Tapping into Energy Efficiency (EE) Throughout the Nation

July 16, 2015

Overview

- Energy efficiency (EE) presents a significant opportunity to reduce air emissions including greenhouse gas emissions
- Many opportunities for EE with an existing network of Energy Efficiency Program Sponsors (EEPS):
  - Proven & reliable programs
  - Quantifiable energy savings
- Well-established, effective national support infrastructure

Strategic Approach

- States and utilities are increasingly relying on energy efficiency as a least-cost solution to address system needs
- Basic strategic approach is to use investments and market intervention to overcome barriers preventing broader uptake of EE measures

Barrier	EEPS' Role in Reducing Barrier
Higher first cost	Financial Incentive
Lack of product availability	Upstream or stocking incentive
Lack of consumer awareness	Customer direct outreach/local PR
Lack of supply channel awareness	Supply channel outreach/training/PR

- EE sponsors typically view programs as a portfolio
  - Sectors and approaches selected to meet particular program goals

Growing Reliance on Energy Efficiency

- As of January 2014, 26 states adopted and fully funded an EERS policy; in 2014, Indiana and Ohio legislators decided to roll back their states' EERS
- Utility budgets rose to $7.7 billion in 2013, a 7% increase over a year earlier

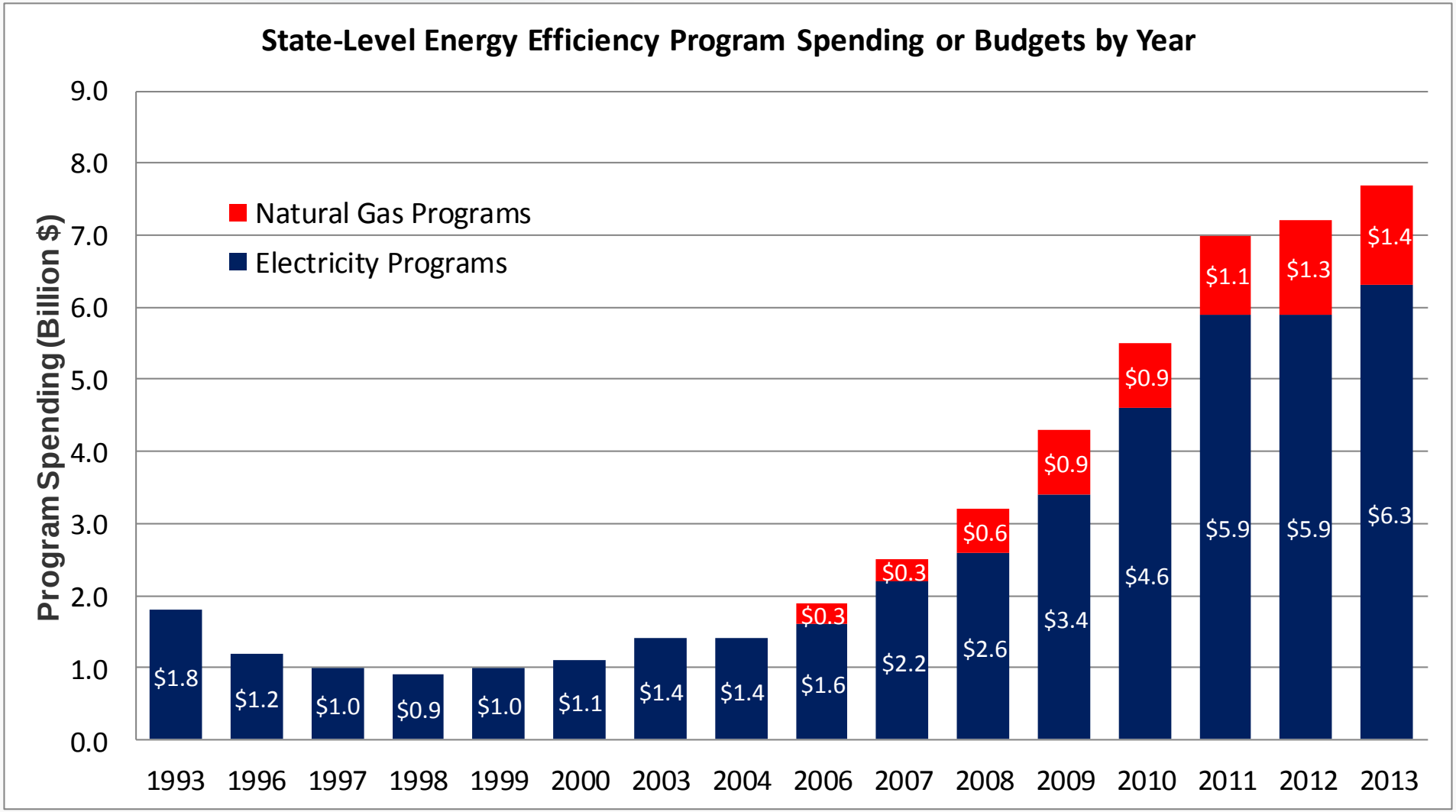
States with Energy Efficiency Resource Standards (EERS) in Place

Source: ACEEE 2014 State Energy Efficiency Scorecard

EE Programming: Funding and Administration

- Largest programs are typically Investor Owned Utility (IOU) programs funded by utility rate payers with
  - Program costs recovered in rates or
  - Small per kWh surcharges
- Majority are utility administered; a few are state administered
- Most state Public Utility Commissions do not have jurisdiction over municipal utilities and electric cooperatives absent other state legislation
- Forthcoming ENERGY STAR State Snapshots on Electricity Delivery and EE Programming will provide valuable background for information gathering and outreach
- Having supportive policies is strongly linked to significant investment in EE programming;
  - *Energy and Environment Guide to Action* is a good resource for learning more about these policies
    - http://epa.gov/statelocalclimate/resources/action-guide.html

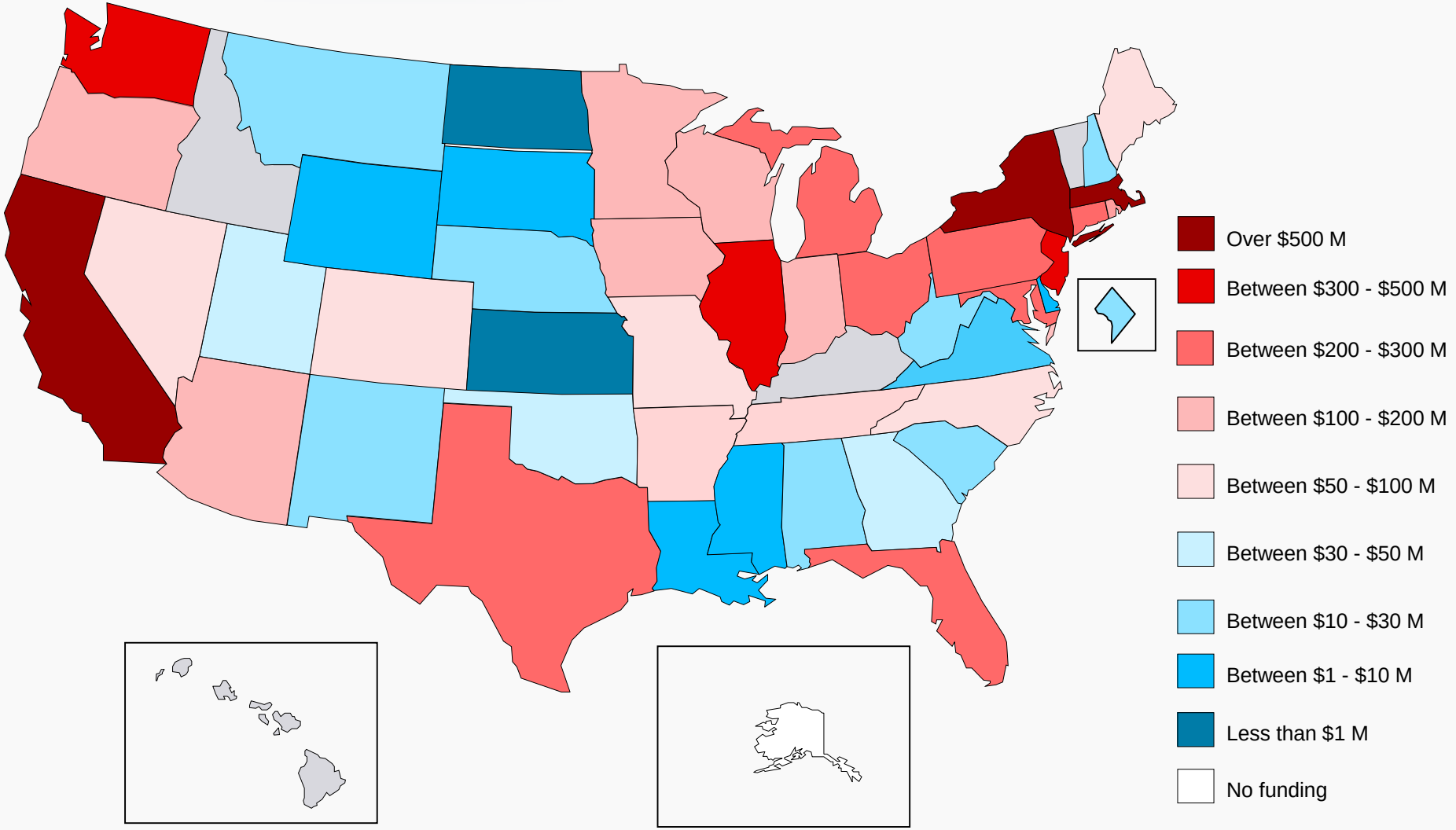
Growing Program Resources



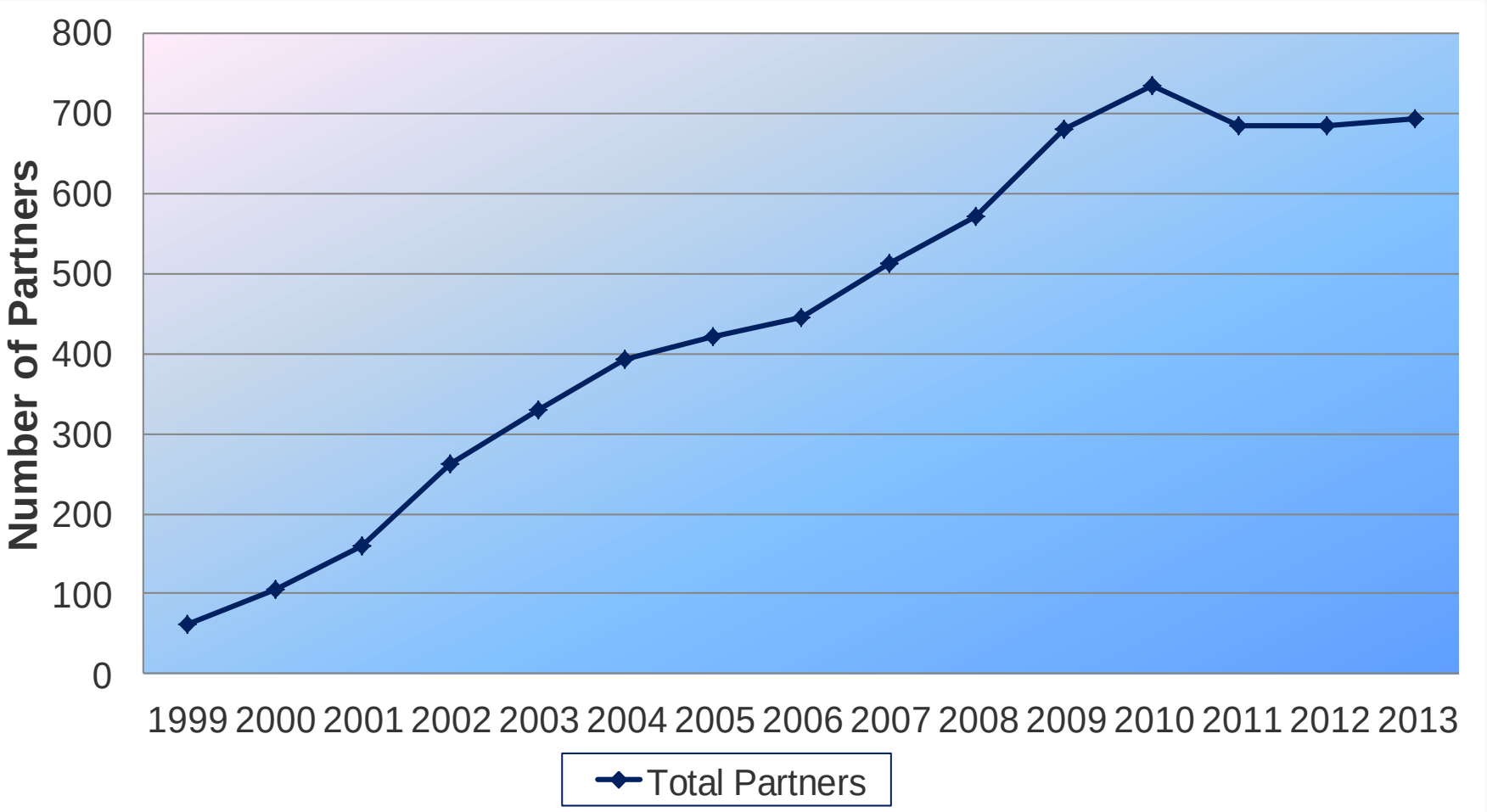
Source: ACEEE 2014 State Energy Efficiency Scorecard

*All values are actual program spending (EIA Form 861) except for 2009, 2010, 2011, 2012, and 2013 which are budgets (CEE Annual Industry Reports).

Significant Funding in a Growing Number of States (2014-15 est.)



EPA Partnerships with Energy Efficiency Program Sponsors



Note: EEPS include electric and gas utilities as well as state agencies

Established Energy Efficiency Programs

Efficient Residential Products

Key Program Elements/Approaches

- Financial incentives/rebates: consumer-direct, buy-downs, and other cooperative marketing incentives offered via retail or other major distribution channels
- Consumer education
- Outreach/training to retailers and other major distribution channels (e.g., grocery and hardware stores, HVAC and plumbing contractors) depending on focal product to ensure availability and promotion
- As applicable:
  - retirement and proper recycling of refrigerators (in accordance w/EPA Responsible Appliance Disposal program) to permanently remove them from the grid (sometimes also recycle room a/c and dehumidifiers)
  - quality installation requirements for central heating and cooling systems to ensure proper sizing, refrigerant charge, and system air flow

***Example**:* South Carolina Electric & Gas

- Reduced overall energy consumption by an estimated 200,000 MWh since its program launched in 2011

Efficient Products Initiative — State/Regional Collaboration

Key Program Elements/Approaches

Collaborative approach: Multiple program administrators collaborate to deliver greater results than individual states or service territories could produce alone

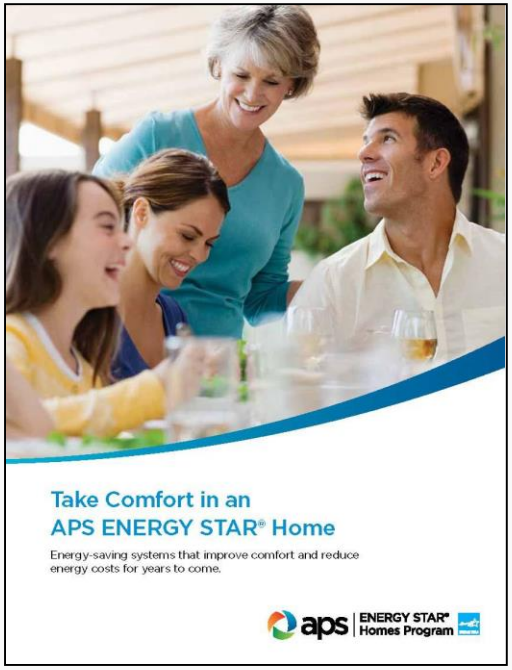
***Example**:* Northeast Retail Products Initiative

- 2013 energy efficient product initiatives will achieve over 5.9 million MWh in lifetime energy savings and avoid emissions of 4.6 million tons of CO_2
- Sponsored by Cape Light Compact, National Grid, NSTAR Electric, Western Massachusetts Electric Company, NH Saves, Efficiency Vermont, Connecticut Light and Power, The United Illuminating Company, Connecticut Municipal Electric Cooperative, PSEG Long Island, and NYSERDA, the initiative is a regional effort facilitated by the Northeast Energy Efficiency Partnerships
- Engages multiple types of program administrators and utilities (muni, co-op, IOU, efficiency utility, state) and ongoing for 13 years

Efficient New Homes

Key Program Elements/Approaches

- Whole house energy efficiency (not just efficient products)
- Consumer-facing outreach and education on value of energy-efficient new construction
- Builder outreach—including recruitment support, education and training, tools, marketing, and technical assistance
- Strategic incentives to cover additional costs of Home Energy Rating System (HERS) verification, equipment efficiency improvements, marketing co-ops
- Market-based solutions for quality assurance and oversight of verification
  - Can be augmented by energy efficiency program administrator, if desired



***Example**:* Arizona Public Service

- > 3,000 energy-efficient homes sponsored in 2014
- Annual savings > 10,000 MWh

Efficient Affordable Housing

Key Program Elements/Approaches

- Energy-efficiency is particularly important in the affordable housing sector
- Consumer-facing outreach and education on value of energy-efficient new construction
- Builder/Affiliate outreach—including recruitment support, education and training, tools, marketing, and technical assistance
- Outreach to other stakeholders such as State Housing Financing Agencies, U.S. Department of Housing and Urban Development (HUD), Habitat for Humanity and weatherization programs
- Strategic incentives to cover additional costs of Home Energy Rating System (HERS) verification, equipment efficiency improvements, marketing co-ops
- Market-based solutions for quality assurance and oversight of verification
  - Can be augmented by energy efficiency program administrator, if desired

***Example**:* Houston Habitat for Humanity

- > 600 energy-efficient homes constructed since 2001
- Lifetime savings > 395,000 kWh
- > 480,000 pounds of avoided CO_2 emissions

Efficient New Multifamily Housing

Key Program Elements/Approaches

- Important and growing sector of new construction marketplace
- Whole-building and unit-level opportunities for energy-efficiency improvements
- Consumer-facing outreach and education on value of energy-efficient new construction
- Builder/Developer outreach—including recruitment support, education and training, tools, marketing, and technical assistance
- Strategic incentives to cover cost of testing and verification requirements
- Market-based solutions for quality assurance and oversight of verification
  - Can be augmented by energy efficiency program administrator, if desired

***Example**:* NYSERDA

- > 6,500 energy-efficient units (new construction) to-date
- Annual savings > 35,000 MWh
- > 53 million pounds of avoided CO_2 emissions

Efficient New Manufactured Homes

Key Program Elements/Approaches

- Manufactured housing offers a unique opportunity to extend the advantages of controlled-environment factory production to include energy efficiency
- Consumer-facing outreach and education on value of energy-efficient new construction
- Manufacturing Plant outreach—including recruitment support, education and training, tools, marketing, and technical assistance
- Strategic incentives are typically focused on manufacturing plants; cover the increased wholesale costs of producing energy efficient manufactured homes
- Market-based solutions for quality assurance and oversight of verification
  - Can be augmented by energy efficiency program administrator, if desired

energyright® solutions TVA

***Example**:* TVA

- > 1,100 energy-efficient homes
- Annual savings > 13,600 MWh
- > 20.6 million pounds of avoided emissions

Home Improvement

Key Program Elements/Approaches

- On-line/DIY assessments
  - Provide consumers with basic information about their homes' performance and general recommendations for improvements to enhance efficiency
- In-home/Professional audits
  - Opportunity to review energy use and comfort concerns with homeowners; conduct inspection of exterior--walls, foundations and roofs; check and record age/type/condition major systems (e.g., heating, ventilation, and air conditioning – "HVAC")
  - Often include free installation of low-cost energy-efficiency improvements (e.g., ENERGY STAR certified bulbs and low flow WaterSense showerheads) to ensure some savings from every home audited
  - Provide customized/prioritized recommendations to consumer for more comprehensive improvements; estimated savings reports; next steps for locating trained service providers
  - Consider offering advanced whole-home audit and improvement via Home Performance with ENERGY STAR (for experienced markets w/network of qualified contractors)

***Example**:* Baltimore Gas and Electric

- Completed 6,600 comprehensive whole-house energy audits, reducing combined energy use by nearly 6 million kWh

Efficient Commercial Products

Key Program Elements/Approaches

- Financial incentives that cover a portion of the incremental cost of installing higher efficient technology—often set to a payback threshold (e.g., 1 to 2 years)
  - Prescriptive incentives—an advertised financial incentive for installing higher efficiency units; savings amounts are often "Deemed" by regulators
  - Calculated incentives—for larger or more complicated jobs; spreadsheets often built off of engineering algorithms and target multiple measures; may cap incentives on a sq. foot basis; more likely to require pre-approval or onsite verification
- Marketing and outreach to end users (advanced programs tailor outreach by end users, e.g., offices, retail space, schools, etc.)
- Linkage to FEMP or ENERGY STAR specifications as relevant (e.g., lighting, IT, rooftop unitary HVAC, commercial food service equipment)
- Program marketing via trade allies—manufacturers, vendors, equipment installers, and retailers; in some cases, trade ally incentives are offered to motivate sales
- Proof of proper installation, onsite verification, or commissioning assistance depending on measures

***Example**:* Pacific Gas and Electric Company

- Offer a coordinated commercial food service (CFS) statewide program with the CA IOUs that achieves on average savings of 8 million kWh and 550,000 therms
- From 2010 through 2012, PG&E rebated 8,196 CFS units and saved 14.6 million kWh and 595,000 therms

Commercial Whole Building Improvement

Key Program Elements/Approaches

- Segmented marketing by sector (e.g., office, schools, hospitality, etc.)
- Facilitated benchmarking with Portfolio Manager (support for benchmarking/disclosure policies as relevant)
- Engaging upper level management in decision-making
- Conducting building performance assessment to identify improvement opportunities
- Trade ally outreach and training
- Prescriptive or custom incentives to reduce incremental costs of equipment, audit, or retro-commissioning assistance
- Post installation verification
- Offer Building Performance with ENERGY STAR in advanced markets

Example: Consumers Energy

- Pilot program delivered 421 MWh electric savings and 7,360 MCF in gas savings, from an initial focus on school districts
- Based on success, program model was extended to additional sectors, and will be commercialized under Large Commercial Building program umbrella

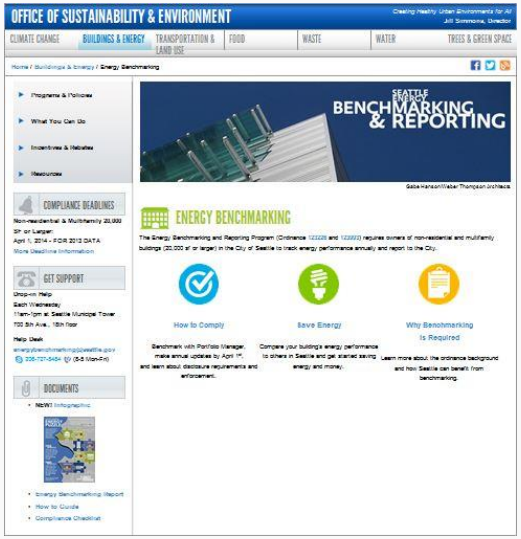
Commercial Building Transparency & Improvement Policies

Key Program Elements/Approaches

- Use of actual energy use data to benchmark existing commercial buildings
- Begin with state/local government buildings to *lead by example*
- Disclosure of benchmarking results
- Implementation options – from voluntary competitions to mandatory policies
- Utilities often provide data, including aggregated whole building energy for multi-tenant buildings

***Example**:* Seattle benchmarking & reporting ordinance

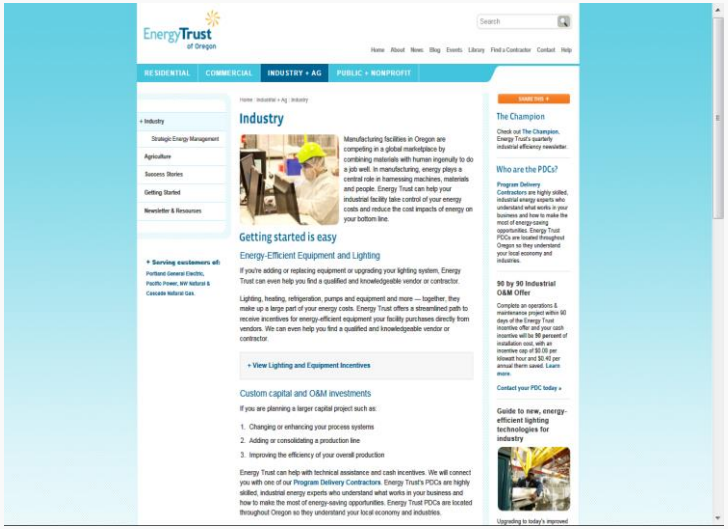
- Over 90% of required buildings reported energy use; the highest compliance rate in the nation
- EPA national analysis shows that buildings benchmarking consistently reduced greenhouse gas emissions 6% over 3 years



Efficient Industry

Key Program Elements/Approaches

- Utilities and service providers can promote savings goals and support their industrial customers in saving energy
- Focus outreach on specific industry sectors
- Promote sharing of best practices and lessons learned among companies in relevant sectors
- Establish an energy savings challenge goal and let industry determine best way to achieve it
- Use recognition to motivate improvement



***Example**:* Energy Trust of Oregon, Strategic Energy Management pilot program

- Several plants committed to achieving the national ENERGY STAR Challenge to Industry goal of reducing energy intensity by 10% or more in 5 years or less
- Three plants achieved the goal, saving over 550,000 mmBtu's of primary energy and avoiding over 12,000 metric tons of carbon dioxide.

Measuring Program Impacts

- How: compare baseline conditions (what would have happened with no program) and program reporting period conditions; controls for actions unrelated to energy efficiency (e.g., weather, building occupancy)
  - Project by project (end-use metering, billing regression, modeling)
  - Deemed savings with good data and historical experience (supported by measure savings, hours of use, and lifetime research)
  - Large-scale consumption data analysis (comparison vs. a control group or regression level analysis on retail electric sales)
- Delivers expected values within an associated level of certainty
  - Level of certainty/rigor varies by program type (i.e., utilities pay more to verify and evaluate large projects or programs that represent a large portion of their energy savings)
- Conducted by independent third-party evaluators with Public Utility Commission oversight

Source: SEE Action Energy Efficiency Program Impact Evaluation Guide 2012

National Support Infrastructure for Effective Energy Efficiency Programming

Reduced Implementation Costs for Program Sponsors

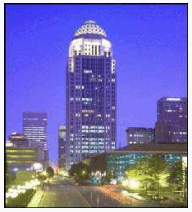
EPA ENERGY STAR infrastructure:

- Defines efficiency—criteria developed and continually refined to remain meaningful (FEMP good resource for some commercial products)
- Develops metrics to measure efficiency—defines/creates standardized ways to measure efficiency as needed
- Ensures integrity—third party certification/verification for products, protocols for onsite verification of homes and home improvements, normalized billing analysis combined with PE verification for buildings
- Makes it easy for consumers to identify and ask for efficiency products and services
- Spurs supply and demand through channel marketing and consumer outreach
- Maintains sophisticated commercial building & industrial energy management tools—e.g. Portfolio Manager
- Allows efficiency programs to focus resources on other barriers

Comprehensive and Widely-Leveraged Platform

Residential

- **Certified New Homes**
  - Deliver 20-30% improvement compared to typical home
  - Many measures cannot be captured cost effectively post construction
- **Connection to Home Improvements**
  - Structural changes to existing homes to improve efficiency (e.g., adding insulation, air sealing, properly installing products)
  - Costs vary, often higher cost



Commercial

- **Corporate energy management**
  - Benchmarking, goals, upgrades (new and existing buildings)
  - Whole building labeling for excellence
    - Technical assistance
    - Uses 35% less energy
  - Cost effective, secure savings through measured performance

Industrial

- **Corporate energy management**
  - Cost effective improvement of plant-level performance, corporate energy management, processes & systems
  - Plant benchmarking, labeling
  - Industrial sector energy guides & tools
  - Secure savings through measured performance

Certified Products

- 70+ products / >1,800 manufacturers
- 10-65% more efficient than typical
- For plug loads—not system components
- Lower cost
- Numerous opportunities across sectors

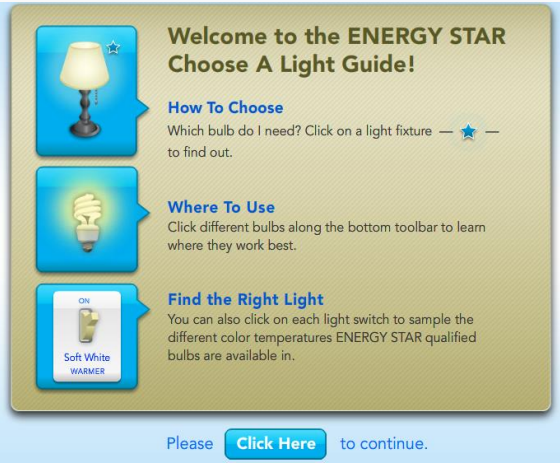
ENERGY STAR Brand Strength

In 2014:

- 89% of households recognized the label
- > 80% had a high or general understanding of the label's purpose
- Households that recognized and purchased ENERGY STAR products rated them 4.0+ (out of 5)
- 75% of knowing purchasers would likely recommend ENERGY STAR to a friend

Portfolio Planning Assistance

- Energy efficiency programs are most effective when viewed and planned as a portfolio
  - How secure is the investment?
  - How much will it cost?
  - When will it achieve savings?
  - How long will savings last?
  - What other investments/strategies need to be considered to offset risks?
  - Is it wise to consider some long-term investments?
- EPA provides guidance based on decades of experience and facilitating best practice exchange



Market Insights

- What is the opportunity?
- What's preventing better uptake?
- Who are the market actors?
- How is the market structured?
- What strategies can help overcome barriers?

November, 2012

ENERGY STAR

UNDERSTANDING AND DESIGNING ENERGY-EFFICIENCY PROGRAMS FOR DATA CENTERS

The U.S. Environmental Protection Agency (EPA) is providing this guide to help inform energy efficiency program administrators about opportunities to save energy in data centers, and to share emerging practices for program design and implementation based on the experiences of recent data center programs.

WHY DATA CENTERS?

Data centers consume up to 50 times the electricity of standard office space.[1] In 2010, between 1.7% and 2.2% of the total electricity use in the United States was consumed by data centers. United States data center electricity use nearly doubled between 2000 and 2005, and increased by approximately 36% between 2005 and 2010. Despite some recent efficiency gains, data centers remain a significant and growing energy end use.[2] Industry analysts expect data center energy consumption to continue to grow at a rate of more than 9% per year through 2020 (from a base of 200 trillion end-use BTUs in 2008 to 600 trillion end-use BTUs in 2020).[3]

Utilities and other energy-efficiency program administrators can play a significant role in helping customers reduce data center operating costs, while also reducing energy demand.

DELIVERING SOLUTIONS FOR DATA CENTERS

Information technology (IT) is intrinsic to our economy, society, and culture. For most enterprises, IT provides crucial support for financial operations, data storage and analysis, and all levels of management.

Data centers consume a significant amount of energy per square foot, even when the physical space they occupy is small. In addition to operating at very high energy intensities, data centers operate 24 hours per day, 365 days per year. This high load factor presents an important target for energy-efficiency programs.

The U.S. Department of Energy (DOE) estimates that for every 1 watt of energy used to directly operate a computer, as much as two additional watts are used by the data center to support that computer. However, the DOE has found that energy-efficient data centers are capable of reducing that consumption by up to 80%.[4]

While data center energy-efficiency programs are relatively new, early pioneers are realizing significant savings. *Duke Energy* and several utilities in *Wisconsin* manage data center programs that achieved an average energy savings of 396 MWh per project during their 2009 to 2012 program cycles. During that time, they processed, paid, and claimed energy savings for 174 applications, ranging in savings from under 250 MWh to greater than 3,000 MWh.[5]

This guide will:

- Characterize the data center market;
- Highlight energy-efficiency program opportunities in data centers;
- Provide an overview of data center programs throughout the country;
- Discuss the market structure and resulting challenges, and suggest solutions to overcome those challenges;
- Summarize appropriate program models and measures;
- Explain program planning strategies and evaluation, measurement, and verification (EM&V) best practices that can mitigate program implementation barriers; and
- Suggest implementation strategies for data center programs.

Consumer Education Platform

National outreach leveraged in local markets

- **Change the World, Start with ENERGY STAR**—engages customers in saving energy at work, at home and in the community
- **Low Carbon IT**—focuses on helping organizations reduce energy use in information technology
- **National Building Competition**—pits buildings across the nation against each other in a battle to trim the most energy waste
- **ENERGY STAR Challenge for Industry**—challenges industry to reduce energy use intensity by 10 percent in five years or less

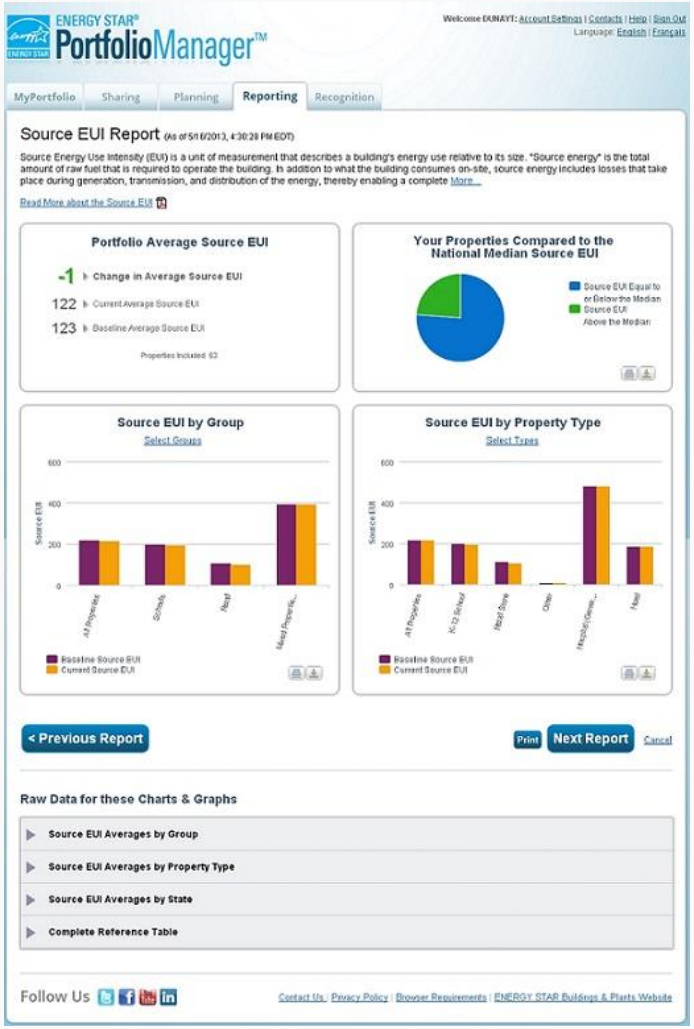
Networking/Barrier Removal

- Partner network
  - > 700 utility and state efficiency programs
  - > 2500 retailers
  - > 1800 manufacturers
  - > 5500 home builders
  - > 6000 commercial and industrial orgs
  - > 1100 service and product providers
- Annual partner meetings
- Online information exchange
- Retail Action Council
- Best practice exchanges
  - Webinars, case studies, program guides, etc.

ENERGY STAR Portfolio Manager

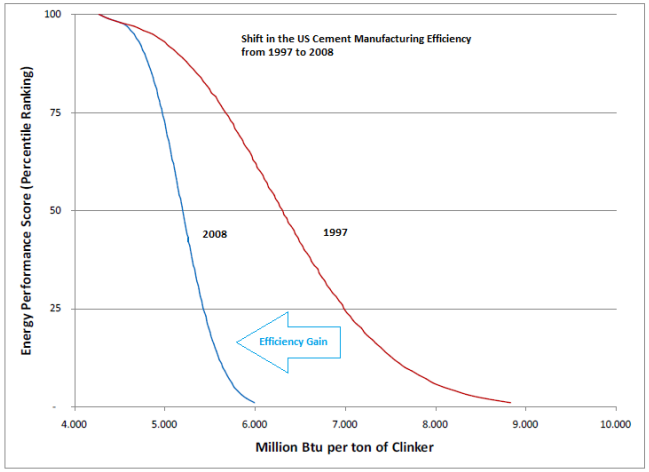
- Management Tool – Helps business and organizations by offering a platform to:
  - Assess whole building energy and water consumption based on actual consumption data
  - Track changes in energy, water, greenhouse gas emissions, and cost over time
  - Apply for ENERGY STAR certification
- Metrics Calculator – Provides key performance metrics to integrate into a strategic management plan
  - Energy consumption (source, site, weather normalized)
  - Water consumption (indoor, outdoor)
  - Greenhouse gas emissions (indirect, direct, total, avoided)
  - ENERGY STAR 1-to-100 score (available for many building types)

→ ***www.energystar.gov/benchmark***



Assistance for Industry

- Motivating improvement
  - **ENERGY STAR Challenge for Industry** - over 1000 plants have pledged to cut energy intensity by 10% in 5 years
  - Over 320 sites have achieved the Challenge for Industry to date, saving over 60 trillion Btu since 2010
  - Several utilities promote the Challenge to their customers.
- Identifying savings potential
  - ENERGY STAR **Energy Guides** identify industry-specific savings
  - ENERGY **STAR Plant Energy Performance Indicators** benchmark plants
- Convening sector-specific initiatives
  - 29 industrial sectors in **ENERGY STAR Industrial Focuses**
  - Shifts in sector-wide efficiency have been observed through the ENERGY STAR Industrial Focuses in Cement, Automobile Assembly, and Corn Refining.
  - Wisconsin Focus on Energy industrial operated successful programs in pulp & paper and food processing sectors.
- Recognizing leaders in ENERGY STAR for effective energy programs for continuous improvement:
  - 35% - ***Toyota's*** intensity reduction since 2002
  - 17% - ***Saint-Gobain's*** energy savings since 2008
  - 8% - ***Eastman Chemical's*** savings since 2008
  - 24% - ***Hanesbrands'*** intensity reduction since 2007
  - 34% - ***Corning's*** intensity reduction since 2005
- Partners across the industrial sector
  - Nearly 800 – corporate industrial ENERGY STAR Partners



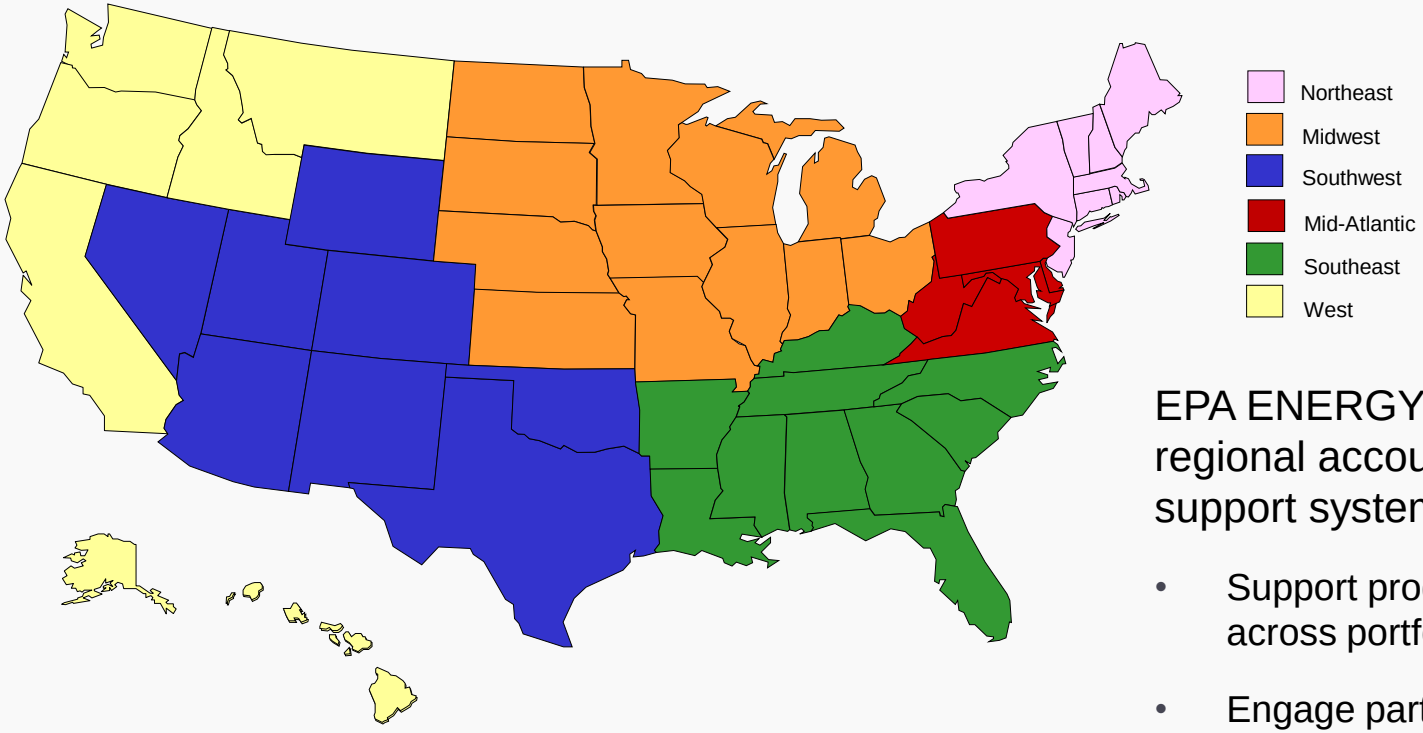
Example: *"Shifted the Performance Curve"*

Since 2002, EPA's ENERGY STAR has helped the US Cement Industry benchmark plant energy performance and manage energy. In 2008, EPA observed that the industry's energy performance **shifted significantly**. This shift represents these reductions:

- 13% in total energy use
- 5.4 billion kg of energy-related carbon dioxide emissions
- 60 trillion Btu

www.energystar.gov/industry

For More Information:



EPA ENERGY STAR maintains a regional account management support system:

- Support program implementation across portfolio
- Engage partners during key decision timeframes pulling in relevant program experts
- EEaccountmanager@icfi.com
- EPA contact: mcnamara.Maureen@epa.gov