigating friendly competition among neighbors



The Southeast Energy Efficiency Alliance's award-winning elephant in the room ads **use humor** to increase EE awareness

Massachusetts equipped a hybrid SUV with a **thermal imaging system** to document evidence of wasted energy in homes



Charlottesville is using a **handheld tool** that Americorps volunteers use to engage homeowners at events

RePower Bainbridge created Electric Avenue, a visual street painting that builds awareness by displaying the collective energy savings of two island neighborhoods

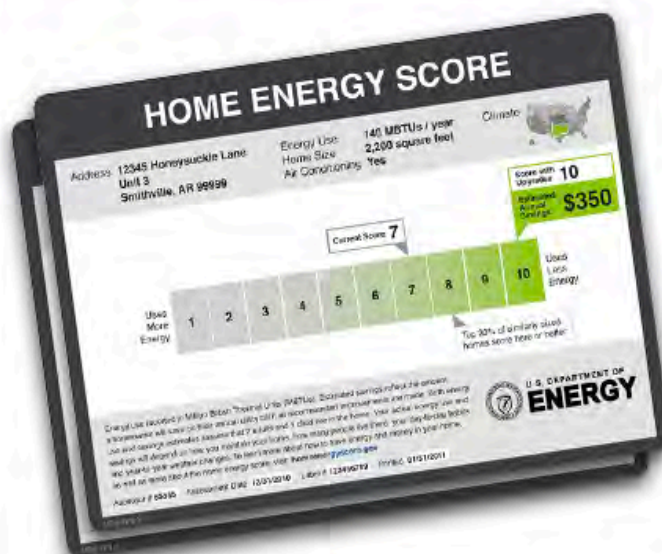


Rutland has created a **H.E.A.T Squad** of friendly neighborhood experts to educate the community about EE benefits



Home Energy Scoring Tool

[Contact Us](#) | [About Us](#) | [Login](#)



The Department of Energy's Home Energy Scoring Tool allows qualified assessors to:

- Generate clear, credible home energy assessments at a reasonable cost;
- Recommend customized upgrades and other cost saving tips; and,
- Help consumers compare the energy use of different homes.

The Home Energy Scoring Tool is quick and easy to use. Qualified assessors can gather the information needed to assess a home in one short site visit. This low-cost, high value assessment can be provided as a stand-alone service or as an add-on to a home inspection or comprehensive energy audit.

For more information on how to become a qualified assessor or receive a home energy score, visit www.homenergyscore.gov.

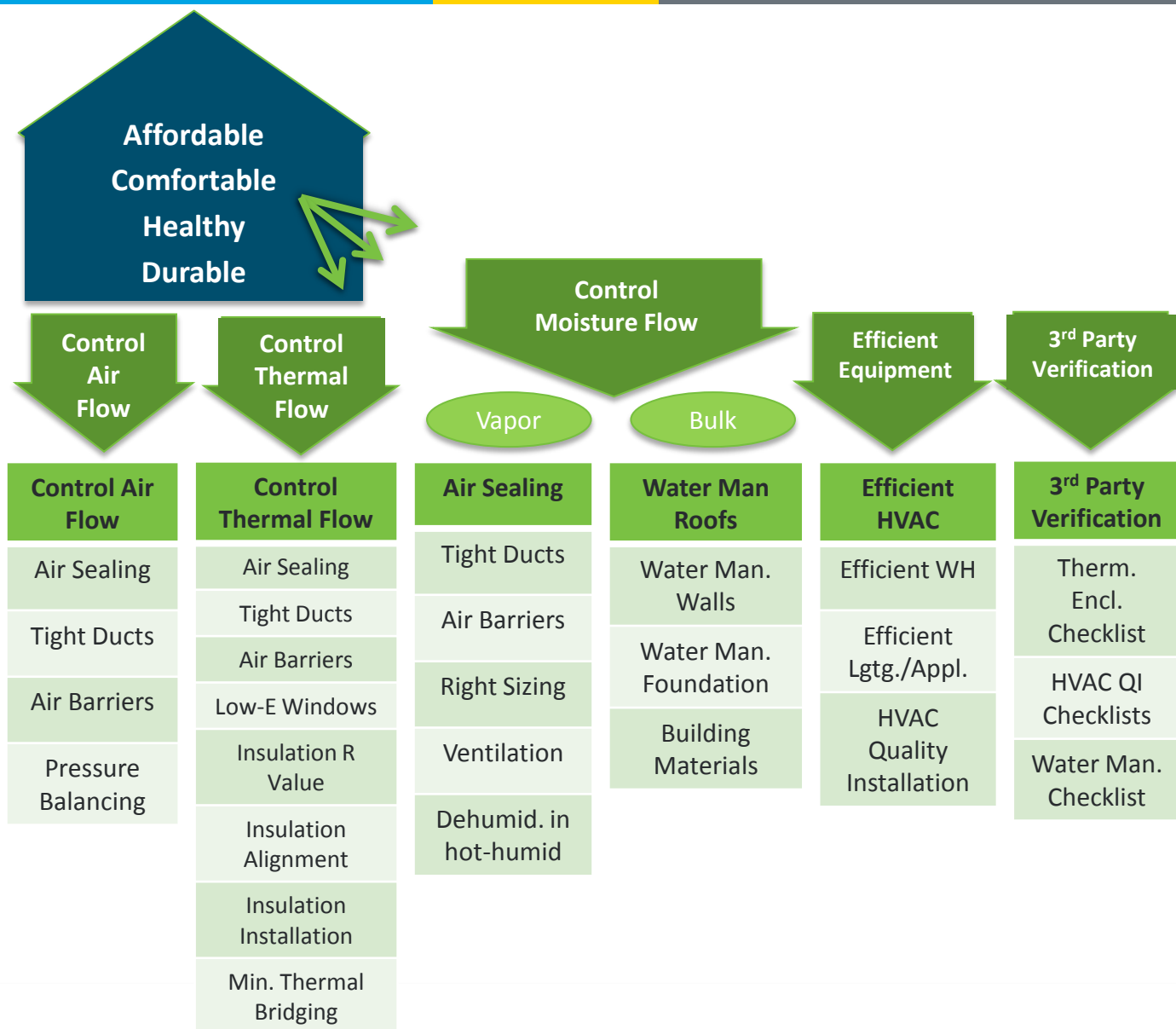


The Home Energy Saver Tool was developed by the Lawrence Berkeley National Laboratory in collaboration with the U.S. Department of Energy under the American Recovery and Reinvestment Act (ARRA). The Modeling Engine for Home Energy Saver can be licensed as an API through the Lawrence Berkeley National Laboratory.

[Privacy Policy](#)
[About Us](#)
[Contact Us](#)

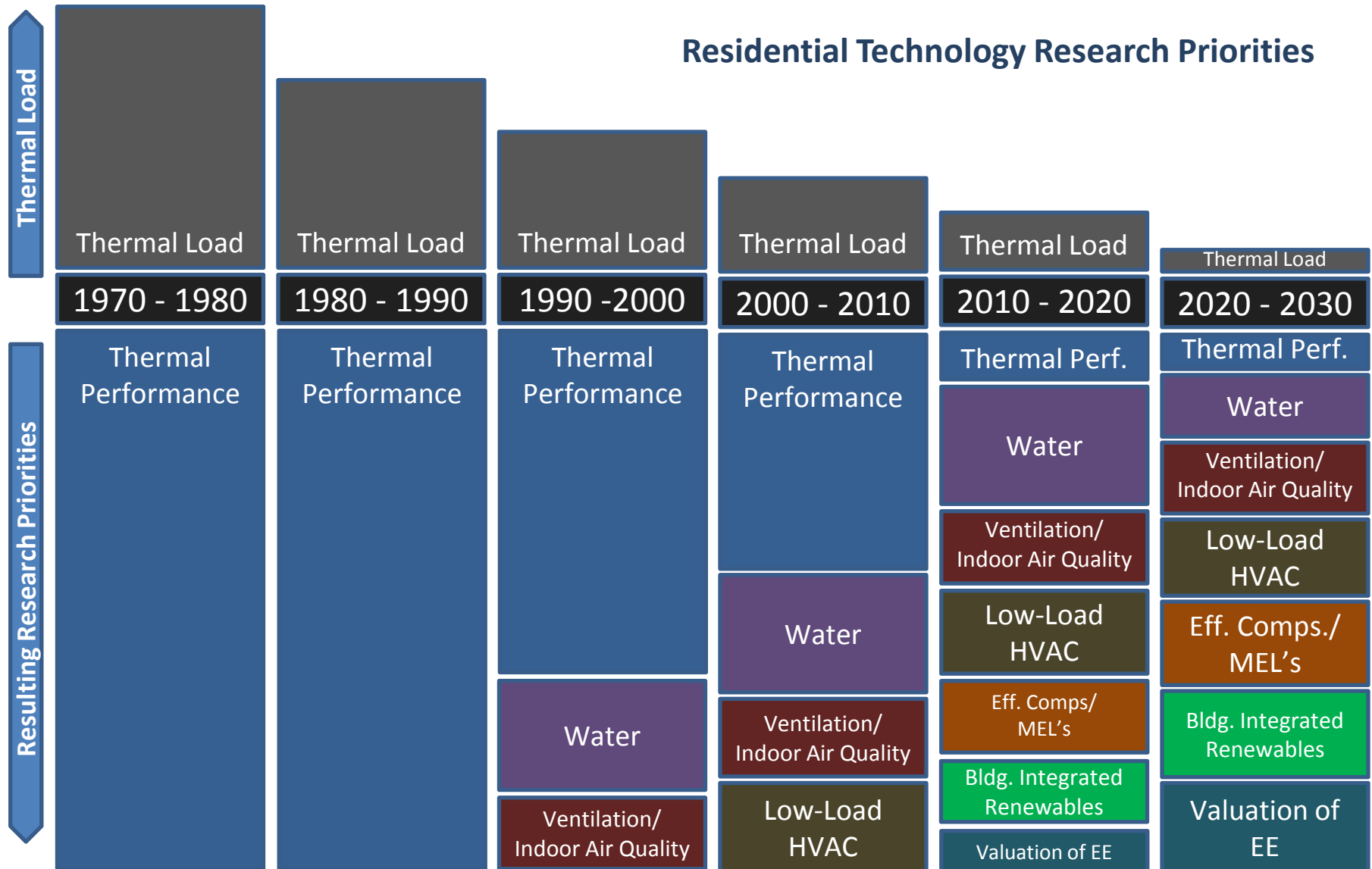
Recommendation of the Vice President's Middle Class Task Force

Building America is an industry-driven research and demonstration program. To achieve whole house energy efficiency, we need to control air, moisture, & thermal flows in homes. Building America accelerates the development and adoption of advanced technologies and practices for energy efficient existing and new homes.

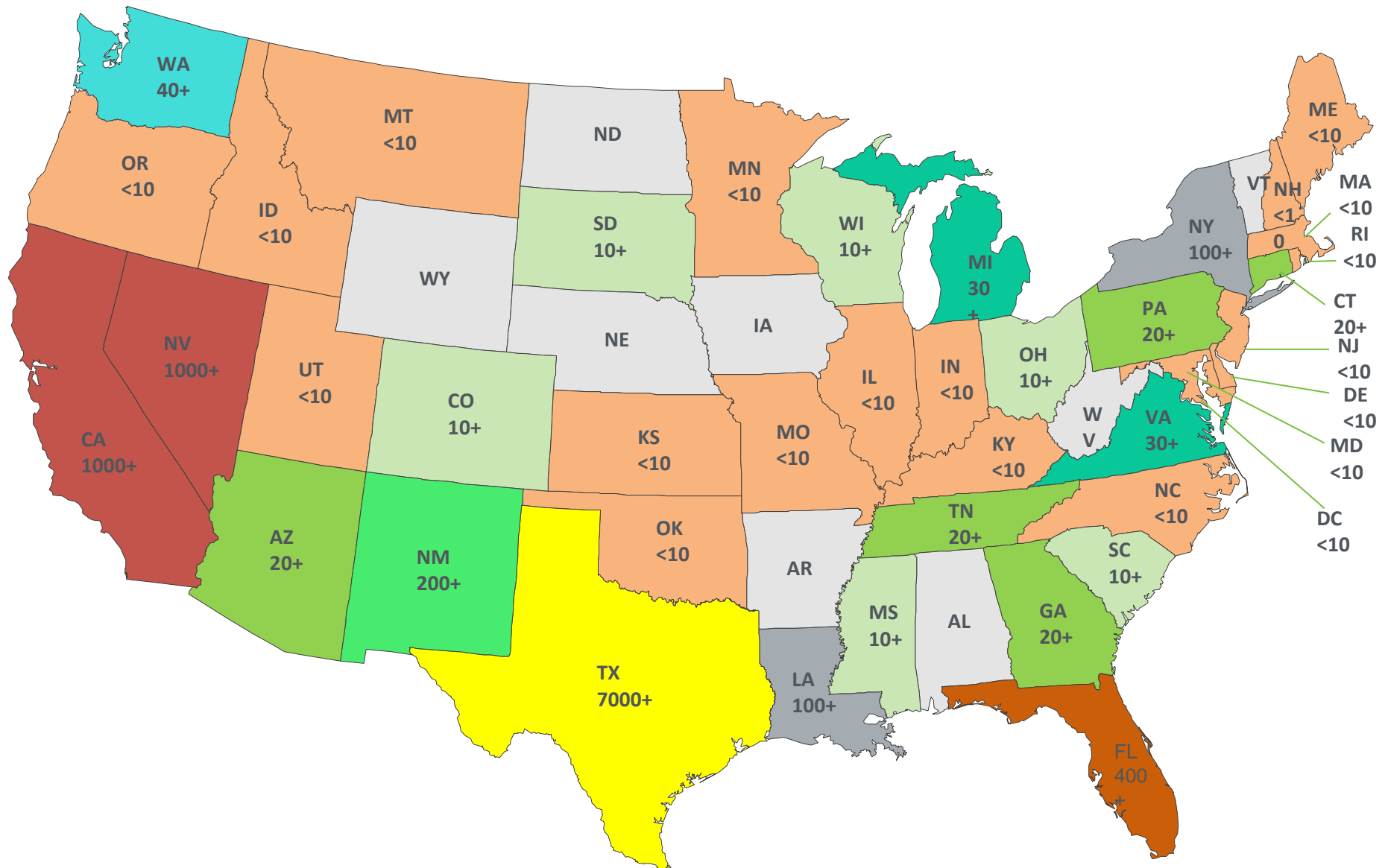


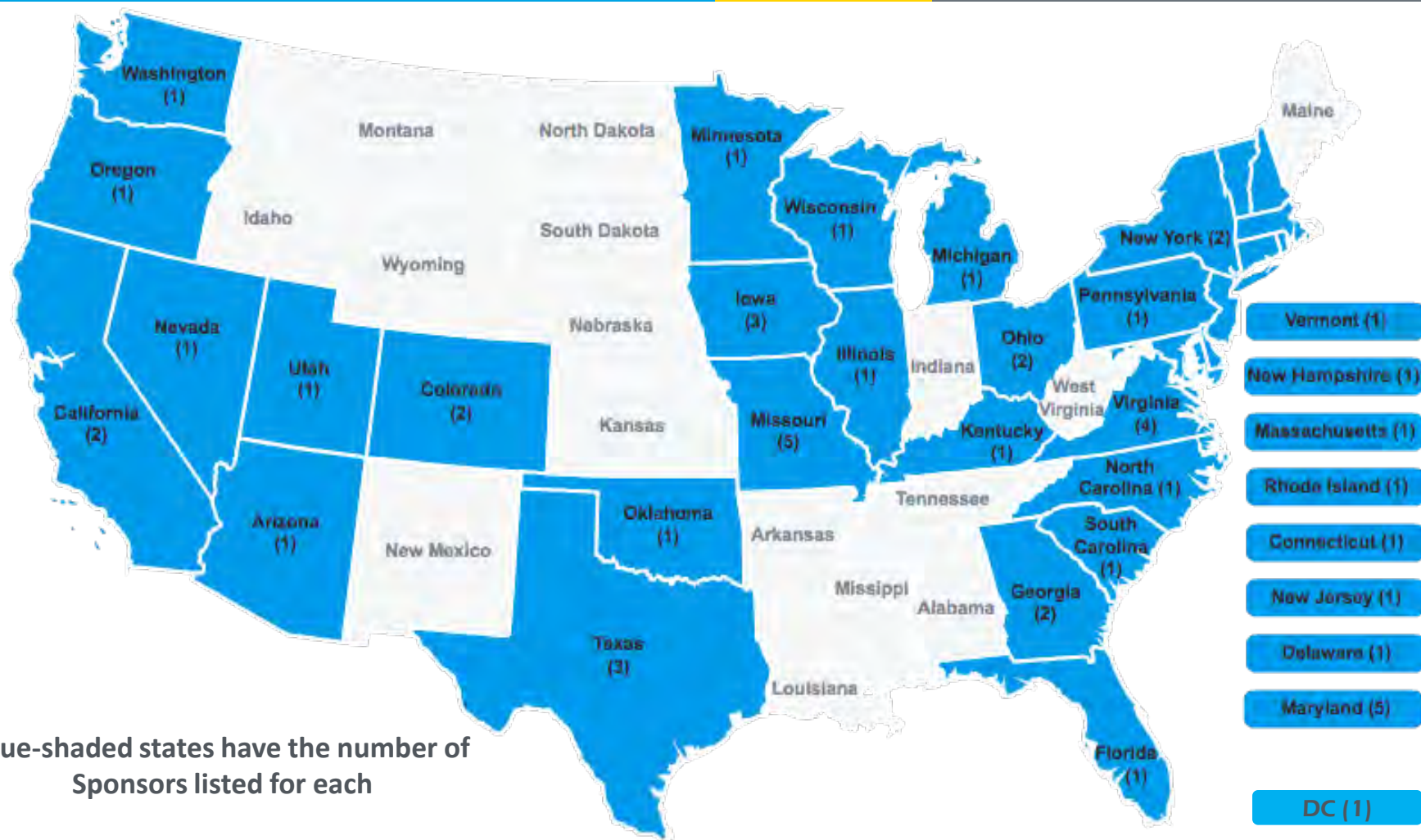
Thermal Loads Substantially Reduced as Homes Approach Net Zero Ready

Residential Technology Research Priorities



Builders Challenge Participants

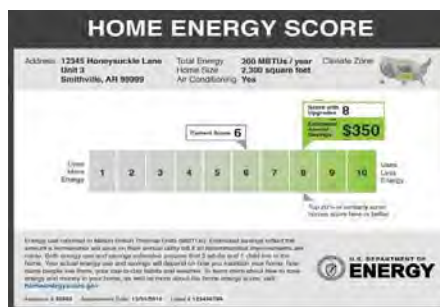




Program Goals:

- 1) Retrofit 60,000 homes in 2012, 2) Identify lessons learned based on deployment successes and failures, and 3) transition unsuccessful grantees to sustainable models.

- Provide current HPwES news, information, and relevant documents
- Regional Account Managers
- Provide technical support
- Encourage Sponsor feedback
 - Ability to help guide future development of HPwES
- Coordination with other federal programs
 - Support integration with Home Energy Score and Guidelines for Home Energy Professionals
 - Provide research opportunities through Building America teams
 - Share lessons learned with the Better Building Neighborhood Program
 - Link to national laboratories



The Solar Decathlon Enhances Energy Efficiency Education & Awareness

DOE's Solar Decathlon is an award-winning program that challenges collegiate teams to design, build, and operate solar-powered houses that are cost-effective, energy-efficient, and attractive

Highlights:

- The 2011 event had over 357,000 house visits in 10 days
- Over 4,000 middle school students toured the houses
- 250 articles appeared in nearly 150 print publications worldwide
- 500 television interviews worldwide and 87 radio interviews

Irvine, California has been selected as the site for the 2013 Solar Decathlon

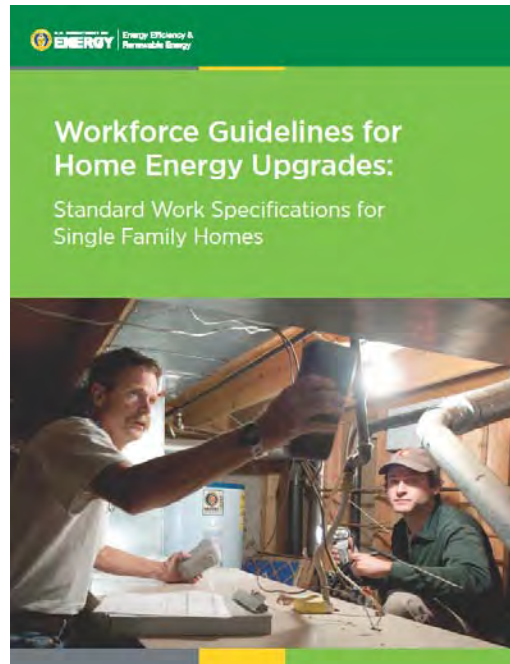


First Place Winner – University of Maryland

2013 Solar Decathlon Teams

- [Arizona State University](#) and [The University of New Mexico](#)
- [Czech Technical University](#)
- [Hampton University](#) and [Old Dominion University](#) (Virginia)
- [Middlebury College](#) (Middlebury, Vermont)
- [Missouri University of Science and Technology](#) (Rolla, Missouri)
- [Norwich University](#) (Northfield, Vermont)
- [Queens University](#), [Carleton University](#), and [Algonquin College](#) (Kingston and Ottawa, Ontario, Canada)
- [Santa Clara University](#) (Santa Clara, California)
- [Southern California Institute of Architecture](#) and [California Institute of Technology](#) (Los Angeles, California)
- [Stanford University](#) (Palo Alto, California)
- [Stevens Institute of Technology](#) (Hoboken, New Jersey)
- [The Catholic University of America](#), [George Washington University](#), and [American University](#) (Washington, DC)
- [The University of North Carolina at Charlotte](#) (Charlotte, North Carolina)
- [The University of Texas at El Paso](#) and [El Paso Community College](#) (El Paso, Texas)
- [University of Calgary](#) (Calgary, Alberta, Canada)
- [University of Louisville](#), [Ball State University](#) and [University of Kentucky](#) (Louisville, Kentucky; Muncie, Indiana; and Lexington, Kentucky)
- [University of Nevada Las Vegas](#) (Las Vegas, Nevada)
- [University of Southern California](#) (Los Angeles, California)
- [Vienna University of Technology](#) (Vienna, Austria)
- [West Virginia University](#) (Morgantown, West Virginia).

Goal: Collaborate with industry to develop the tools for a high-quality residential energy upgrade industry, supported by good training and a skilled and credentialed workforce.



Guidelines for Quality Work

Guidelines for Effective Training

Guidelines for Professional Certifications

Recommendation of the Vice President's Middle Class Task Force

Status: Public comment #2 on Guidelines for Quality Work Q1 2012; Guidelines for Effective Training in place; 4 new professional certifications available Q2 2012

SEEARP... It's Working!

Launched December 2009

\$300 million in funding – 56 states

1.7 million rebates by Sept 2011

Less than 1% will revert to the Treasury

Closing February 2012

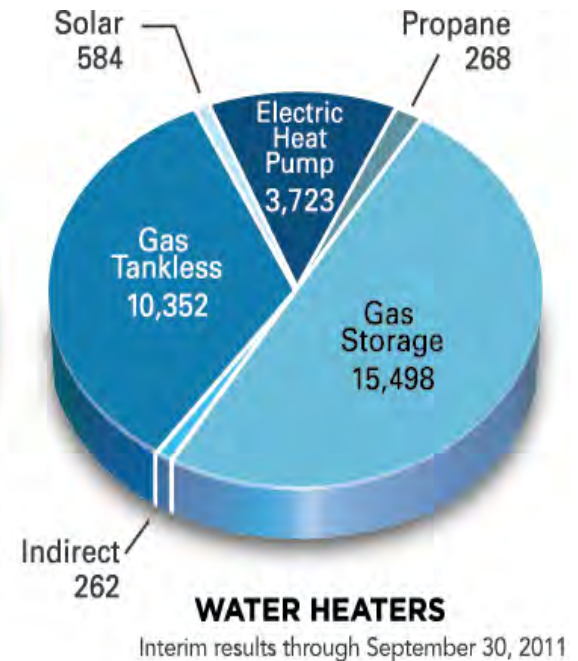
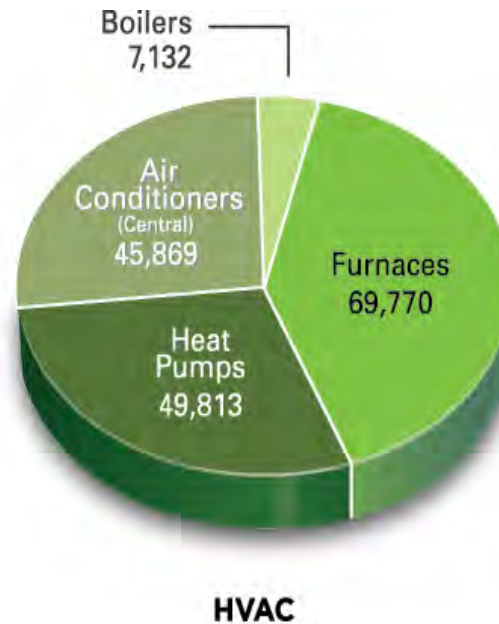
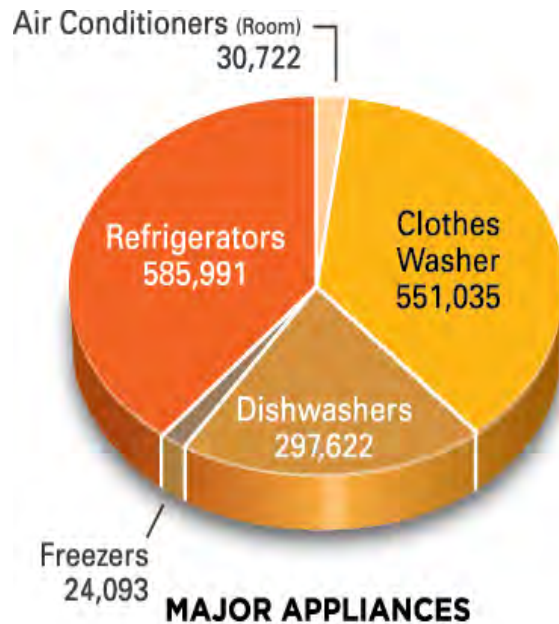
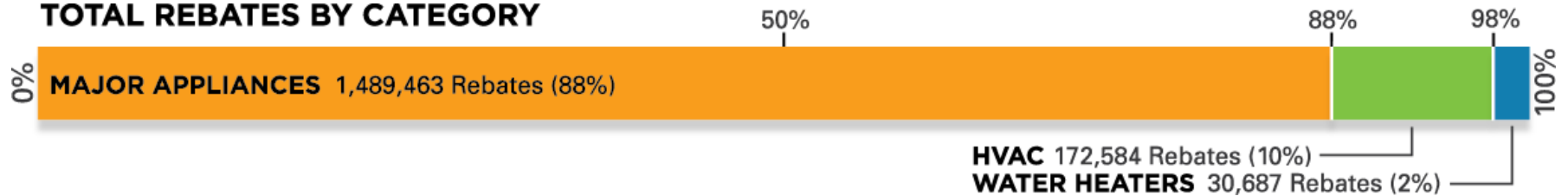
	Major Appliances	HVAC	Water Heaters	All Products
Total Rebates and Percent of Total (Thousands)	1,489 (88%)	173 (10%)	31 (2%)	1,693 (100%)
Rebate Payments to Customers (Millions)	\$166	\$81	\$6	\$254
Consumer Spending (Millions) and Leveraging Ratio	\$1,296 (6.8:1)	\$620 (6.6:1)	\$38 (4.8:1)	\$1,954 (6.7:1)
Sales Tax Leveraged* (Millions) and Leveraging Ratio	\$72 (0.4:1)	\$35 (0.4:1)	\$2 (0.3:1)	\$109 (0.4:1)
Annual Cost Savings* (Millions)	\$48	\$15	\$3	\$65
Annual Energy Savings* (Billions of Btu)	735	738	151	1,624

* Estimated

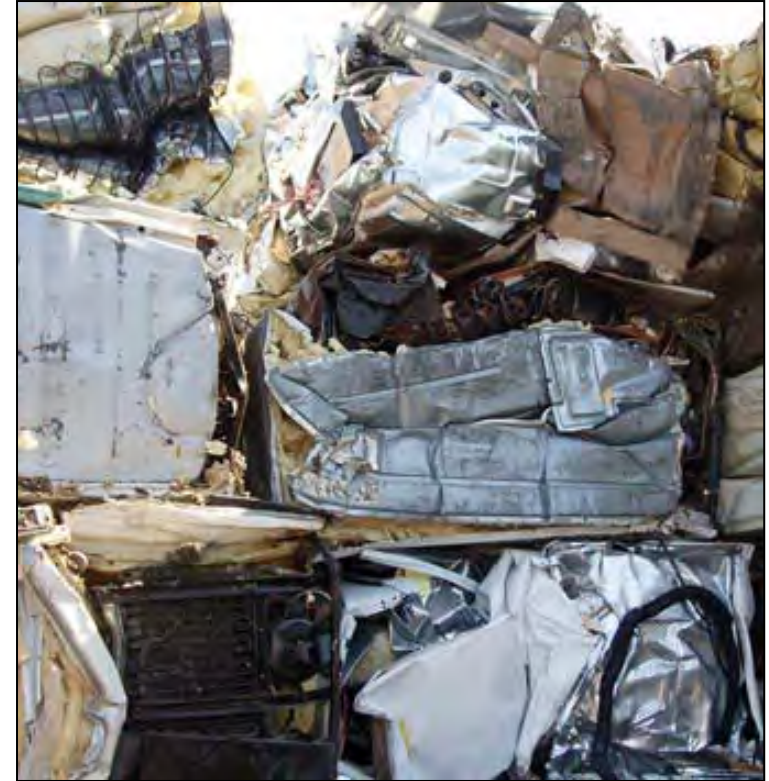
Interim results through September 30, 2011.
Due to rounding, the sum of the first three columns may not equal the "All Products" total.

SEEARP... The Rebates

TOTAL REBATES BY CATEGORY

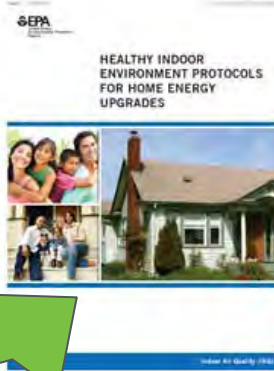


SEEARP Was a Boon for Recyclers – Paving the Way to a Sustainable Program



Taking old appliances off the grid and reclaiming their reusable material

Putting it All Together



Assess efficiencies and viability of technical EE innovations through Building America and lab research

Incorporate Workforce Guidelines and Indoor Air Protocols for Home Energy Upgrades

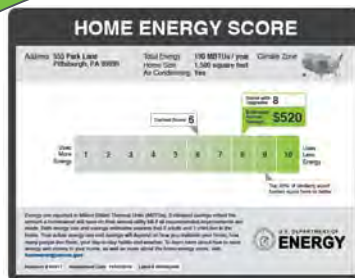
2010

2011

2012



Promote Successes for all DOE Retrofit Programs – Expand Beyond Grants



Integrate HPwES

Incorporate Home Energy Score

Incorporate SEE Action recommendations

Leverage bulk purchasing strategies

Regulatory Efforts Translate to Huge Savings

DOE Future Direction: Goals, Strategies and Progress

Model Energy Codes: 50/70/90 Goals

50% Goal of Increased Energy Savings

- Cost-effective, Product Neutral and Increase Usability
- Exploring performance-based options
- Alternative paths to compliance

Progress: Achieved 30% in IECC 2012 and 90.1-2010

70% Initiative for Increased Adoption

- 40 states and territories to adopt ARRA target codes or most current model codes by 2015

Progress: 27 adopted IECC 2009; 1 adopted 2012 IECC
34 adopted 90.1-2007; 1 adopted 90.1-2010

90% Compliance by 2017

- Demonstrate compliance with ARRA requirements
- Increase the number and availability of compliance guides, field measurement tools, and resources

Progress: Established and tested compliance methodology

50% Better Codes
Proposed by 2013/2015

70% Code Adoption by 2015

90% Compliance by 2017

Research & Development Activities

Commercial Code Development

- Submit code proposals towards 50% goal
- Provide technical performance indicator analysis to support code development

Residential Code Development

- Publish Residential Cost-Effectiveness Methodology to evaluate the energy and economic impacts of codes
- Develop code change proposals to update the IECC towards the 50% goal

Rulemakings

- Final 2012 IECC Determination currently at OMB
 - Preliminary Determination for 2012 IECC published in October 2011
- Final rules for Fossil Fuel, Sustainable Design, Federal Building Efficiency Standard (90.1-2010); all final rules at OMB
- Manufactured Housing NOPR is at OMB
- Federal Building Efficiency Standard (2012 IECC) to be issued in 2012

Deployment Support

Adoption-Technical Assistance to States:

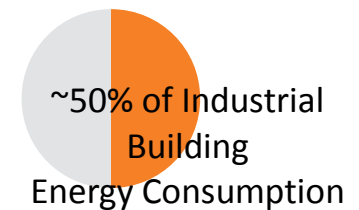
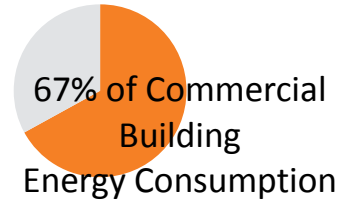
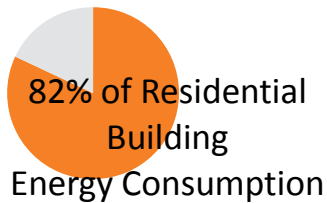
- State specific adoption and compliance plans
- Analysis of energy savings associated with adoption of new codes
- Analysis of first cost impacts and cost-effectiveness associated with adoption of new codes
- Comparative analysis of future code options
- Development of Resource Guides Series

Compliance- Support states as they work to demonstrate compliance:

- National deployment of compliance tools and assessments at state level
- Development of customized training materials for state codes
- Web-based and in-person training on the national model codes and state codes
- State-specific energy codes in [REScheck](#)
- State-specific energy codes in [COMcheck](#)

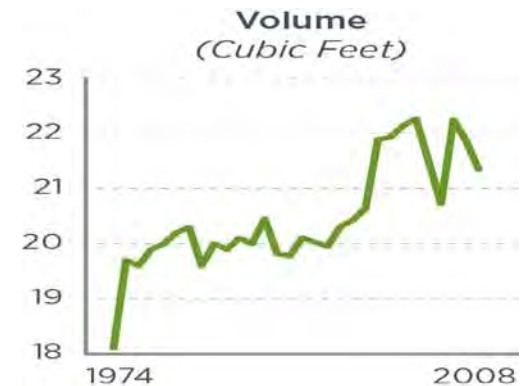
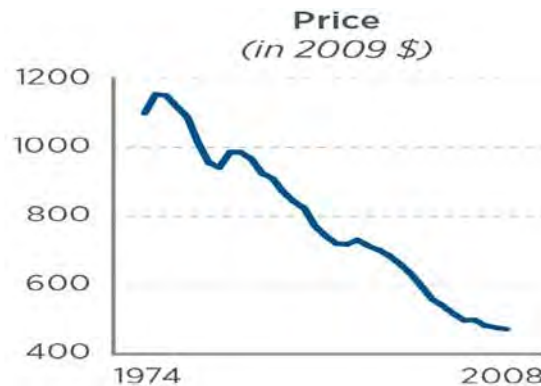
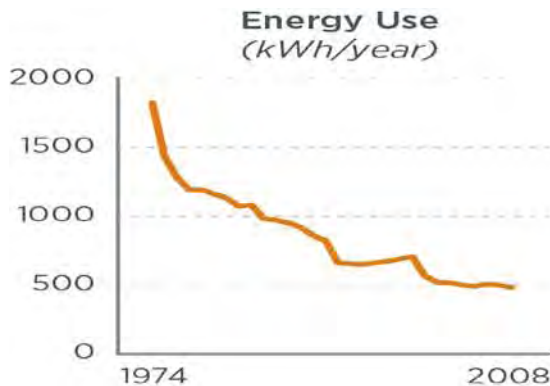
What does the Building and Equipment Standards Program Cover?

Over 50 products are covered by DOE's Building and Equipment Standards program. These are known as "covered products." Covered products are responsible for:



Because of the successful standards put into place by the Building Technologies Program, today's refrigerators use only about 30 percent of the energy that was required to power models built in 1975. Compared to those 1970's models, today's refrigerators **save the nation about \$20 billion per year** in energy costs, or \$150 per year for the average American family.

The next proposed increase in refrigerator and freezer efficiency— scheduled to take effect in 2014— will save the nation almost 4.84 quadrillion Btu over 30 years. That's the equivalent amount of energy savings that could be used to power a third of Africa for an entire year.



Accomplishments

- Through the energy saved since the first Federal standards in 1987, DOE has helped avoid the construction of up to 31 power plants....the same amount of electricity consumed annually by Spain
- Standards that went into effect from 1988 to 2006 will have an estimated cumulative energy savings of 39 quads by 2020, and 63 quads by 2030
- Cumulative net present value of consumer benefit amounts to:
 - \$64 billion at the end of 2005
 - \$150 billion as of 2010
 - \$241 billion by 2030
- The program has delivered more than \$650 in net savings for every federal dollar spent; consumers and businesses are saving \$15 billion a year as of 2010 and this is expected to nearly double by 2025
- Annual carbon savings reach 38 million tons by 2020 and the cumulative savings by 2045 is estimated at 1,200 million tons



The Building Technologies Program Thanks You

Roland Risser

Program Manager

Robert Aasen

Planning and Analysis

Saralyn Bunch

Building Energy Codes

John Cymbalsky

Appliances and Equipment

David Lee

Residential Program

Arah Schuur

Commercial Program