

How Residential Energy Efficiency Can Support State Energy Planning



energy.gov/eere/slsc/EEopportunities

About this Presentation

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This short presentation is intended to give states and their stakeholders a vision for what it would look like to include residential energy efficiency in their energy plans.

Residential Energy Efficiency as an Energy Savings Approach

Possible Lead(s)

- State energy office
- Local sustainability program
- Utility or third-party efficiency program administrator

Metrics

- kWh and other fuel savings determined through EM&V, relative to pre-installation usage

Potentially Related Programs

- State/local energy campaigns/challenges
- Access to real estate info on home features and energy expenditures
- Partnerships with housing agencies, real estate, appraisal industries
- Workforce training and certification programs

Savings Opportunity:

245 million MWh (22%) electricity savings nationally by 2042; 0.2 to 22.2 million MWh per state

State Actions and Strategies

Strategies and Approaches

- Achieve energy savings in existing homes through:
 - Public-private partnerships (utility and non-utility)
 - Education and outreach
 - Financial incentives and direct assistance (e.g., funding for low-moderate income households)

State / Local Policy Options

- Establish a state residential EE policy framework with specific goals
- Enact utility regulations and mechanisms that enable investment in residential EE as a resource
- Provide residents with financial incentives and access to financing (e.g., low-interest loans, on-bill, PACE)
- Establish local programs and policies (e.g., outreach and educational campaigns, disclosure ordinances, rental housing requirements)

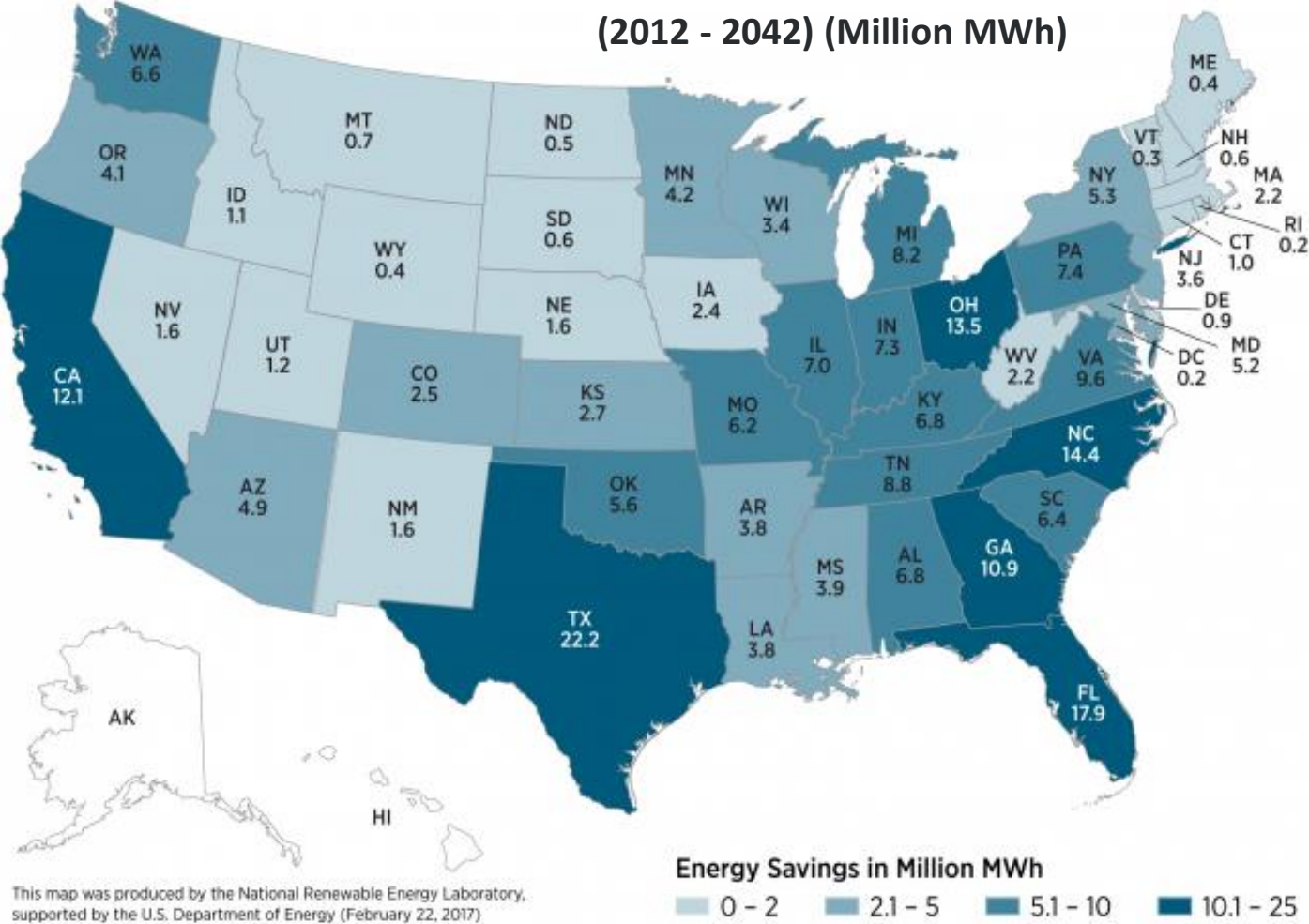
EM&V

Recent EM&V resources provide guidance, including:

- [SEE Action EM&V Resource Portal](#)
- [DOE Uniform Methods Project](#)
- [Residential Program Solution Center Handbook: Evaluation and Data Collection](#)
- [Guide for Benchmarking Residential Program Progress](#)
- [The Status and Promise of Advanced M&V](#)

Sizable Opportunity: Cost-Effective Potential Savings in All States

Estimated Economic Potential Electricity Savings by State
 Residential Single Family (SF) Existing Homes
 (2012 - 2042) (Million MWh)



- State-level electricity savings: 0.2 (RI) to 22.2 (TX) million MWh
- Total electricity savings: 245 million MWh (22%)
- Would also save 4,200 trillion BTUs
- Most states can save 15-30% of SF electricity

This map was produced by the National Renewable Energy Laboratory, supported by the U.S. Department of Energy (February 22, 2017)

NREL, 2017. 2017.Electric End-Use Energy Efficiency Potential in the U.S. Single-Family Housing Stock. <http://www.nrel.gov/docs/fy17osti/65667.pdf>

What is Residential Energy Efficiency?

How Residential Energy Efficiency Programs Work

- A program administrator (e.g., utility, state energy office) works with networks of home improvement contractors and service providers to help households make energy-saving improvements (“retrofits”) to existing homes, such as:
 - Installing **ENERGY STAR lighting and appliances**
 - Tightening or improving the home envelope by **reducing air leaks, adding insulation**, and **installing ENERGY STAR windows**
 - Upgrading to **energy efficient heating, cooling and water heating systems**
- Program administrators help households make informed decisions through access to credible information about a home’s energy use and opportunities for savings
- Program administrators support workforce training and certification programs to support contractors and to ensure quality work that achieves energy savings
- Program administrators typically provide financial incentives (e.g., rebates or incentives) and access to affordable financing (e.g., loans, on-bill financing, R-PACE) to help customers pay for energy efficiency retrofits and related improvements

Benefits of Residential Energy Efficiency

- Lowers household energy consumption and improves energy affordability
- Improves comfort and health of households, and durability of the housing stock
- Addresses utility system priorities and risks, including peak load and transmission and distribution system constraints
- Supports economic development and job creation, especially for small businesses

For more information on residential energy efficiency programs and technologies, visit:

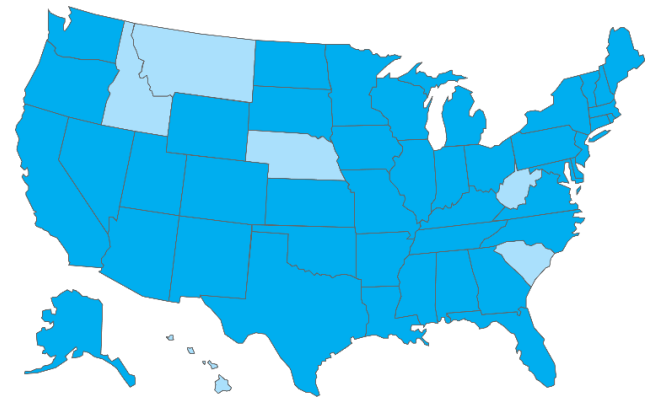
<https://energy.gov/eere/buildings/residential-buildings-integration>

Current Status of Residential Energy Efficiency

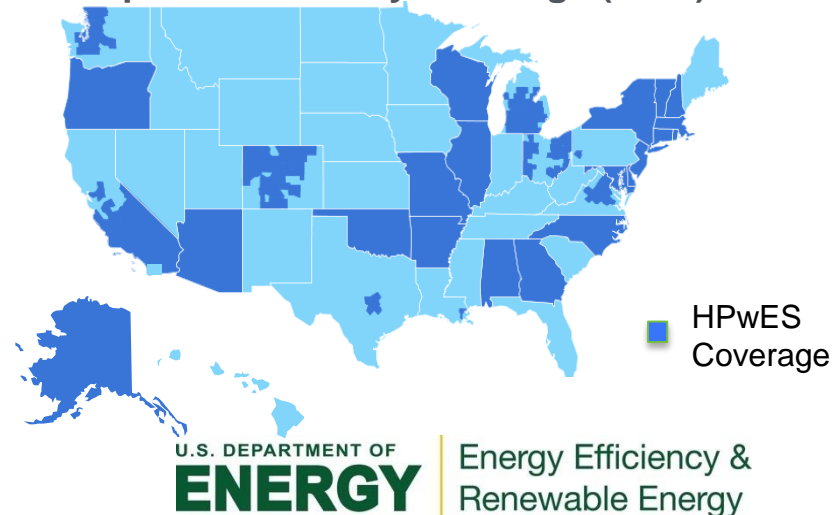
States/localities/utilities in all regions and climate zones offer programs, incentives, or financing options to help households make their homes more energy efficient

- **Dozens of states support residential energy efficiency through state plans, policies, incentives, and public-private partnerships**
 - 24 states have adopted energy efficiency resource standards that include savings from residential buildings
 - Total utility investment in residential energy efficiency was ~\$2.4 billion in 2016
 - Most states and some localities offer financing and/or incentives to households for efficiency improvements
- **DOE offers programs, partnerships, tools and resources for developing and implementing residential energy efficiency programs and services:**
 - The [Residential Program Solution Center](#) provides key lessons, resources, and knowledge from hundreds of residential energy efficiency programs
 - [Home Performance with ENERGY STAR Programs](#) are offered in 30 states and could expand
 - [Home Energy Score](#) is available in all 50 states through a network of local and national partners
 - The [Better Buildings Residential Network](#) offers a national network of 300+ residential programs and service providers with more added regularly

States with Participating Members of the Better Buildings Residential Network



Home Performance with ENERGY STAR Sponsor Territory Coverage (2016)



State and Local Role in Residential Energy Efficiency

To achieve savings at scale, state and local action is required.

Policy Actions

- State and local policymakers can:
 - Develop state energy efficiency goals; include residential energy efficiency in sustainability plans, utility plans, and demand-side management programs
 - Adopt state policies (or local ordinances) requiring disclosure of energy performance of homes (e.g., at time of sale) and add these data to local multiple listing services (MLSs)
 - Fund direct assistance and/or subsidies to low and moderate income households, including for emergency equipment replacement programs
 - Establish minimum energy performance requirements for rental housing (single-family and/or multi-family)
 - Establish minimum workforce qualification requirements or guidelines for contractors & trades performing residential retrofit work, including trade licensing, training, and certification
 - Establish financing and/or incentive programs for residential energy efficiency improvements
 - Ensure work meets or exceeds quality standards and protects consumers by developing policies and procedures for verification of installations, quality assurance, and dispute resolution
 - Develop policies to authorize and implement local government community choice aggregation programs

Implementation Actions

- Partner with utilities, contractors, financial institutions, and private sector firms to help households make energy efficiency improvements
- Conduct or support community-based outreach
- Provide training, certification, and technical assistance to home improvement trades / contractors
- Evaluate progress and adjust or revise programs to improve effectiveness

More details available:

State policies:

[*SEE Action: A Policymakers Guide to Scaling Up Home Energy Upgrades*](#)

Program implementation:

[*Residential Program Solution Center*](#)

Best Practices in Residential Energy Efficiency

States with successful track records:

Establish requirements for utility programs to invest in energy efficiency as a resource that provides consistent, stable funding for residential energy efficiency programs and services

- Establish clear residential energy efficiency program goals and objectives, including requirements for energy savings, customer participation, workforce development, and measurement & verification of benefits
- Sponsor or promote consistent statewide programs, such as Home Performance with ENERGY STAR and Home Energy Score
- Enable access to affordable financing for residential retrofit projects.
- Provide funding and technical assistance to low-moderate income households
- Support the development of a qualified workforce by
 - sponsoring workforce development initiatives and programs
 - forming contractor/trade ally networks
 - establishing minimum licensing, certification and qualifications for trades
- Conduct regular program evaluations that include input from stakeholders, and utilize feedback to continuously improve programs and services

To learn more about proven practices from successful programs and access step-by-step guidance, visit the [Residential Program Solution Center](#).



Partners

- Potential residential energy efficiency program partners include:
 - Housing and community planning and development agencies
 - Nonprofit organizations
 - Utilities
 - Financial institutions
 - Workforce and economic development organizations
 - Community Action Agencies (i.e., low-income assistance, weatherization programs)
 - Home energy raters, home inspectors, and local building inspection and permitting officials
 - Trade associations and contractor networks
 - Real estate and appraisal firms

For more information, see the [Better Buildings Residential Network Partnerships Toolkit](#)

Residential Energy Efficiency: State and Local Examples

State examples

- **Arkansas**
 - Adopted a Statewide [Energy Efficiency Resource Standard \(EERS\)](#) in 2010
 - Enabled [Pay As You Save](#) financing through a State [loan loss reserve mechanism](#)
- **California**
 - Established long-term statewide EE goals for investor-owned utilities; offers traditional and innovative utility-sponsored programs and incentive structures, including [Energy Upgrade California](#) and [Pay for Performance](#)
 - Enabled [residential PACE](#) financing statewide
- **Massachusetts**
 - EERS requires utilities to save > 2.5% of retail electricity savings annually
 - Established the [Mass SAVE](#) program to offer statewide access to assessments, rebates, financing, and low income programs
- **Michigan**
 - EERS adopted with electricity (1%) and natural gas (0.75%) savings goals (percent of retail sales)
 - Established statewide financing ([Michigan Saves](#)) for residential retrofit loans via 3rd party lenders
- **Vermont**
 - Established statewide third-party energy efficiency program administrator model ([Efficiency Vermont](#))
 - Achieving 2% net annual electricity savings from EE programs
- **Washington**
 - [Washington State Energy Strategy](#) (2012) includes recommendations for residential programs, including energy use disclosure, alternative financing, quality assurance, and minimum standards for rental housing

Local examples

- **Austin, TX**
 - City Council established energy savings goals for its municipal utility, [Austin Energy](#), which offers rebates and financing for residential retrofits
- **Cincinnati, OH**
 - Adopted the [Green Cincinnati Plan](#) (2013) with residential energy efficiency goals
 - Offers local programs and incentives for residential retrofits through the [Greater Cincinnati Energy Alliance](#)
- **Fort Collins, CO**
 - Established citywide energy savings goal
 - Municipal utility developed [Efficiency Works](#)TM which streamlines the home energy upgrade process and offers rebates and financing for improvements
- **Mountain Association for Community Economic Development (MACED), KY**
 - Developed the [How\\$martKY](#) program in partnership with six Rural Electric Cooperatives in eastern Kentucky
 - On-bill financing for energy efficiency improvements authorized by the [Kentucky Public Service Commission](#) as a tariff rider
- **Portland, OR**
 - Established community energy savings goals, engaged residents to raise awareness, and initiated a city-wide [home energy efficiency pilot program](#) to develop markets for residential energy efficiency services
 - [Adopted requirement](#) to perform Home Energy Score at time of sale

Complementary / Related Programs

Several options exist for supporting residential energy efficiency service providers and enabling local markets:

- Conduct a community-wide energy campaign or challenge with a residential energy savings goal
- Enable access to information on home characteristics and annual energy consumption
- Establish pathways for energy data to be included in home listings on local multiple listing services (MLSs)
- Develop partnerships with state and local housing and community development agencies to promote residential energy efficiency programs and services to low-moderate income households
- Support workforce development and training programs to train and certify energy raters, inspectors, contractors, trades, and service providers
 - Leverage existing workforce programs and resources (e.g., weatherization training centers, workforce investment boards)

Residential Energy Efficiency Programs Are Cost-Effective

Residential energy efficiency improvements are cost-effective EE investments

- The U.S. average total levelized cost of saved electricity for residential energy efficiency programs was 3.3¢ per kWh from 2009 to 2013 ([LBNL](#))
- Levelized cost of saved electricity for existing homes programs ranges from 2.1¢ per kWh (consumer product rebates) to 9.4¢ per kWh (whole home retrofits) (see [LBNL 2015, Figure 5](#))
- Utilities can offer a range of residential energy efficiency programs and services that meet cost-effectiveness tests
 - Offering a portfolio of programs and services, including bundled measures, can maximize cost effectiveness (e.g., lighting change outs and whole home air and duct sealing programs)
 - Low-moderate income programs are typically excluded from cost-effectiveness tests, or use a modified set of criteria
- Many states also consider the non-energy benefits (e.g., indoor air quality improvements) of residential energy efficiency when evaluating cost effectiveness

Key Resources Include:

- [Keys to the House: Unlocking Residential Savings With Program Models for Home Energy Upgrades](#) (LBNL) – based on cost-effectiveness data compiled from multiple utility-sponsored residential energy efficiency programs
- [DOE Cost-effectiveness Calculator](#) – screening tool to estimate cost-effectiveness of measures
- [National Standard Practice Manual](#) – a framework and recommended best practices for valuation of residential energy efficiency measures and programs

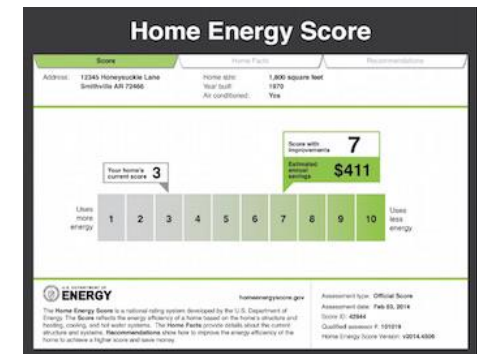
EM&V Methods for Residential Energy Efficiency

Energy savings from residential energy efficiency typically include electricity and other fuels (e.g., natural gas, oil, propane).

- Savings from residential EE are typically determined through well established **EM&V protocols and methods** to determine:
 - Market impacts, cost-effectiveness, program effectiveness, energy savings, and other benefits
 - See: [Uniform Methods Project](#), model protocols for determining energy and demand savings from residential energy efficiency measures
- **M&V 2.0** is becoming available to determine savings from residential energy efficiency
 - Uses automated whole building analytics to provide near-real time savings estimates and greater detail on building energy use and performance
 - See: [The Status and Promise of Advanced M&V: An Overview of “M&V 2.0” Methods, Tools, and Applications](#)
- **Example Reports**
 - [Better Buildings Neighborhood Program national evaluation](#) reports and analyses documented the impact, lessons learned, and market effects from >30 residential energy efficiency programs across the country (2010-2013) to inform future program design and implementation

DOE Sponsored Programs and Resources

- **Partnerships, tools and resources for program administrators**
 - [Home Performance with ENERGY STAR](#) is a public-private voluntary partnership program focused on turning building science-based recommendations into solutions for improved, energy-efficient homes
 - [Home Energy Score](#) helps a homeowner compare their home's performance to other homes located in the same climate
 - The [Better Buildings Residential Network](#) connects energy efficiency programs and partners to share best practices and learn from one another to increase the number of homes that are energy efficient.
 - The [Residential Program Solution Center](#) provides key lessons, resources, and knowledge to help program administrators and their partners develop and implement residential energy efficiency programs
- **Resources for policymakers**
 - The SEE Action Residential Retrofit Working Group publishes resources on state and local residential energy efficiency policies, including [A Policymaker's Guide to Scaling Home Energy Upgrades](#)

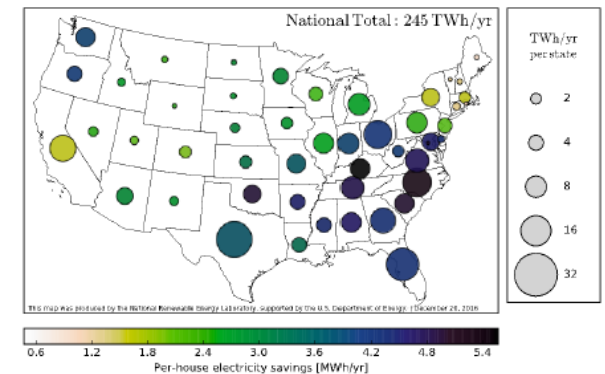


Analytical Tools, Data, and Technical Resources

DOE provides analyses, tools and technical support resources to support residential energy efficiency programs, home improvement trades, and the housing industry

Featured Analyses, Tools and Resources:

- [Electric End-Use Energy Efficiency Potential in the U.S. Single-Family Housing Stock](#) estimates the technical and economic potential of >50 residential energy efficiency measures by state
- [The Health and Home Performance Literature Review](#) reviews the occupant health and indoor environmental outcomes from residential energy efficiency and related home performance upgrades.
- The [Home Improvement Catalyst](#) identifies trade-based measures and strategies for capturing greater energy efficiency through home improvement transactions
- The [Building America Solution Center](#) provides access to expert information on high-performance construction and retrofit measures for builders, home improvement trades and building science professionals



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Visit: energy.gov/eere/slsc/EEopportunities

[How Energy Efficiency Programs Can Support State Energy Planning](#)

Overview and individual presentations on features and benefits associated with including energy efficiency in state energy plans, covering:

- National and state-level energy savings potential estimates for 2030
- Current activity at the national and state levels, best practices, energy savings examples, cost-effectiveness, measurement approaches, and DOE support for:
 - Building energy codes
 - City-led efficiency efforts
 - Combined heat and power
 - Energy savings performance contracting
 - Industrial efficiency, including superior energy performance
 - Ratepayer-funded programs
 - Residential energy efficiency
 - Low income energy efficiency
- Technical assistance available

[Guide for States: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gases and Air Pollution, and Meet Energy Needs in the Power Sector](#)

State and Local Energy Efficiency Action Network (SEE Action) resource presents pathways thru:

- Case studies of successful regional, state, and local approaches
- Resources to understand the range of expected savings from energy efficiency
- Common protocols for documenting savings
- Sources for more information