



# Energy-Saving

HOMES, BUILDINGS,  
& MANUFACTURING

U.S. DEPARTMENT OF  
**ENERGY** | Energy Efficiency &  
Renewable Energy

## How Energy Efficiency Programs Can Support State Climate and Energy Planning: *Efficiency as an Emission Reduction Approach*

[energy.gov/eere/slsc/EEopportunities](https://energy.gov/eere/slsc/EEopportunities)

# Outline

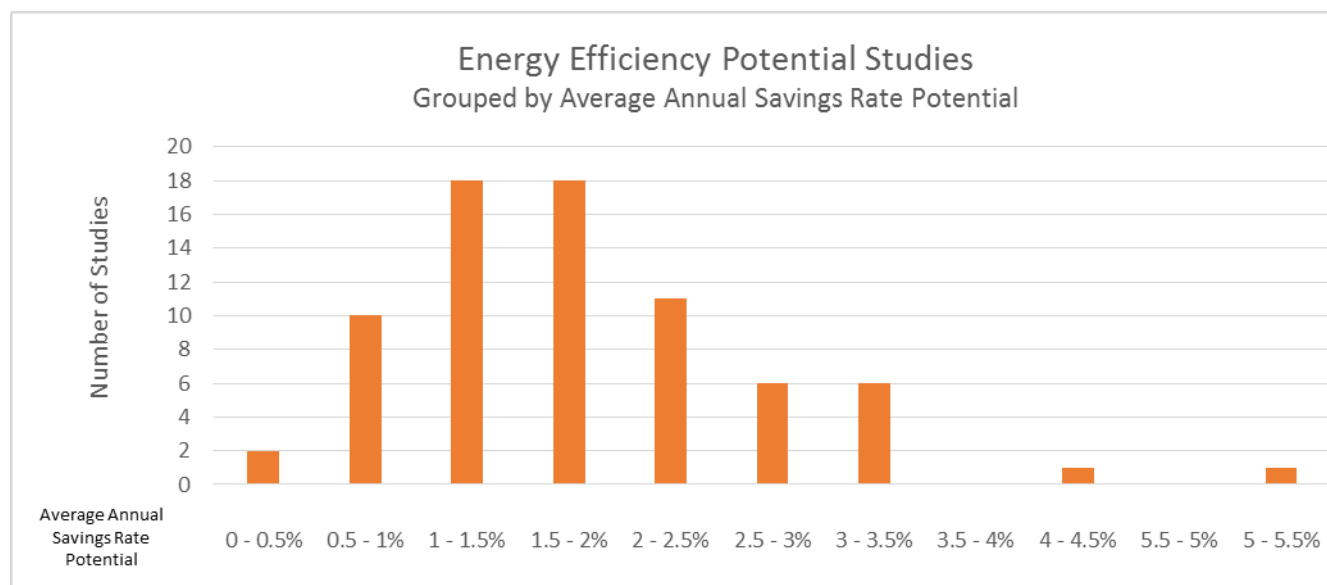
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## Energy Efficiency as an Emission Reduction Approach:

- Energy savings potential and achievements
- Electricity and carbon savings opportunity estimates
- Synopses of seven major opportunity areas
- DOE technical assistance available for energy and climate planning and implementation, by sector
- Appendix – assumptions and data sources for calculations of electricity and carbon savings

# Energy Efficiency Potential Studies & Achieved Electricity Savings

- DOE identified 79 energy efficiency potential studies published between 2007 and 2015 completed for states, utilities, and NGOs.<sup>1</sup> They provide estimates across 44 states.
- The majority (60%) found an average savings rate of 1 to 2.5% from prior year electricity sales in economic or achievable potential.



- The 10 states leading on energy efficiency are already achieving 1.25 to 3.5% in annual electricity savings.<sup>2</sup> Many of these states have been running energy efficiency programs for decades and are continuing to increase savings.

<sup>1</sup> U.S. Department of Energy, 2016, [Energy efficiency potential studies catalog](#)

<sup>2</sup> American Council for an Energy-Efficiency Economy (ACEEE), 2015, [State Energy Efficiency Scorecard](#)

# Many Substantial, Well Documented Energy Savings Opportunities

Savings come from EE activities across:

- industrial, commercial, public, residential bldgs
- ratepayer-funded (e.g., utility) programs
- private sector initiatives
- state / local government-run programs

Typical Lead			Savings Pathways	Estimate of National Electricity Savings Potential in 2030*	Estimate of National Carbon Savings Potential in 2030**
Private Sector	S/L Gov't	Utility			
			✓ Ratepayer-Funded Efficiency Programs	645-895 million MWh	368-510 million short tons
✓	✓	✓	Industrial Efficiency	85-130 million MWh	48-74 million short tons
✓	✓	✓	Combined Heat and Power	75-115 million MWh	43-66 million short tons
✓	✓		Energy Savings Performance Contracting	45-90 million MWh	26-51 million short tons
	✓	✓	Building Energy Codes	50-60 million MWh	29-34 million short tons
	✓		City-Led Energy Efficiency Efforts	25-50 million MWh	14-29 million short tons

*\*DOE calculations of ballpark achievable potential based on sector-specific assumptions for activities occurring 2013-2030; see appendix.*

*\*\*Carbon emissions estimates based on national average total output emission rate published in 2012 eGRID; see appendix.*

**NOTE: Savings Pathways may have overlapping savings, so estimates are NOT additive.**

# EE Savings Pathways Can Be Incorporated into Climate Planning

Typical Lead			Savings Pathways	Helps reach carbon reduction goals	
Private Sector	State / Local Gov't	Utility		Reduces smokestack emissions	Produces verifiable energy savings
		✓	Ratepayer-Funded Efficiency Programs	✓	✓
✓	✓	✓	Industrial Efficiency	✓	✓
✓	✓	✓	Combined Heat and Power	✓	✓
✓	✓		Energy Savings Performance Contracting	✓	✓
	✓	✓	Building Energy Codes	✓	✓
	✓		City-Led Energy Efficiency Efforts	✓	✓
	✓	✓	Low Income Energy Efficiency Programs	✓	✓

Gov't = government

# Ratepayer-Funded Efficiency as an Emission Reduction Approach

## Possible Leads

- Utilities (investor-owned, rural cooperatives, municipal utilities)
- Non-utility program administrators

## E-Savings

- Savings in compliance year vs 2012 baseline

## Potential Program Components

- New and existing residential buildings (single family, multi-family, low income)
- Small, medium & large commercial buildings
- Industrial facilities

## Potential Electricity Savings

645 – 895 million MWh in 2030  
368 – 510 million short tons CO<sub>2</sub>

Activity	EM&V
Energy Savings Approaches	
<ul style="list-style-type: none"> <li>• Program administrators generate energy savings from:               <ul style="list-style-type: none"> <li>- EE programs that support improvements to residential, commercial, industrial buildings</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Recent resources provide guidance, including:               <ul style="list-style-type: none"> <li>- <a href="#">SEE Action Energy Efficiency Program Impact Evaluation Guide</a></li> <li>- <a href="#">SEE Action EM&amp;V Resource Portal</a></li> <li>- <a href="#">DOE Uniform Methods Project</a></li> <li>- <a href="#">NEEP EM&amp;V Forum</a></li> <li>- <a href="#">Regional Technical Forum of the Northwest Power and Conservation Council</a></li> </ul> </li> </ul>
State Policy Options	
<ul style="list-style-type: none"> <li>• Could include               <ul style="list-style-type: none"> <li>- Requiring a specified level of EE savings (e.g., EERS)</li> <li>- Requiring inclusion of EE as a resource in capacity planning (e.g., Integrated Resource Planning)</li> <li>- Regulatory policies to incentivize successful utility delivery of EE</li> <li>- Consider options for energy efficiency delivery agent</li> </ul> </li> </ul>	
Low Income Opportunities	
<ul style="list-style-type: none"> <li>• EE programs in low income neighborhoods</li> </ul>	

# Industrial Energy Efficiency as an Emission Reduction Approach

## Possible Leads

- State Energy Offices (SEOs)
- Utilities / Program Administrators
- Industrial End-Users
- ESCOs

## E-Savings

- Metered electricity savings after installing measures or making operational and behavioral changes compared to project start

## Potential Program Components

- Strategic Energy Management (SEM)
- ISO50001
- Superior Energy Performance (SEP)

Potential Electricity Savings  
 85 – 130 million MWh in 2030  
 48 – 74 million short tons CO<sub>2</sub>

Activities	EM&V
Energy Savings Approaches	
<ul style="list-style-type: none"> <li>• SEOs, program administrators, industrial end users, ESCOs generate energy savings from:                             <ul style="list-style-type: none"> <li>– Energy management</li> <li>– Energy management system</li> <li>– Training</li> <li>– Metering</li> <li>– Technical assistance</li> <li>– Capital improvements</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Third-party verification of savings occurs within Superior Energy Performance in accordance with <a href="#">Superior Energy Performance EM&amp;V Protocol</a></li> <li>• <i>Forthcoming resources:</i> <ul style="list-style-type: none"> <li>– Library of common industrial EE projects/practices and accepted savings calculation methodologies</li> <li>– Uniform Methods Project Protocols for Strategic Energy Management/Superior Energy Performance (Summer 2016)</li> </ul> </li> </ul>
State Policy Options	
<ul style="list-style-type: none"> <li>• Could include:                             <ul style="list-style-type: none"> <li>– Energy efficiency resource standard (EERS)</li> <li>– Registry of energy savings from ISO50001 certification or Superior Energy Performance</li> </ul> </li> </ul>	
Low Income Opportunities	
<ul style="list-style-type: none"> <li>• Possible if facility located in a low income community</li> </ul>	

# Combined Heat and Power as an Emission Reduction Approach

- Possible Leads
- State energy offices (SEOs)
  - City energy or sustainability office
  - Utilities / program administrators
  - Industrial end-users
  - ESCOs

- E-Savings
- kWh / MWh generated on site

- Potential Program Components
- District energy / microgrids

Potential Electricity Savings  
*75 – 115 million MWh in 2030*  
*43 – 66 million short tons CO<sub>2</sub>*

Activities	EM&V
Energy Savings Approaches	
<ul style="list-style-type: none"> <li>• Large energy users, utility, or state energy offices generate energy savings from:               <ul style="list-style-type: none"> <li>- Incentives to support CHP installation in buildings</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Recent resources provide guidance, including:               <ul style="list-style-type: none"> <li>- <a href="#"><u>Combined Heat and Power: A Clean Energy Solution</u></a></li> <li>- <a href="#"><u>Guide to the Successful Implementation of State CHP Policies</u></a></li> <li>- Assessment of the Technical Potential for CHP in the U.S. [forthcoming]</li> </ul> </li> </ul>
State Policy Options	
<ul style="list-style-type: none"> <li>• Could include               <ul style="list-style-type: none"> <li>- CHP in state energy resource standard (e.g., EERS, RPS)</li> <li>- Interconnection standards</li> </ul> </li> </ul>	
Low Income Opportunities	
<ul style="list-style-type: none"> <li>• CHP projects in low income neighborhoods (e.g., multifamily housing, schools, community centers, hospitals, facilities)</li> </ul>	



# Energy Savings Performance Contracting as an Emissions Reduction Approach

Possible Leads

- State Energy Office
- State/Local General Services
- Local Sustainability Office
- Commercial building owner
- ESCO

E-Savings

- Annual kWh reduced since project installation date

Potential Program Components

- Green Bank or other internal state/city funding
- Utility
- State ESPC Support Program

Potential Electricity Savings  
*45 – 90 million MWh in 2030*  
*26 – 51 million short tons CO<sub>2</sub>*

Activities	EM&V
Energy Savings Approaches	
<ul style="list-style-type: none"> <li>• State energy or general services office, building owners, ESCOs, utilities generate energy savings from:                             <ul style="list-style-type: none"> <li>- Direct energy management</li> <li>- Capital improvements</li> <li>- Technical assistance</li> <li>- Training</li> <li>- Metering</li> <li>- Utility incentives</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Recent resources provide guidance, including:                             <ul style="list-style-type: none"> <li>- <a href="#"><u>Federal Energy Management Program M&amp;V Guidelines Version 4.0</u></a></li> </ul> </li> </ul>
State Policy Options	
<ul style="list-style-type: none"> <li>• Could include:                             <ul style="list-style-type: none"> <li>- Energy efficiency resource standard (EERS)</li> <li>- Executive Order or legislation to create ESPC program w/target savings or investments</li> <li>- State financing for ESPC projects</li> <li>- State admin. rules to support ESPCs</li> </ul> </li> </ul>	
Low-Income Opportunities	
<ul style="list-style-type: none"> <li>• Energy savings projects in low-income neighborhoods (e.g., schools, community centers, facilities, multifamily housing)</li> </ul>	

# Building Energy Codes as an Emission Reduction Approach

## Possible Leads

- State code administrator
- State energy office
- Utility
- NGO

## E-Savings

- # new code or beyond code built bldgs. X reduction in kWh per bldg. from code in 2012

## Potential Program Components

- Stretch Code Programs
- ENERGY STAR New Homes
- Zero Energy Ready Homes

Potential Electricity Savings  
 50 – 60 million MWh in 2030  
 29 – 34 million short tons CO<sub>2</sub>

Activities	EM&V
<h3>Energy Savings Approaches</h3> <ul style="list-style-type: none"> <li>• State energy office, utility, or NGO generate energy savings from:                             <ul style="list-style-type: none"> <li>- Education</li> <li>- Training</li> <li>- Enforcement activities</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>• Recent resources provide guidance, including:                             <ul style="list-style-type: none"> <li>- DOE <a href="#">Building Energy Codes Program (BCEP)</a></li> <li>- <a href="#">Achieving Energy Savings and Emission Reductions from Building Energy Codes: A Primer for State Planning</a></li> <li>- <i>Multi-state in field evaluation (forthcoming)</i></li> </ul> </li> </ul>
<h3>State Policy Options</h3> <ul style="list-style-type: none"> <li>• Could include:                             <ul style="list-style-type: none"> <li>- Legislation to require adoption of latest national model energy code upon update</li> <li>- Legislation to require reduction in building energy use by date (e.g., 70% by 2030)</li> </ul> </li> </ul>	
<h3>Low Income Opportunities</h3> <ul style="list-style-type: none"> <li>• Building code adoption and compliance in low income neighborhoods</li> </ul>	

# City-Led Efficiency Efforts as an Emission Reduction Approach

## Possible Leads

- City energy or sustainability office
- City general services office
- Municipal utility
- Community-based organizations

## E-Savings

- Aggregate city-wide (municipal, industrial, commercial, residential) electricity savings compared to starting year consumption

## Potential Program Components

- Building performance policies
- Voluntary building efficiency challenges
- Financing (property assessed clean energy [PACE], performance contracting)
- Municipal building efficiency
- Water/wastewater treatment facilities
- Streetlight upgrades
- Homeowner outreach

Potential Electricity Savings  
 25 – 50 million MWh in 2030  
 14 – 29 million short tons CO<sub>2</sub>

Activities	EM&V
<p>Energy Savings Approaches</p> <p>City offices, utility, or community-based organizations generate energy savings from:</p> <ul style="list-style-type: none"> <li>• Training, outreach, enforcement of building efficiency policies</li> <li>• Outreach and technical assistance for voluntary programs</li> <li>• Installing energy upgrades to municipal buildings, water/ wastewater treatment facilities, streetlights</li> </ul>	<p>Recent resources provide guidance, including:</p> <ul style="list-style-type: none"> <li>• <a href="#"><u>DOE Benchmarking &amp; Transparency Policy and Program Impact Evaluation Handbook</u></a></li> <li>• <a href="#"><u>Assessment of Automated Measurement and Verification (M&amp;V) Methods</u></a></li> <li>• <a href="#"><u>Federal Energy Management Program M&amp;V Guidelines Version 4</u></a></li> </ul>
<p>State Policy Options</p> <p>Could include:</p> <ul style="list-style-type: none"> <li>• Enable cities to implement PACE</li> <li>• Provide guidance to utilities for streamlining energy data access for building benchmarking</li> <li>• Create state-led city programming (e.g., MA Green Communities)</li> </ul>	
<p>Low Income Opportunities</p> <ul style="list-style-type: none"> <li>• Building energy efficiency programs in low income neighborhoods</li> </ul>	

# Low-Income Efficiency Programs as an Emission Reduction Approach

## Possible Leads

- State administrators
- State energy office
- Utility
- Housing NGO's focused on low income

## E-Savings

- # of homes improved X average savings associated with improvement

## Potential Program Components

- Weatherization Assistance Program
- Home Performance with ENERGY STAR
- Proper HVAC maintenance and installation practices
- Duct sealing
- Air sealing and insulation program

## Activities

### Energy Savings Approaches

- State energy office, utility, or NGO generate energy savings from:
  - Education
  - Training and certification of technicians
  - Manage homeowner relationships
  - Outreach
  - Connect clients with contractors to improve homes
  - Monitor EM&V

### State Policy Options

- Could include:
  - Legislation to provide funds for retrofit program with incentives
  - Legislation to provide low-cost financing
  - Rate payer funded programs directed at low-income

### Low Income Opportunities

- All efforts targeted at low-income households

## EM&V

- Recent resources provide guidance, including:
  - [Weatherization Works-Summary of findings from the Retrospective Evaluation of the U.S. Department of Energy's Weatherization Assistance Program](#)
  - [Better Buildings Residential Program Solution Center](#)
  - [Appliance Rebate Program-Design Guide](#)
  - [The Uniform Methods Project: Methods for Determining Energy Efficiency Savings for Specific Measures](#)

# Get More Information on These Pathways

Visit: [energy.gov/eere/slsc/EEopportunities](https://energy.gov/eere/slsc/EEopportunities)

## [Pathways Presentations: How Specific Energy Efficiency Opportunities Can Support State Climate and Energy Planning](#)

Seven presentations (one for each pathway) of features and benefits associated with including energy efficiency opportunities in climate and energy plans, covering:

- current activity at the national and state levels
- best practices
- energy savings examples
- cost-effectiveness
- evaluation, measurement, and verification (EM&V) approaches
- DOE support

## [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](#)

New State and Local Energy Efficiency Action Network (SEE Action) resource presents the pathways through:

- case studies of successful regional, state, and local approaches
- sources for more information
- resources to understand the range of expected savings from energy efficiency
- common protocols for documenting savings

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## Existing DOE Technical Assistance & Resources Available

# DOE Provides Support for Clean Energy Planning & Implementation

Based on inquiry and resources available, technical assistance can include...

## Existing Resources

## Launching New Projects

**Published Resources**  
Provide resources or links to toolkits, guides, webinars, data, and other technical materials

**Partnerships / Initiatives**  
Share opportunities to join or leverage work from existing facilitated efforts

**Expand Efforts Underway**  
Add new info, cases, or partners to existing projects to address a request

**DOE Expert Consultations**  
Provide access to DOE and Lab staff for consultation and/or analytical assistance

**Direct Funding**  
Provide funding through DOE funding announcements (e.g., SEP competitive, SunShot)



# Fastest Way to Access Technical Assistance

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## STATE, LOCAL AND TRIBAL TECHNICAL ASSISTANCE GATEWAY

[Frequently Asked Questions](#)[Featured Topic: Greenhouse Gas Reduction Strategies in the Electric Power Sector](#)

### CONTACT US

For more information about technical assistance at the Department of Energy, contact us via [e-mail](#).

## ENERGY.GOV/TA

The State, Local and Tribal Technical Assistance Gateway provides an access point to DOE's technical assistance and cooperative activities with state, local and tribal officials. Through its [program and staff offices](#), DOE has engaged extensively with various levels of state, local and tribal governments, providing technical assistance on a range of energy issues. Our existing technical assistance and other activities, as well as relevant information offered by other federal agencies, are provided below by program or topic.

If you're a state, local or tribal official, or a representative from an organization of such officials, with a specific question or need for assistance, [email us](#) and we'll work collaboratively across the DOE to address your inquiry. Responses could include access



# Wide Range of DOE Existing Resources & Partnerships Available

Typical Lead			Savings Pathways	Example Best Practice Programs, Policies, EM&V
Private Sector	S/L Gov't	Utility		
		✓	Ratepayer-Funded Efficiency Programs	State and Local Energy Efficiency Action Network
✓	✓	✓	Industrial Efficiency	Superior Energy Performance
✓	✓	✓	Combined Heat and Power	CHP Technical Assistance Partnerships
✓	✓		Energy Savings Performance Contracting	Better Buildings ESPC Accelerator
	✓	✓	Building Energy Codes	Building Energy Codes Analyses of Savings
	✓		City-Led Energy Efficiency Efforts	Better Buildings Challenge
	✓	✓	Low Income Energy Efficiency	Home Performance with ENERGY STAR

S/L Gov't = state or local government

# Industrial Sector Resource Highlights

Typical Leads	Savings Pathways	Direct Technical Assistance
<ul style="list-style-type: none"> <li>• Private Sector</li> <li>• State / Local Utilities</li> </ul>	<p><b>Industrial Efficiency</b></p> <hr/> <p><b>Combined Heat and Power</b></p>	<ul style="list-style-type: none"> <li>• <a href="#">Superior Energy Performance</a></li> <li>• <a href="#">Better Buildings Better Plants</a></li> <li>• <a href="#">Industrial Assessment Centers</a></li> <li>• <a href="#">CHP Technical Assistance Partnerships</a></li> </ul>

## Best Practice Programs and Policies

- [Industrial Energy Efficiency: Designing Effective State Programs for the Industrial Sector](#)
- [Superior Energy Performance \(SEP\) Guide for the Development of Energy Efficiency Program Plans](#) (NEW)
- [SEP Cost Effectiveness Screening Tool](#) (NEW)
- [SEP Program Planning Template](#) (NEW)
- [SEP Program Transition Tables](#) (NEW)

## Evaluation, Measurement, and Verification (EM&V) Resources

- ❖ [Superior Energy Performance EM&V Protocol](#)
- ❖ Uniform Methods Project Protocols for Strategic Energy Management/Super Energy Performance (forthcoming, Summer 2016)
- ❖ Uniform Methods Project Protocols for CHP (forthcoming, Summer 2016)

# Commercial / Public Sector Resource Highlights

Typical Leads	Savings Pathways	Direct Technical Assistance
<ul style="list-style-type: none"> <li>• State / Local</li> <li>• Utilities</li> </ul>	Building Energy Codes	• <a href="#">Building Energy Codes Program</a>
	Energy Savings Performance Contracting	• <a href="#">Better Buildings ESPC Accelerator</a>
	City-Led Energy Efficiency Efforts	• <a href="#">Better Buildings Challenge</a>
	Ratepayer-Funded Efficiency Programs	• <a href="#">Better Buildings Alliance</a> • <a href="#">State Energy Program</a>
	Combined Heat and Power	• <a href="#">CHP Technical Assistance Partnerships</a>

## Documentation of Best Practice Programs and Policies

- [State and Local Solution Center](#)
- [Benchmarking and Disclosure: State and Local Policy Design Guide and Sample Policy Language](#)
- [New York City Benchmarking and Transparency Policy Impact Evaluation Report](#)
- [Energy Data Access Toolkit](#)

## Evaluation, Measurement, and Verification (EM&V) Resources

- ❖ [DOE Benchmarking & Transparency Policy and Program Impact Evaluation Handbook](#)
- ❖ [Assessment of Automated Measurement and Verification \(M&V\) Methods](#)
- ❖ [FEMP M&V Guidelines Version 4](#)

# Residential Sector Resource Highlights

Typical Leads	Savings Pathways	Direct Technical Assistance
<ul style="list-style-type: none"> <li>State / Local</li> <li>Utilities</li> </ul>	<b>Building Energy Codes</b>	<ul style="list-style-type: none"> <li><a href="#">Building Energy Codes Program</a></li> </ul>
	<b>Low Income Energy Efficiency</b>	<ul style="list-style-type: none"> <li><a href="#">Weatherization Assistance Program</a></li> <li><a href="#">Home Performance with ENERGY STAR</a></li> </ul>
	<b>Ratepayer-Funded Efficiency Programs</b>	<ul style="list-style-type: none"> <li><a href="#">Home Energy Score</a></li> <li><a href="#">Zero Energy Ready Home</a></li> <li><a href="#">Better Buildings Residential Network</a></li> </ul>

## Documentation of Best Practice Programs and Policies

- [Weatherization Assistance Program Technical Assistance Center](#)
- [Building America Solution Center, Better Buildings Residential Program Solution Center](#)
- [SEE Action Policy Makers' Guide to Home Energy Upgrades \(NEW\)](#)

## Evaluation, Measurement, and Verification (EM&V) Resources

- ❖ [Achieving Energy Savings and Emission Reductions from Building Energy Codes: A Primer for State Planning](#)
- ❖ [Savings and Cost Analysis for Zero Energy Ready Homes](#)
- ❖ [EM&V of Residential Behavior-Based EE Programs Guide](#)
- ❖ [Home Energy Upgrade Program Cost-Effectiveness Screening Tool](#)
- ❖ Cost/Benefit Report on Home Upgrade Program Models (forthcoming, Spring 2016)

# Cross-Cutting Resource Highlights

Typical Leads	Topics	Direct Technical Assistance
<ul style="list-style-type: none"> <li>• State / Local</li> <li>• Utilities</li> </ul>	<p>State Energy Planning</p> <hr/> <p>Evaluation, Measurement &amp; Verification</p> <hr/> <p>Financing (e.g., on bill, PACE)</p>	<ul style="list-style-type: none"> <li>• <a href="#">State Energy Program</a></li> <li>• <a href="#">DOE Technical Assistance Program</a></li> </ul>

## Documentation of Best Practice Programs and Policies

- [Energy Efficiency Savings Opportunities and Benefits](#)
- [SEE Action Guide: Energy Efficiency as a Least-Cost Strategy to Reduce Greenhouse Gas Emissions and Meet Energy Needs in the Power Sector](#)
- [State and Local Solution Center](#)
- 2015 Energy Efficiency Financing Snapshot: A Market Review and Guide for State and Local Governments (forthcoming, Spring 2016)

## Evaluation, Measurement, and Verification (EM&V) Resources

- ❖ [Uniform Methods Project](#)
- ❖ [Energy Efficiency Program Impact Evaluation Guide](#)
- ❖ [Energy Efficiency Under Alternative Carbon Policies: Incentives, Measurement, and Interregional Effects](#)
- ❖ Evaluator Certification (forthcoming, 2016)

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# Appendix: Calculations of Electricity and Carbon Savings

# Estimates of National Electricity and Carbon Savings Potential in 2030

**NOTE: Pathways may include overlapping savings, so estimates are NOT additive.**

Savings Pathway	Ballpark Achievable Potential Calculations Based on the Following Low to High Scenarios	Data Sources	Low estimate	High estimate
<b>Ratepayer-Funded Efficiency Programs</b>	Total estimated savings in 2030 from reduced electricity load growth rates due to ratepayer-funded energy efficiency programs achieving annual incremental savings of <a href="#">1.1 - 1.5%</a> from 2012 baseline.	LBNL, 2013, <a href="#">The Future of Utility Customer-Funded Energy Efficiency Programs in the U.S.</a>	645 million MWh 368 million short tons CO <sub>2</sub>	895 million MWh 510 million short tons CO <sub>2</sub>
<b>Industrial Efficiency</b>	Total estimated savings in 2030 for <a href="#">50 - 75%</a> of industrial plants achieving 2% annual energy intensity improvements (based on the Better Plants standard) from the AEO 2015 forecasted baseline for 2030.	<a href="#">EIA 2015 AEO</a> Tables 25-35	85 million MWh 48 million short tons CO <sub>2</sub>	130 million MWh 74 million short tons CO <sub>2</sub>
<b>Combined Heat and Power</b>	Total estimated savings in 2030 from completing <a href="#">30 - 45%</a> of economical (less than 10 year payback) CHP system installation projects smaller than 100 MW.	American Gas Association, 2013, <a href="#">The Opportunity for CHP in the United States</a>	75 million MWh 43 million short tons CO <sub>2</sub>	115 million MWh 66 million short tons CO <sub>2</sub>
<b>Energy Savings Performance Contracting</b>	Total estimated savings in 2030 based on <a href="#">0 - 8%</a> annual growth rates in volume of ESCO projects from 2012 baseline.	LBNL, 2015, <a href="#">Estimating customer electricity and fuel savings from projects installed by the US ESCO industry</a> and LBNL, 2014, <a href="#">A method to estimate the size and remaining market potential of the U.S. ESCO industry</a>	45 million MWh 26 million short tons CO <sub>2</sub>	90 million MWh 51 million short tons CO <sub>2</sub>
<b>Building Energy Codes</b>	Total estimated savings in 2030 from 100% adoption and <a href="#">70-95%</a> compliance rates for ASHRAE 90.1-2010 / ASHRAE 90.1-2013 commercial building codes (compared to ASHRAE 90.1-2007 baseline) and IECC 2012 / IECC 2015 residential building codes (compared to IECC 2009 baseline)	<a href="#">DOE determinations and supporting analysis</a> and <a href="#">PNNL Codes Impact Analysis</a>	50 million MWh 29 million short tons CO <sub>2</sub>	60 million MWh 34 million short tons CO <sub>2</sub>
<b>City-Led Energy Efficiency Efforts</b>	Total estimated savings in 2030 from <a href="#">5 - 10%</a> savings in city-wide (residential, commercial, and industrial) electricity consumption for the largest 50 U.S. cities.	ACEEE, 2015, <a href="#">City Energy Efficiency Scorecard</a> Table C6	25 million MWh 14 million short tons CO <sub>2</sub>	50 million MWh 29 million short tons CO <sub>2</sub>

Carbon emissions estimates based on national average total output emission rate (1,136.53 lb/MWh or .57 short tons/MWh) published in [2012 eGRID](#)