The 2019 State Energy Efficiency Scorecard

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Executive Summary

KEY FINDINGS

This report ranks US states on their policy and program efforts to save energy.

- First place goes to **Massachusetts**, which leads the *State Scorecard* for the ninth year in a row. Thanks to a strong policy framework established under its Green Communities Act a decade ago, the state continues to achieve among the highest levels of utility savings in the nation. Earlier in the year, regulators approved a new three-year efficiency plan, including an expanded portfolio of programs intended to help align savings efforts with statewide greenhouse gas reduction goals. Massachusetts aims to reduce emissions by 80% by 2050.
- Rounding out the top 10 are **California** at #2 and **Rhode Island** and **Vermont**, tied at #3, followed by **New York, Connecticut, Maryland, Minnesota, Oregon,** and **Washington**.
- **Maryland** is this year's most-improved state. Utility efficiency programs, delivered through the EmPOWER Maryland initiative, have steadily evolved in recent years, spurred by robust legislative savings targets. Meanwhile the state continues to strengthen efficiency in the buildings and transportation sectors, establishing strong building energy codes, directing funding toward public transportation, and seeking to accelerate adoption of electric vehicles.
- Other states to watch include **New Jersey** and **New York**, where utilities and regulators continue to work to design strengthened efficiency programs to meet new utility savings targets approved in 2018. These states and others have established ambitious clean energy goals to transition to a carbon-free economy, while including energy efficiency as a key pillar in their strategies to do so.
- **Kentucky** fell the farthest in the rankings due to a 2018 decision that discontinued most of Kentucky Power's demand-side management programs. Other utilities in the state have seen similar reductions in program funding.
- Savings from ratepayer-funded electric efficiency programs remained fairly level compared with last year's results, totaling approximately **27.1 million megawatt-hours**. These savings are equivalent to about 0.73% of total retail electricity sales in the United States in 2018, enough to power more than 2.6 million homes for a year.
- States continue to update and strengthen residential and commercial building energy codes. Since the publication of the 2018 IECC, states like **Maryland**, **Massachusetts**, **Nebraska**, **Illinois**, and **Ohio** have adopted the newest code versions, and numerous other states are currently reviewing these codes for potential adoption in the near future.
- It was an especially big year for state appliance standards, with four states—**Washington, Colorado, Hawaii,** and **Nevada**—adopting new laws and an additional six states and the District of Columbia filing bills.

The *State Energy Efficiency Scorecard*, now in its 13th edition, ranks states on their policy and program efforts. It assesses performance, documents best practices, and recognizes leadership. The report captures the latest policy developments and state efforts to save energy and highlights opportunities and policy tools available to governors, state legislators, and regulators.

Figure ES1 shows the states' rankings, divided into five tiers for easy comparison. Later in this section, table ES2 provides details of each state's scores.

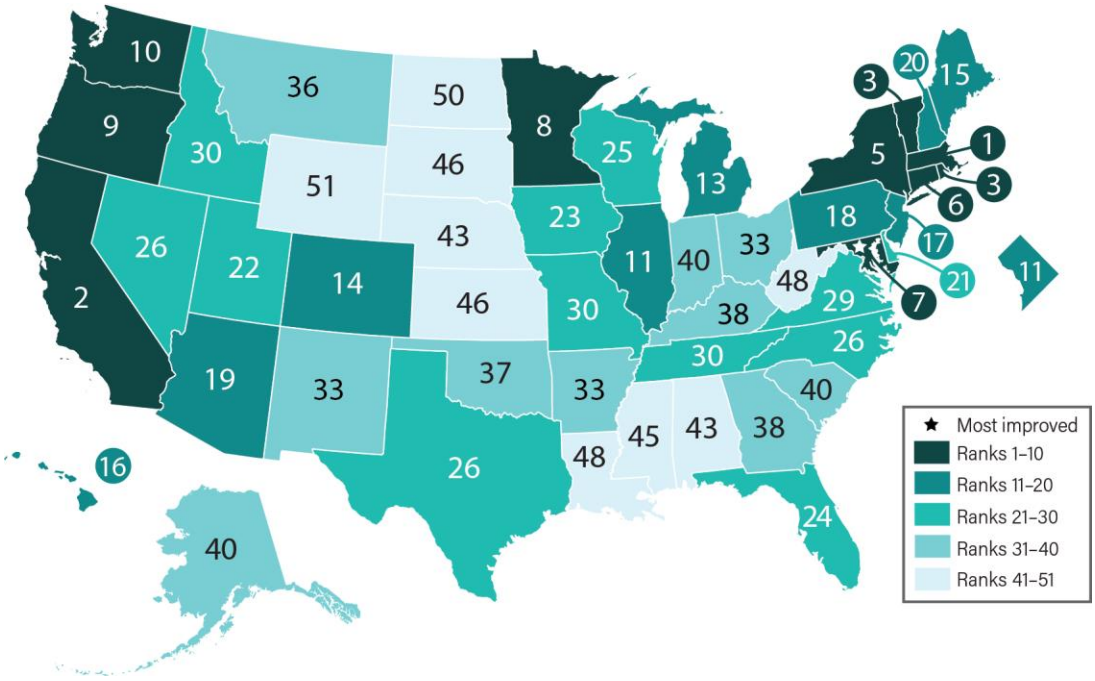

Figure ES1. *2019 State Scorecard* rankings

It was a whirlwind year for energy efficiency in 2019 at the state level. Many legislatures and governors established the transition to clean energy and reduced greenhouse gas (GHG) emissions as their top priority and increased their efficiency efforts to help achieve it. While leading states like Massachusetts, California, and New York continued to innovate and advance model programs, some of the most exciting stories emerged from states where efficiency has historically been overlooked as a resource. Nevada, New Mexico, Washington, New York, and Maine all adopted 100% clean energy goals coupled with plans to ramp up efficiency investment. In Virginia and New Jersey, utilities unveiled significant expansions of efficiency program portfolios in response to game-changing clean energy bills passed in 2018. State legislatures in Colorado, Washington, and Hawaii adopted new appliance standards in the biggest wave of state-level standard adoption in this decade. States also led the way in addressing challenges and opportunities surrounding building electrification and increasing uptake of electric vehicles as a means to achieve a low-carbon future.

POLICY AREAS

The *Scorecard* compares states across six policy areas:

- Utility and public benefits programs and policies
- Transportation policies
- Building energy efficiency policies
- Combined heat and power (CHP) policies
- State government–led initiatives around energy efficiency
- Appliance and equipment standards

Table ES1 provides examples of states that have adopted best-practice policies in each area. For more information about leading states, refer to the *Scorecard* chapter corresponding to each policy area.

Table ES1. States adopting best-practice policies

Area	States	Achievements
Utility and public benefits	Massachusetts, Rhode Island, Vermont	All have continued to post electric utility savings above 2% of retail sales, the highest levels in the nation.
Transportation	District of Columbia, California, Massachusetts, Oregon, Vermont	Each of these jurisdictions has adopted California's vehicle emissions standards as well as its Zero-Emission Vehicle (ZEV) programs, and each has adopted goals to reduce vehicle miles traveled and transportation-related GHGs.
Building energy efficiency	California, Illinois, Oregon, Pennsylvania, Texas, Maryland, Massachusetts, Nebraska, New York, Washington	These states have strengthened statewide building energy codes by adopting 2015 or 2018 IECC code versions, in addition to devoting resources to maintaining code compliance.
CHP	California, Maryland, Massachusetts, New Jersey, New York, Rhode Island	All these states have promoted CHP as an energy resource through establishment of interconnection standards, CHP production goals, and deployment incentives.
State government initiatives	California, Connecticut, Delaware, Massachusetts, Rhode Island, Vermont	These states led this year for offering loan and grant programs to spur energy savings, setting efficiency standards for public buildings and fleets, and investing proceeds from carbon pricing policies in efficiency programs.
Appliance/equipment standards	California, Colorado, Nevada, Washington, Hawaii	Each of these states passed appliance standards this year that are expected to save consumers hundreds of millions of dollars on utility bills.

SCORES

Table ES2 presents state scores in the six policy areas and their total scores.

Table ES2. State scores in the 2019 *State Scorecard*

Rank	State	Utility & public benefits programs & policies (20 pts.)	Trans-portation policies (10 pts.)	Building energy efficiency policies (8 pts.)	Combined heat & power (3 pts.)	State government initiatives (6 pts.)	Appliance efficiency standards (3 pts.)	**TOTAL SCORE (50 pts.)**	Change in rank from 2018	Change in score from 2018
1	Massachusetts	20	8.5	7	3	6	0	44.5	0	0.5
2	California	15.5	8.5	7.5	3	6	3	43.5	0	0
3	Rhode Island	20	6	5.5	3	6	0	40.5	0	–0.5
3	Vermont	18	6.5	6	2	6	2	40.5	1	0
5	New York	14	8.5	6.5	2.5	5.5	0	37	1	1.5
6	Connecticut	12.5	7.5	7	2.5	6	1	36.5	–1	–1.5
7	Maryland	12.5	7.5	6	3	5.5	0	34.5	3	4.5
8	Minnesota	14.5	5.5	6	1.5	5	0	32.5	0	0.5
9	Oregon	10.5	7.5	6.5	1.5	5	1	32	–2	–3
10	Washington	9	7	6.5	2	5	2	31.5	–1	0
11	District of Columbia	9.5	9	6	1	3.5	0	29	1	1.5
11	Illinois	11.5	5	6	2.5	4	0	29	1	1.5
13	Michigan	14	3.5	6	1	4	0	28.5	–2	0
14	Colorado	9.5	4.5	5.5	0.5	5	2	27	0	1.5
15	Maine	10.5	5.5	2.5	2.5	5	0	26	–1	0.5
16	Hawaii	11	4	5.5	1	2.5	1.5	25.5	0	2.5
17	New Jersey	6.5	6	6	3	2.5	0	24	1	2.5
18	Pennsylvania	4.5	5.5	7	2	4.5	0	23.5	0	2
19	Arizona	9.5	4	4	1.5	2.5	0	21.5	–2	–0.5
20	New Hampshire	9.5	3	3.5	0.5	4.5	0	21	1	1.5
21	Delaware	3	5	5	1.5	6	0	20.5	1	2
22	Utah	6.5	3	5.5	0.5	4	0	19.5	–2	–1.5
23	Iowa	9	2.5	5	0.5	1.5	0	18.5	1	1.5
24	Florida	2	4.5	6	0	4	0	16.5	–1	–1
25	Wisconsin	7.5	1	3.5	0.5	3.5	0	16	4	0.5
26	Nevada	4.5	2.5	4	0	4	0.5	15.5	3	0
26	North Carolina	3	3.5	4.5	1	3.5	0	15.5	0	–0.5
26	Texas	1	3	7	0.5	4	0	15.5	–1	–1
29	Virginia	0.5	5	5.5	–0.5	4.5	0	15	–3	–1
30	Idaho	5.5	1	5.5	0	2.5	0	14.5	–4	–1.5
30	Missouri	2.5	2.5	4	1	4.5	0	14.5	3	–0.5
30	Tennessee	1	3.5	3.5	2	4.5	0	14.5	5	0.5
33	Arkansas	7	1	3	–0.5	3.5	0	14	1	–0.5
33	New Mexico	5.5	1.5	2.5	1	3.5	0	14	3	0.5
33	Ohio	4.5	1	3.5	1	4	0	14	–4	–1.5
36	Montana	3.5	0.5	5.5	0	3	0	12.5	1	–0.5
37	Oklahoma	5.5	2.5	1.5	–0.5	3	0	12	2	1
38	Georgia	2	4	3	0	2	0	11	0	–1
38	Kentucky	1	1.5	4	0	4.5	0	11	–9	–4.5
40	Alaska	1	3.5	2	0	4	0	10.5	1	0.5
40	Indiana	3.5	2.5	2.5	0	2	0	10.5	0	0
40	South Carolina	1.5	2	3	0	4	0	10.5	1	0.5
43	Alabama	0	1	6	–0.5	3	0	9.5	0	0
43	Nebraska	0.5	1	6	–0.5	2.5	0	9.5	1	1.5
45	Mississippi	2	2	1.5	–0.5	3	0	8	–1	0
46	Kansas	0.5	1.5	3.5	0	1.5	0	7	0	–0.5
46	South Dakota	2	1	3.5	0	0.5	0	7	0	–0.5
48	Louisiana	0.5	1.5	2	0	2.5	0	6.5	–2	–1
48	West Virginia	–0.5	2	3	0	2	0	6.5	1	1
50	North Dakota	0	1.5	3	0	0.5	0	5	–1	–0.5
51	Wyoming	1	1.5	0	–0.5	2.5	0	4.5	0	0

STRATEGIES FOR IMPROVING ENERGY EFFICIENCY

A variety of policy tools and program designs are available to state officials to strengthen efforts to save energy across multiple use sectors. The following list highlights examples of best practices by state policymakers seeking to improve energy efficiency performance by energy utilities, in the buildings and transportation sectors, and through appliance standards. We also highlight best practices that reduce legal and market barriers to investing in energy efficiency and expand participation in programs that achieve savings.

Establish and adequately fund an energy efficiency resource standard (EERS) or similar energy savings target. EERS policies set specific energy savings targets that utilities or independent statewide program administrators must meet through customer energy efficiency programs. They serve as an enabling framework for cost-effective investment, savings, and program activity. As states address evolving priorities such as decarbonization, cost, equity, and grid value, regulators in places like Massachusetts and New York are adjusting targets to incorporate multiple goals (e.g., fuel-neutral savings) that better align efficiency programs with electrification and GHG reduction objectives.

Examples: Arizona, Arkansas, Massachusetts, Michigan, Minnesota, New York

Adopt California tailpipe emissions standards and set quantitative targets for reducing vehicle miles traveled (VMT). Transportation consumes almost 30% of the total energy used in the United States. At the state level, a comprehensive approach to transportation energy efficiency must address both individual vehicles and the entire transportation system. A variety of state-level policy options are available to improve transportation system efficiency. These include codifying targets for reducing VMT and integrating land use and transportation planning to create sustainable communities with access to multiple modes of travel. While federal fuel economy standards are expected to go a long way toward helping to reduce fuel consumption, standards for model years 2022–2025 are currently under review and face an uncertain future. States that adopt California's tailpipe emissions standards will lead the way toward clean, fuel-efficient vehicles.

Examples: California, Massachusetts, New York, Oregon

Adopt policies to encourage and strengthen programs for income-qualified customers, and work with utilities and regulators to recognize the nonenergy benefits (NEBs) of such programs. States and public utility commissions (PUCs) can include goals specific to the low-income sector, either within an EERS or as a stand-alone minimum acceptable threshold. PUCs can further strengthen programs serving low-income households by designing cost-effectiveness tests that take into account the NEBs that these programs produce, including improved health, greater safety, and fewer trade-offs between energy and other necessities.

Examples: Illinois, Michigan, New Hampshire, Pennsylvania

Adopt updated, more stringent building energy codes, improve code compliance, and involve efficiency program administrators in code support. Buildings use more than 40% of the total energy consumed in the United States, making them an essential target for energy savings. Adopting mandatory building energy codes is one way to ensure a

minimum level of energy efficiency for new residential and commercial buildings. Strategies such as energy performance standards, benchmarking and transparency policies, and financing tools to encourage deep retrofits are also critical, for addressing efficiency in the existing building stock.

Examples: California, Illinois, Maryland, Texas, District of Columbia, Washington, Nebraska

Expand state government–led initiatives and make them visible. States can establish sustainable funding sources for energy efficiency incentive programs, invest in energy efficiency–related R&D and demonstration centers, and lead by example by incorporating energy efficiency into government operations. In the latter area, they can reduce energy use in public buildings and fleets, and use energy savings performance contracts (ESPCs) to finance energy-saving projects. States can also work with utilities and community-based organizations to promote and coordinate energy code compliance training and workforce development programs.

Examples: Alaska, Connecticut, New York

Explore and promote innovative financing mechanisms to leverage private capital and lower the up-front costs of energy efficiency measures. Although utilities in many states offer some form of on-bill financing program to promote energy efficiency in homes and buildings, expanding lender and customer participation has been an ongoing challenge. States can pass legislation to increase stakeholder awareness and address legal barriers to the implementation of financing programs. A growing number of states are seeking new ways to maximize the impact of public funds and invigorate energy efficiency by attracting private capital through emerging financing models such as Property Assessed Clean Energy (PACE) programs and green banks.

Examples: Colorado, Connecticut, Minnesota, Missouri, New York, Rhode Island

Adopt cost-effective efficiency standards for appliances, equipment, lighting, and plumbing products. State appliance standards are a proven policy that lowers utility bills for customers and businesses, reduces pollution, and helps spur national standards. Even when state standards are not adopted at the federal level, adoption by just a few states can be enough to impact national markets. The Appliance Standards Awareness Project (ASAP) has outlined a menu of 18 recommended standards for 2019. Combined, they have the potential to provide more than $100 billion in savings to consumers.[1]

Examples: California, Colorado, Washington, Hawaii, Nevada

[1] Appliance Standards Awareness Project, *Update to "States Go First: How States Can Save Consumers Money, Reduce Energy and Water Waste, and Protect the Environment with New Appliance Standards"* (Boston: ASAP, 2018). appliance-standards.org/sites/default/files/write_up_of%20changes_to-the_analysis_for_2019%20Model%20Bill.pdf.

Chapter 1. Introduction, Methodology, and Results

Author: Weston Berg

The *State Energy Efficiency Scorecard*, now in its 13th edition, ranks states on their policy and program efforts. It assesses performance, documents best practices, and recognizes leadership. The report captures the latest policy developments and state efforts to save energy and highlights opportunities and policy tools available to governors, state legislators, and regulators.

It was a whirlwind year for energy efficiency in 2019 at the state level. Many legislatures and governors established the transition to clean and efficient energy as their top priority. While leading states like California, Massachusetts, and New York continued to innovate and advance model programs, some of the most exciting stories emerged from states where efficiency has historically been overlooked as a resource. Nevada, New Mexico, Washington, New York, and Maine all passed 100% clean energy goals coupled with plans to ramp up efficiency investment. In Virginia and New Jersey, utilities unveiled significant expansions of efficiency program portfolios in response to game-changing clean energy bills passed in 2018. State legislatures in Colorado, Washington, and Hawaii adopted new appliance standards in the biggest wave of state-level standard adoption in this decade. States also led the way in dealing with the challenges and opportunities surrounding building electrification and increasing uptake of electric vehicles as a means to achieve a low-carbon future.

States reported utility spending of approximately $8 billion on energy efficiency in 2018. Electricity savings remained fairly level compared with last year, totaling about 27.1 million megawatt-hours (MWh), enough to power more than 2.6 million homes for a year. Though levels of utility investment in efficiency appear to have plateaued for a number of top-achieving states in recent years, several states have introduced plans to scale up programs for the first time. Meanwhile, other innovators are looking beyond lighting toward the next generation of efficiency, including electric vehicles, smart buildings, cold climate heat pumps, and zero-energy building codes. They are also unlocking energy data to improve understanding of the varying time and locational values of efficiency.

Although prices for renewable electricity continue to decline, energy efficiency remains our nation's least-cost energy resource while delivering a variety of other benefits such as grid reliability and resilience. Other benefits include improving air and water quality, promoting equity, and enhancing health and comfort. Efficiency is also among the largest energy-sector employers, accounting for more than 2.3 million jobs in 2018 (E2 2019). The *Scorecard* seeks to help states, utilities, and businesses realize all these benefits by highlighting recent policy and programmatic successes.

The *Scorecard* is divided into eight chapters. This chapter discusses our scoring methodology (including changes made this year), presents the overall results of our analysis, and provides several strategies states can use to improve their energy efficiency. It also spotlights the leading states, most-improved states, and policy trends underlying the rankings.

Subsequent chapters present detailed results for six major policy areas. Chapter 2 covers utility and public benefits programs and policies. Chapter 3 discusses transportation policies. Chapter 4 deals with building energy code adoption, state code compliance efforts, and building policies. Chapter 5 covers state scores on policies that encourage and enable combined heat and power (CHP) development. Chapter 6 deals with state government initiatives, including financial incentives, lead-by-example policies, and energy efficiency–focused research and development (R&D). Chapter 7 discusses appliance and equipment efficiency standards.

The final chapter summarizes major policy highlights and setbacks occurring since the release of the last *Scorecard* and describes data limitations we encountered in our research. We also describe developing trends in energy efficiency we hope to address with new metrics in future *Scorecard*s.

SCORING

States are the test beds for policies and regulations, and no two states are the same. To reflect this diversity, we chose metrics flexible enough to capture the range of policy and program options that states use to encourage energy efficiency. The policies and programs evaluated in the *State Scorecard* aim to reduce end-use energy consumption, set long-term commitments for energy efficiency, and establish mandatory performance codes and standards. They also help to accelerate the adoption of the most energy-efficient technologies; reduce market, regulatory, and information barriers to energy efficiency; and provide funding for efficiency programs.

We evaluated states in the six primary policy areas in which they are pursuing energy efficiency:

- Utility and public benefits programs and policies[1]
- Transportation policies
- Building energy efficiency policies
- Policies encouraging CHP systems
- State government–led initiatives around energy efficiency
- Appliance and equipment standards

We allocated points among the policy areas to reflect the relative magnitude of energy savings possible through the measures scored. We relied on our analysis of scholarly work and the judgment of ACEEE staff and outside experts about the impact of state policies on energy efficiency in the sectors we covered. A variety of cross-sector potential studies have informed our understanding of the energy savings available in each policy area and have led to ongoing refinements in our scoring methodology (Geller et al. 2007; Neubauer et al. 2009, 2011; Eldridge, Elliott, and Vaidyanathan 2010; Molina et al. 2011; Hayes et al. 2014).

Of the 50 total points possible, we allocated 20 points (40%) to utility and public benefits program and policy metrics, 10 points (20%) to transportation policies and programs, 8

[1] A public benefits fund provides long-term funding for energy efficiency initiatives, usually through a small surcharge on electricity consumption on customers' bills.

points (16%) to building energy efficiency policies, 3 points (6%) to CHP-enabling policies, 6 points (12%) to state-led initiatives (such as lead-by-example programs and support of R&D), and 3 points (6%) to state appliance and equipment standards.

Within each policy area, we developed a scoring methodology based on a diverse set of criteria that we detail in each policy chapter. We used these criteria to assign a score to each state. The scores were informed by data requests sent to state energy officials, public utility commission (PUC) staff, and experts in each policy area. To the best of our knowledge, policy information for *The 2019 State Energy Efficiency Scorecard* is accurate as of June 30, 2019.

Table 1 outlines the scoring.

Table 1. Scoring by policy area and metrics

Policy areas and metrics	Maximum score	% of total points
Utility and public benefits programs and policies	20	40%
Incremental savings from electricity efficiency programs	7	14%
Incremental savings from natural gas and fuels efficiency programs	3	6%
Spending on electricity efficiency programs	2.5	5%
Spending on natural gas efficiency programs	1.5	3%
Large-customer opt-out programs*	(–1)	NA
Energy efficiency resource standards (EERS)	3	6%
Performance incentives and fixed-cost recovery	2	4%
Support of low-income energy efficiency programs	1	2%
Transportation policies	10	20%
GHG tailpipe emissions standards	1.5	3%
Electric vehicle (EV) registrations	1	2%
High-efficiency vehicle consumer incentives	0.5	1%
Targets to reduce vehicle miles traveled (VMT)	1	2%
Change in VMT	1	2%
Integration of transportation and land-use planning	1	2%
Complete streets policies	0.5	1%
Transit funding	1	2%
Transit legislation	0.5	1%
Freight system efficiency goals	1	2%
Equitable transportation policies	1	2%
Building energy efficiency policies	8	16%
Level of code stringency	4	8%

Policy areas and metrics	Maximum score	% of total points
Code compliance study	1	2%
Code enforcement activities	1.5	3%
Energy transparency policies	1	2%
Residential energy labeling	0.5	1%
Combined heat and power	3	6%
Absence of interconnection standards*	(–0.5)	NA
Policies to encourage CHP as a resource	1	2%
Deployment incentives	1	2%
Additional supportive policies	1	2%
State government initiatives	6	12%
Financial incentives	2.5	5%
Lead-by-example efforts in state facilities and fleets	2	4%
Research and development	0.5	1%
Carbon pricing	1	2%
Appliance and equipment efficiency standards	3	6%
Maximum total score	50	100%

* We deduct points for programs and policies that are detrimental toward energy efficiency.

The *State Scorecard* is meant to reflect the current policy landscape, incorporating changes from year to year. We do not envision that the allocation of points will forever remain the same; rather, we will continue to adjust our methodology to reflect the current energy efficiency policy and program environment. Point allocations can change both within and across policy categories. This year we shifted one point from CHP to state government–led initiatives in order to accommodate a new metric on efficiency programs funded through carbon pricing, like the Regional Greenhouse Gas Initiative (RGGI). We also changed the point allocation within several policy areas. We outline these changes later in this chapter and discuss them in more depth in the relevant policy chapters.

Changes in future editions of the *Scorecard* could include further revisions to point allocations and the addition or subtraction of entire categories of scoring. In making these changes, we seek to faithfully represent states' evolving efforts to realize the potential for energy efficiency in the systems and sectors of their economies.

STATE DATA COLLECTION AND REVIEW

We rely on outreach to state-level stakeholders to verify the accuracy and comprehensiveness of the policy information that we use to score the states. As in past years, we asked each state utility commission to review statewide data for the customer-funded energy efficiency programs presented in Chapter 2 and the CHP policies detailed in Chapter 5. Forty-four state commissions responded.

We also asked each state energy office to review information on transportation policies (Chapter 3), building energy codes (Chapter 4), CHP (Chapter 5), and state government initiatives (Chapter 6). We received responses from energy offices in 40 states. In addition, we gave state energy office and utility commission officials the opportunity to review and submit updates to the material in ACEEE's State and Local Policy Database (ACEEE 2019).[2] We also asked them to review and provide comments on a draft version of this *Scorecard* prior to publication.

We used publicly available data and responses from prior years to evaluate states that did not respond to this year's data request or request for review. In addition, we convened expert working groups to provide further information on building energy codes and policies promoting CHP.

Best-Practice Policy and Performance Metrics

The scoring framework described above is our best attempt to represent the myriad efficiency metrics as a quantitative score. Converting spending data, energy savings data, and policy adoption metrics spanning six policy areas into one score clearly involves some simplification. Quantitative energy savings performance metrics are confined mostly to programs run by utilities and statewide or third-party administrators using ratepayer funds. These programs are subject to strict evaluation, measurement, and verification standards. States engage in many other efforts to encourage efficiency, but such efforts are typically not evaluated with the same rigor, so it is difficult to capture comprehensive quantitative data for these programs.

Although our preference is to include metrics based on energy savings achieved in every sector, these data are not widely available. Therefore, except for utility policies, we have not scored the other policy areas on spending or reported savings attributable to a particular policy action. Instead, given the lack of consistent ex post data, we have developed best-practice metrics for scoring the states. Although these metrics do not score outcomes directly, they credit states that are implementing policies likely to lead to gains in energy efficiency. For example, we give credit for *potential* energy savings from improved building energy codes and appliance efficiency standards, since *actual* savings from these policies are rarely evaluated. We have also attempted to reflect outcome metrics to the extent possible; for example, electric vehicle (EV) registrations and reductions in vehicle miles traveled (VMT) both represent positive results of transportation policies. We include a full discussion of the policy and performance metrics in each chapter.

AREAS BEYOND OUR SCOPE: LOCAL AND FEDERAL EFFORTS

Energy efficiency initiatives implemented by actors at the federal or local level or in the private sector (with the exception of investor-owned utilities and CHP facilities) generally fall outside the scope of this report. It is important to note that regions, counties, and municipalities have become actively involved in developing energy efficiency programs, a positive development that reinforces state-level efficiency efforts. ACEEE's *City Energy Efficiency Scorecard* (Ribeiro et al. 2019) captures data on these local actions; we do not specifically track them in the *State Scorecard*. However a few *State Scorecard* metrics do

[2] Available at database.aceee.org.

capture local-level efforts, including the adoption of building codes and land-use policies, as well as state financial incentives for local energy efficiency initiatives. We also include municipal utilities in our data set to the extent that they report energy efficiency data to the US Energy Information Administration (EIA), state PUCs, or other state and regional groups. As much as possible, however, we focus on state-level energy efficiency activities.

The *State Scorecard* has not traditionally covered private-sector investments in efficient technologies outside of customer-funded or government-sponsored energy efficiency initiatives, codes, or standards. However we do recognize the need for metrics that capture the rapidly growing role of private financing mechanisms. We currently track states with active Property Assessed Clean Energy (PACE) programs, green bank financing, and loan programs offered by state agencies. However incompleteness and variations in reporting program results have made development of a fair and transparent performance-based scoring metric a challenge. Until the reliability and completeness of savings data from these private initiatives improves, we award points for the presence of such programs but stop short of measuring levels of funding or savings. In cases in which this information was made available, we have included it in Appendix J.

THIS YEAR'S CHANGES IN SCORING METHODOLOGY

We updated our scoring methodology in two policy areas this year to better reflect potential energy savings and changing policy landscapes.

Our treatment of policies supporting deployment of CHP technologies (Chapter 5) received an update in response to the growing complexity of CHP's role as a clean energy resource relative to local grid energy mixes. We lowered the number of achievable points from 4 to 3 while still acknowledging the important role the technology plays in delivering energy savings. This served several purposes. First, it allowed us to shift a point to state government–led initiatives in order to accommodate a new metric highlighting state efforts to support energy efficiency through carbon pricing policies (see below). Our reduction in CHP points also addressed some concerns expressed by reviewers:

- Potential double counting of efficiency efforts highlighted in the CHP chapter and those tracked in Chapter 2, which evaluates utility policies
- Unduly penalizing states in which higher levels of zero-emission resources make CHP less attractive as a policy priority

Within the CHP chapter, we also sought to provide more flexibility in scoring to recognize previously unscored efforts including nonwires alternatives and other market-based approaches that encourage cost-effective CHP for targeted grid needs. In addition, we put more emphasis on state incentives for and support of CHP, particularly for the resilience benefits it offers during extreme weather events.

In Chapter 6, which evaluates state government–led initiatives, we sought to recognize the past year's steadily growing trend of states taking action to pursue 100% clean energy or carbon-free energy goals. We did so by awarding points to those few that have promoted efficiency efforts through the establishment of a price on carbon (through either a carbon tax or a cap-and-trade system). Such programs benefit efficiency in a couple of ways. They

improve the economics of efficiency by factoring into energy prices the societal costs associated with carbon, and in most cases states and other jurisdictions dedicate a portion of revenues from these programs to efficiency offerings. We discuss additional details on scoring, including changes to methodology, in each chapter.

2019 STATE ENERGY EFFICIENCY SCORECARD *RESULTS*

We present the results of the *State Scorecard* in figure 1 and describe them more fully in table 2. In this section, we also highlight some key changes in state rankings, discuss which states are making notable new commitments to energy efficiency, and provide recommendations for states wanting to increase their energy efficiency.

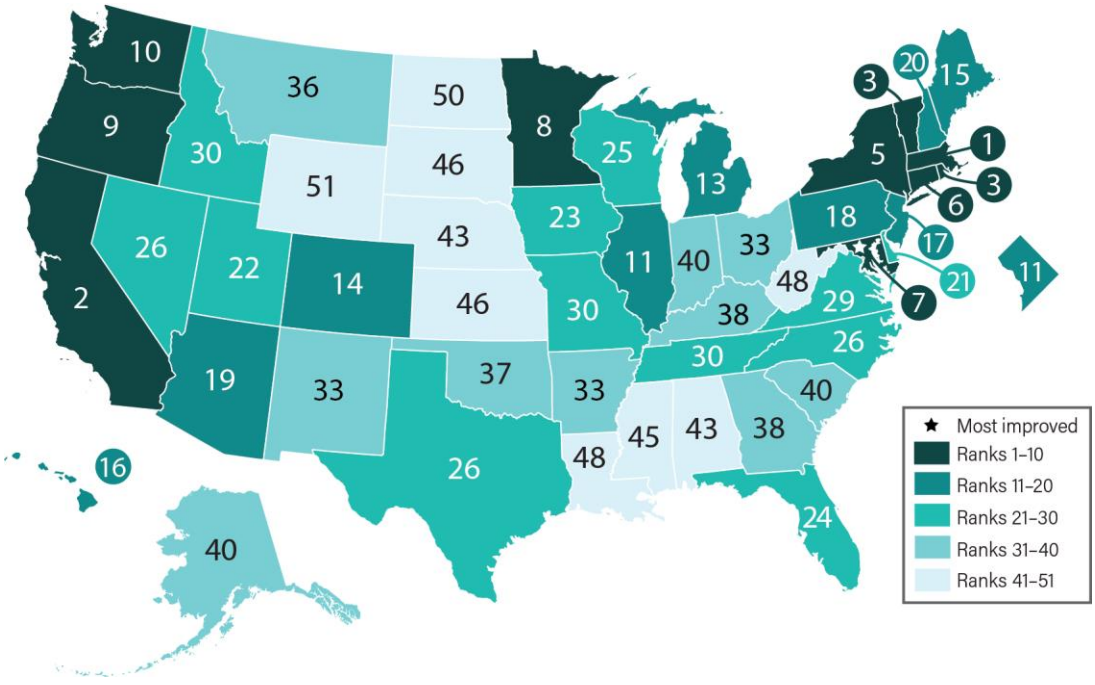

Figure 1. *2019 State Scorecard* rankings

Table 2. Summary of state scores in the *2019 State Scorecard*

Rank	State	Utility & public benefits programs & policies (20 pts.)	Trans-portation policies (10 pts.)	Building energy efficiency policies (8 pts.)	Combined heat & power (3 pts.)	State government initiatives (6 pts.)	Appliance efficiency standards (3 pts.)	**TOTAL SCORE (50 pts.)**	Change in rank from 2018	Change in score from 2018
1	Massachusetts	20	8.5	7	3	6	0	44.5	0	0.5
2	California	15.5	8.5	7.5	3	6	3	43.5	0	0
3	Rhode Island	20	6	5.5	3	6	0	40.5	0	–0.5
3	Vermont	18	6.5	6	2	6	2	40.5	1	0
5	New York	14	8.5	6.5	2.5	5.5	0	37	1	1.5
6	Connecticut	12.5	7.5	7	2.5	6	1	36.5	–1	–1.5
7	Maryland	12.5	7.5	6	3	5.5	0	34.5	3	4.5
8	Minnesota	14.5	5.5	6	1.5	5	0	32.5	0	0.5
9	Oregon	10.5	7.5	6.5	1.5	5	1	32	–2	–3
10	Washington	9	7	6.5	2	5	2	31.5	–1	0
11	District of Columbia	9.5	9	6	1	3.5	0	29	1	1.5
11	Illinois	11.5	5	6	2.5	4	0	29	1	1.5
13	Michigan	14	3.5	6	1	4	0	28.5	–2	0
14	Colorado	9.5	4.5	5.5	0.5	5	2	27	0	1.5
15	Maine	10.5	5.5	2.5	2.5	5	0	26	–1	0.5
16	Hawaii	11	4	5.5	1	2.5	1.5	25.5	0	2.5
17	New Jersey	6.5	6	6	3	2.5	0	24	1	2.5
18	Pennsylvania	4.5	5.5	7	2	4.5	0	23.5	0	2
19	Arizona	9.5	4	4	1.5	2.5	0	21.5	–2	–0.5
20	New Hampshire	9.5	3	3.5	0.5	4.5	0	21	1	1.5
21	Delaware	3	5	5	1.5	6	0	20.5	1	2
22	Utah	6.5	3	5.5	0.5	4	0	19.5	–2	–1.5
23	Iowa	9	2.5	5	0.5	1.5	0	18.5	1	1.5
24	Florida	2	4.5	6	0	4	0	16.5	–1	–1
25	Wisconsin	7.5	1	3.5	0.5	3.5	0	16	4	0.5
26	Nevada	4.5	2.5	4	0	4	0.5	15.5	3	0
26	North Carolina	3	3.5	4.5	1	3.5	0	15.5	0	–0.5
26	Texas	1	3	7	0.5	4	0	15.5	–1	–1
29	Virginia	0.5	5	5.5	–0.5	4.5	0	15	–3	–1
30	Idaho	5.5	1	5.5	0	2.5	0	14.5	–4	–1.5
30	Missouri	2.5	2.5	4	1	4.5	0	14.5	3	–0.5
30	Tennessee	1	3.5	3.5	2	4.5	0	14.5	5	0.5
33	Arkansas	7	1	3	–0.5	3.5	0	14	1	–0.5
33	New Mexico	5.5	1.5	2.5	1	3.5	0	14	3	0.5
33	Ohio	4.5	1	3.5	1	4	0	14	–4	–1.5
36	Montana	3.5	0.5	5.5	0	3	0	12.5	1	–0.5
37	Oklahoma	5.5	2.5	1.5	–0.5	3	0	12	2	1
38	Georgia	2	4	3	0	2	0	11	0	–1
38	Kentucky	1	1.5	4	0	4.5	0	11	–9	–4.5
40	Alaska	1	3.5	2	0	4	0	10.5	1	0.5
40	Indiana	3.5	2.5	2.5	0	2	0	10.5	0	0
40	South Carolina	1.5	2	3	0	4	0	10.5	1	0.5
43	Alabama	0	1	6	–0.5	3	0	9.5	0	0
43	Nebraska	0.5	1	6	–0.5	2.5	0	9.5	1	1.5
45	Mississippi	2	2	1.5	–0.5	3	0	8	–1	0
46	Kansas	0.5	1.5	3.5	0	1.5	0	7	0	–0.5
46	South Dakota	2	1	3.5	0	0.5	0	7	0	–0.5
48	Louisiana	0.5	1.5	2	0	2.5	0	6.5	–2	–1
48	West Virginia	–0.5	2	3	0	2	0	6.5	1	1
50	North Dakota	0	1.5	3	0	0.5	0	5	–1	–0.5
51	Wyoming	1	1.5	0	–0.5	2.5	0	4.5	0	0

How to Interpret Results

Although we provide individual state scores and rankings, the differences among states are most instructive in tiers of 10. Relatively few points separate states' total scores in the middle tiers: just 6 points in the third tier and 3.5 points in the fourth. These middle tiers also have a significant number of states tied in the rankings. For example, in the third tier Nevada, North Carolina, and Texas are tied for 26th. Small improvements in energy efficiency will likely have a significant effect on the rankings of states in the middle tiers. Conversely, idling states will easily fall behind as other states in this large group ramp up their efficiency efforts.

The top tier exhibits more variation in scoring, with a 13-point range between 1st place and 10th. This represents about a third of the total variation in scoring among all the states. Massachusetts led all states again this year and was joined by California, Rhode Island, and Vermont as the only states scoring 40 or more points. Other states in the top tier are also well-established high scorers. Generally speaking, the highest-ranking states have all made broad, long-term commitments to energy efficiency, indicated by their staying power at the top of the *State Scorecard* over the past decade. However it is important to note that retaining one's spot in the lead pack is no easy task; all of these states must embrace new, cutting-edge strategies and programs to remain at the top.

2019 Leading States

Massachusetts maintained its hold on first place this year, taking the top spot for the ninth year in a row. The Bay State was followed closely by California, also a perennial *Scorecard* leader. Both states are setting strong examples for others to follow by delivering a robust array of policies to drive energy efficiency across multiple sectors.

Supported by a strong policy framework established under the state's Green Communities Act more than a decade ago, **Massachusetts**'s energy efficiency goals, among the most advanced and sophisticated in the nation, continue to serve as a model for others. Earlier in the year, the Department of Public Utilities approved a new three-year energy efficiency plan for the state's utilities, with an expanded array of measures and targets to better align efficiency with statewide GHG reduction goals. These include an increasing commitment to strategic electrification through homeowner incentives to switch from oil and propane furnaces to electric heat pumps, as well as incentives to reduce winter and summer peak demand. According to the state's recent Global Warming Solutions Act 10-year progress report, state policies to implement all cost-effective energy efficiency have contributed to a 3.4% reduction in GHGs from 1990 levels, projected to grow to 5.4% by 2020. This is the highest contribution to reducing emissions of all the state's carbon mitigation strategies (Massachusetts Executive Office of Energy and Environmental Affairs 2019).

California, which has historically helped spur national energy efficiency efforts through its groundbreaking building energy codes, standards for efficient appliances, and limits on vehicle emissions, continues to propel energy savings across multiple sectors. The state has passed efficiency standards for dozens of appliances in the past several decades—many of which have gone on to be enacted at the federal level—and in 2019 adopted new standards for products like air compressors and portable air conditioners. Reflecting the state's wide and enduring reach, Washington, Colorado, Hawaii, and Nevada also passed standards

bills modeled on California's. Together with utilities and other stakeholders, the California Energy Commission continues to work on strategies to meet the state-adopted SB 350 goal of doubling cumulative energy efficiency savings by 2030 relative to 2015. The state has also moved forward with ambitious efforts to decarbonize the buildings sector, authorizing $200 million over four years to advance low-carbon space heating and water heating under SB 1477. California also launched a proceeding to coordinate its development of building energy codes and appliance standards with statewide goals to reduce GHG emissions from buildings by at least 40%, relative to 1990 levels, by 2030.

Rhode Island ranked third for the third year in a row, tying with Vermont. Under its robust Three-Year Energy Efficiency Procurement Plan, the state continues to deliver levels of electric savings that are among the highest in the United States. Last year Rhode Island adopted a voluntary residential stretch code promoting goals to cut emissions 45% below 1990 levels by 2035 under the Resilient Rhode Island Act of 2014. The state's energy office and National Grid have also promoted and standardized residential energy labeling practices by working with the US Department of Energy (DOE) on its Energy Metrics to Promote Residential Energy Scorecards in States (EMPRESS) project. Rhode Island has also collaborated with Northeast Energy Efficiency Partnerships to consolidate home energy data in a central portal. In addition, the state leads by example with clear energy goals established for state agencies, and is working to advance construction of zero energy buildings through education, outreach, and training.

Vermont pulled into a tie for third place, extending to six years its run in the top five. Efficiency Vermont, the statewide energy efficiency administrator, delivered savings above 2.3% of electric sales—the third highest of any state—from measures installed in 2018. Together these measures are expected to save more than $220 million over their lifetime. The state was also recognized by the US Environmental Protection Agency's (EPA) ENERGY STAR® program for the success of the new Efficiency Vermont Marketplace, a recently launched online tool to help customers research efficient appliances and electronics. The state is also undertaking a rulemaking process to adopt the 2018 IECC for residential and commercial buildings and expects it to be in place by early fall of 2019 with effective dates at the beginning of 2020.

New York returned to the top five this year as policymakers and program administrators continue their pursuit of aggressive savings goals first unveiled by the governor on Earth Day 2018. This goal, to reduce energy consumption by 185 trillion Btus by 2025, was recently codified by lawmakers under the New York Climate Leadership and Community Protection Act, which sets one of the nation's most ambitious climate targets: 100% carbon-free electricity by 2040 and economy-wide net-zero carbon emissions by 2050. State regulators also convened a series of conferences seeking to clarify a path forward on the new goals and issued an order adopting additional sub-targets for electricity savings, heat pumps, and income-qualified customers. New York's sophisticated and diverse policy approach, which also encompasses other innovations like energy benchmarking, accelerated building codes, and efforts to accelerate building electrification, seems to be gaining momentum toward a more energy-efficient future for the state.

States rounding out the top 10 largely reflected the top tier of last year's *State* Scorecard, though in slightly different order: Connecticut, Maryland, Minnesota, Oregon, and Washington. Each state has established strong policy structures, incentives, and standards to drive savings through utility programs, efficient new construction, and improved sustainability in the transportation sector.

Recent examples include the **New York** Climate Leadership and Community Protection Act and the June passage in **Oregon** of SB 1044, which sets goals for the adoption of zero-emission vehicles (ZEVs). The state of **Washington** delivered a variety of conservation bills this year that included efficiency standards for electric and water appliances and for commercial buildings larger than 50,000 square feet, as well as legislation mandating that 100% of the state's electricity be sourced from clean energy in 2045. In **New York**, utilities filed detailed electric, gas, and heat pump goals to support an ambitious statewide 185-TBtu savings target for 2025 established last year.

Table 3 shows the number of years that states have been in the top 5 and top 10 spots in the *State Scorecard* rankings since their inception in 2007.

Table 3. Leading states in the *State Scorecard*, by years at the top

State	Years in top 5	Years in top 10
California	13	13
Massachusetts	12	13
Oregon	10	13
Vermont	11	13
New York	8	13
Connecticut	6	13
Rhode Island	7	12
Washington	1	13
Minnesota	0	12
Maryland	0	9
Illinois	0	2
Maine	0	2
New Jersey	0	2
Wisconsin	0	1

Eight states have occupied the top 5 spots, and 14 have appeared somewhere in the top 10, since the first edition of the *State Scorecard*. California is the only state to have earned a spot among the top 5 in all 13 years, followed by Massachusetts for 12 years and Oregon for 10 years. New Jersey, Wisconsin, Illinois, and Maine have all placed in the top 10 in the past, but none scored high enough to rank in the top tier this year.

Changes in Results Compared with *The 2018 State Energy Efficiency Scorecard*

Overall, 21 states and the District of Columbia gained points and 20 states lost points this year compared with last year's *Scorecard* rankings. Nine states had no change in score.[3] Table 4 compares the results.

Table 4. Number of states gaining or losing points compared with 2018, by policy area

Policy category	States gaining points		No change		States losing points	
Utility and public benefits	18	35%	21	41%	12	24%
Transportation	11	22%	29	57%	11	22%
Building energy policies	16	31%	30	59%	5	10%
Combined heat and power	2	4%	5	10%	44	86%*
State government initiatives	17	33%	33	65%	1	2%
Appliance standards	4	8%	47	92%	0	0%
Total score	22	43%	9	18%	20	39%

Percentages may not total 100 due to rounding. *Because of an adjustment to the scoring methodology that shifted a point to the state government initiatives category from CHP, a relatively high number of states lost a point in the latter category this year.

The fact that 20 states lost points this year should not necessarily be interpreted as a sign that they are losing ground. Given the number of metrics in the *State Scorecard* and states' varying efforts, movement among the states should be expected. The landscape for energy efficiency is in constant flux, and changes in state scores reflect a variety of factors. In some cases they result from the leading states' ever-rising bar for energy efficiency policies and outcomes. In others they stem from changes to our *Scorecard* methodology, such as the shift of an additional point this year to the state government chapter to recognize states funding energy efficiency through proceeds from carbon pricing policies.

Leaving aside methodology, the number of states losing points this year does not indicate a lack of nationwide progress. On the contrary, several states, including Colorado, Maine, Massachusetts, New Jersey, New Mexico, New York, and Nevada, have renewed, extended, or strengthened energy efficiency targets to help lay the groundwork for future savings. As mentioned earlier, savings from electric efficiency programs in 2018 totaled approximately 27.1 million MWh, equivalent to approximately 0.73% of total retail electricity sales in the United States. And this does not include ongoing savings from energy efficiency measures installed in earlier years that continue to save energy, more than 250 million MWh in 2018, or close to 7% of electricity consumption. More information on state scores for utility programs is included in Chapter 2.

Most-Improved States

Relative to last year, this year's most-improved state was Maryland. Also showing improvement were Hawaii, New Jersey, Pennsylvania, and Delaware. All of these states added at least 2 points to their scores, with most moving up in the rankings.

[3] The *State Scorecard* looks at all 50 states and the District of Columbia, which is treated as a state under DOE Program Rule 10 CFR Part 420–State Energy Program.

Maryland added 4.5 points to its score, leaping from 10th to 7th place. Utilities in the state have steadily ramped up efficiency programs in recent years, spurred by strong energy reduction goals established by the state's Public Service Commission (PSC) in 2015 (and codified in 2017) to reach 2% annual savings. To date, these efforts, delivered through the EmPOWER Maryland Program, have saved more than 8 million MWh, with expected savings of approximately $9 billion over the life of installed measures, according to recent reports. Maryland has consistently pursued efficiency in the buildings and transportation sectors as well, maintaining strong building energy codes, increasing funding to public transportation, and stepping up planning for grid integration of EVs. The state has also shown a commitment to leading by example, with the governor signing an executive order this year to reduce energy consumption in state-owned buildings by 10% by 2029.

Hawaii added 2.5 points this year, thanks in part to the passage of HB 556, which adopted minimum efficiency standards for several products not covered at the federal level, including computers, faucets, and showerheads. The new standards are projected to save Hawaiians up to $38 million on their utility bills in 2025; by 2035 these savings could reach more than $75 million annually. The state also continues to achieve top-tier levels of utility savings, guided by its Clean Energy Initiative and goals to reduce consumption 30% relative to forecasted demand by 2030 through efficiency measures.[4] In the past year, Hawaii Energy and the state public utilities commission have also led two working groups in a series of workshops and stakeholder engagements to consider how energy efficiency programs can evolve to meet the state's aggressive decarbonization goals.

New Jersey also added 2.5 points as utilities and regulators continued work on strengthening efficiency programs under new 2% electricity savings targets passed last year. The governor also announced the New Jersey Partnership to Plug-In, a first-of-its-kind, statewide partnership to create a strategic and streamlined framework to support New Jersey's electric vehicle ecosystem. Its goal is to register 330,000 ZEVs by 2025. The state utility regulator also put forth a draft energy plan earlier in the year charting a path toward achieving the governor's goal of 100% clean energy by 2050 and including energy efficiency as a key focus.

A number of other states also unveiled important new energy efficiency policies clearing the way for future savings. To name a few, these included the following:

- In **Nebraska**, legislators passed LB 405, updating the statewide residential and commercial energy codes to the 2018 IECC without amendments, currently the most stringent codes in the Midwest.
- **New Mexico** passed HB-291 earlier in the year, strengthening utility efficiency goals to target cumulative savings of 5% of 2020 sales by 2025. The law also raises the cap on efficiency spending and establishes decoupling, removing the disincentive for utilities to save energy.
- **Colorado** passed SB 236, strengthening the position of efficiency programs with respect to cost-effectiveness screening by requiring electric utilities to use a carbon emissions cost of at least $46 per ton of CO_2 in evaluations of electric generation and

[4] See hawaiicleanenergyinitiative.org.

heating resources. The governor also signed legislation to strengthen building energy codes, adopt comprehensive appliance standards for 15 products, and protect against current efforts to roll back federal light bulb standards.

States Losing Ground

Sixteen states fell in the rankings this year due to several factors, such as greater progress by other states and changes to the scoring methodology in several categories, including state government–led initiatives and CHP policies. This loss of ground indicates the complex relationship between changes in total score and changes in rank. Of the 20 states that lost points, 12 fell in the rankings, 5 did not change, and 3 states—Missouri, Arkansas, and Montana—actually improved in rank despite losing a point. The fall in rank of several states might appear incommensurate with their relatively minor loss of points relative to last year. But given the number of metrics covered in the *State Scorecard* and states' differing efforts, relative movement among states should be expected. As mentioned earlier, the difference among states' total scores, particularly in the middle tiers of the *State Scorecard*, is small; as a result, idling states can easily fall behind in the rankings as others ramp up efforts to become more energy efficient.

Kentucky lost 4.5 points, dropping nine positions to 38th place, the largest point loss and fall in the rankings in 2019. Much of the state's tumble is due to the state public service commission's decision last year to discontinue almost all of Kentucky Power's demand-side management programs. The state's other utilities also made substantial reductions in similar programs. Since then, levels of statewide electric savings have fallen to just a fraction of those reported in previous years and were the eighth-lowest of any state.

In general, we see two trends among the states losing ground in the *State Scorecard.* First, many of those falling behind are not increasing energy savings year after year and are therefore being outpaced as other states ramp up programs to meet higher savings targets. States losing ground also typically have not fully implemented changes to the utility business model that encourage utilities to take full advantage of energy efficiency as a resource, including through decoupling, performance incentives, and energy savings targets.

Second, opt-out provisions have been approved in many of the states falling behind in the *State Scorecard* rankings. These provisions allow large customers to avoid paying into energy efficiency programs, forcing other customers to subsidize them while limiting savings achieved by utilities.

STRATEGIES FOR IMPROVING ENERGY EFFICIENCY

A variety of policy tools and program designs are available to state officials to strengthen efforts to save energy across multiple use sectors. The following list highlights examples of best practices by state policymakers seeking to improve energy efficiency performance by energy utilities, in the buildings and transportation sectors, and through appliance standards. We also highlight best practices that reduce legal and market barriers to investing in energy efficiency and expand participation in programs that achieve savings.

Establish and adequately fund an energy efficiency resource standard (EERS) or similar energy savings target. EERS policies set specific energy savings targets that utilities or independent statewide program administrators must meet through customer energy efficiency programs. They serve as an enabling framework for cost-effective investment, savings, and program activity. As states address evolving priorities such as decarbonization, cost, equity, and grid value, regulators in places like Massachusetts and New York are adjusting targets to incorporate multiple goals (e.g., fuel-neutral savings) that better align efficiency programs with electrification and GHG reduction objectives.

Examples: Arizona, Arkansas, Massachusetts, Michigan, Minnesota, New York

Adopt California tailpipe emissions standards and set quantitative targets for reducing VMT. Transportation consumes almost 30% of the total energy used in the United States. At the state level, a comprehensive approach to transportation energy efficiency must address both individual vehicles and the entire transportation system. A variety of state-level policy options are available to improve transportation system efficiency. These include codifying targets for reducing VMT and integrating land use and transportation planning to create sustainable communities with access to multiple modes of travel. While federal fuel economy standards are expected to go a long way toward helping to reduce fuel consumption, standards for model years 2022–2025 are currently under review and face an uncertain future. States that adopt California's tailpipe emissions standards will lead the way toward clean, fuel-efficient vehicles.

Examples: California, Massachusetts, New York, Oregon

Adopt policies to encourage and strengthen programs for income-qualified customers, and work with utilities and regulators to recognize the nonenergy benefits (NEBs) of such programs. States and PUCs can include goals specific to the low-income sector, either within an EERS or as a stand-alone minimum acceptable threshold. PUCs can further strengthen programs serving low-income households by designing cost-effectiveness tests that take into account the NEBs that these programs produce, including improved health, greater safety, and fewer trade-offs between energy and other necessities.

Examples: Illinois, Michigan, New Hampshire, Pennsylvania

Adopt updated, more stringent building energy codes, improve code compliance, and involve efficiency program administrators in code support. Buildings use more than 40% of the total energy consumed in the United States, making them an essential target for energy savings. Adopting mandatory building energy codes is one way to ensure a minimum level of energy efficiency for new residential and commercial buildings. Strategies such as energy performance standards, benchmarking and transparency policies, and financing tools to encourage deep retrofits are also critical for addressing efficiency in the existing building stock.

Examples: California, Illinois, Maryland, Texas, District of Columbia, Washington, Nebraska

Expand state government–led initiatives and make them visible. States can establish sustainable funding sources for energy efficiency incentive programs, invest in energy efficiency–related R&D and demonstration centers, and lead by example by incorporating energy efficiency into government operations. In the latter area they can reduce energy use in public buildings and fleets and use energy savings performance contracts (ESPCs) to finance energy-saving projects. States can also work with utilities and community-based organizations to promote and coordinate energy code compliance training and workforce development programs.

Examples: Alaska, Connecticut, New York

Explore and promote innovative financing mechanisms to leverage private capital and lower the up-front costs of energy efficiency measures. Although utilities in many states offer some form of on-bill financing program to promote energy efficiency in homes and buildings, expanding lender and customer participation has been an ongoing challenge. States can increase stakeholder awareness and pass legislation to address legal barriers to the implementation of financing programs. A growing number of states are seeking new ways to maximize the impact of public funds and invigorate energy efficiency by attracting private capital through emerging financing models such as Property Assessed Clean Energy (PACE) programs and green banks.

Examples: Colorado, Connecticut, Minnesota, Missouri, New York, Rhode Island

Adopt cost-effective efficiency standards for appliances, equipment, lighting, and plumbing products. State appliance standards are a proven policy that lowers utility bills for customers and businesses, reduces pollution, and helps spur national standards. Even when state standards are not adopted at the federal level, adoption by just a few states can be enough to impact national markets. The Appliance Standards Awareness Project (ASAP) has outlined a menu of 18 recommended standards for 2019. Combined, they have the potential to provide more than $100 billion in savings to consumers (ASAP 2018).

Examples: California, Colorado, Washington, Hawaii, Nevada

Chapter 2. Utility and Public Benefits Programs and Policies

Author: Weston Berg

INTRODUCTION

The utility sector is critical to implementing energy efficiency. Electric and natural gas utilities and independent statewide program administrators deliver a substantial share of electricity and natural gas efficiency programs in the United States.[6] These programs, funded by utility customers through utility rates and statewide public benefits funds, encourage customers to use efficient technologies and thereby reduce their energy waste. Energy efficiency is a resource—just as power plants, wind turbines, and solar panels are. Driven by regulation from state utility commissions, utilities and administrators in some states have for decades been delivering energy efficiency programs and market transformation initiatives for residential, commercial, industrial, and income-qualified customers.[7]

Utilities and administrators implement energy efficiency programs in all 50 states and the District of Columbia. Program approaches include financial incentives, such as rebates and loans; technical services, such as audits, retrofits, and training for architects, engineers, and building owners; behavioral strategies; and educational campaigns about the benefits of energy efficiency improvements. Utilities and administrators also continue to develop new and creative ways of delivering energy efficiency to their customers, including some customer segments that have been more difficult to serve, such as small businesses and multifamily housing.

METHODOLOGY

For this chapter, we gathered statewide data on the following:

- Utility energy sales (electricity and natural gas) to customers in 2017 and 2018
- Utility revenues from retail energy sales in 2017 and 2018
- Number of residential natural gas customers in 2017
- Budgets for electricity and natural gas energy efficiency programs in 2018 and 2019
- Actual spending for electricity and natural gas energy efficiency programs in 2017 and 2018
- Incremental net and gross electricity and natural gas energy efficiency program savings in 2017 and 2018[8]

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[6] Other major programs, run by state governments, are discussed in Chapter 6. In addition, the US Department of Energy Weatherization Assistance Program (WAP), started in 1976, provides weatherization services to approximately 35,000 homes every year using DOE funds. More than $200 million was dedicated annually to the program in both FY 2016 and FY 2017, though these are not considered within the *State Scorecard* given the report's state-level policy scope.

[7] For more information on the historical growth of utility energy efficiency programs, see York et al. (2012).

[8] Gross savings are those expected from an energy efficiency program, crediting all installed efficiency measures, including those that would have been installed in the absence of the program. Net savings are those attributable to the program, typically estimated by subtracting savings from free riders (program participants who would have implemented or installed the measures without the incentive, or with a lesser incentive), and adding in estimates of savings from free drivers (program nonparticipants who implemented or installed the measures due to the program). States differ in how they define, measure, and account for free-ridership and other components of the net savings calculation (Haeri and Khawaja 2012).

- Incremental net and gross energy savings of unregulated fuels including fuel oil, kerosene, wood, and propane, where available, in 2017 and 2018
- Policies and regulations to encourage utility investment in energy efficiency
- Utility policies and programs related to large customers, including self-direct and opt-out provisions
- Policies and levels of spending related to utility investment in low-income energy efficiency programs
- Data access policies and provisions[9]

Our data sources included information requests completed by state utility commissions, EIA (EIA 2018b, 2018d, 2019a, 2019b), and regional efficiency groups.[10] We sent the data we gathered, along with last year's *State Scorecard* data, to state utility commissions and independent administrators for review. Table 5 shows overall scores for utility programs and policies. Tables 7, 9, 11, and 13 provide data on electricity and natural gas efficiency program savings and spending in the most recent years for which data are available.

SCORING AND RESULTS

This chapter reviews and ranks the states on the basis of their performance in implementing utility-sector efficiency programs and enabling policies that are evidence of a commitment to energy efficiency. The eight utility scoring metrics are

- Incremental electricity program savings as a percentage of retail sales (7 points)[11]
- Incremental natural gas and unregulated fuels program savings as a percentage of residential and commercial sales (3 points)
- Electricity program spending as a percentage of statewide electric utility revenues (2.5 points)
- Natural gas program spending per residential gas customer (1.5 points)
- Opt-out provisions for large customers (–1 point)
- EERS for utilities and statewide program administrators (3 points)
- Utility business models that encourage energy efficiency, including performance incentives and revenue decoupling (2 points)
- Policies and utility funding in support of low-income energy efficiency programs (1 point)

In this category, a state could earn up to 20 points, or 40% of the 50 total points possible in the *State Scorecard*. We set this point allocation because the savings potential of utility and public

[9] We used this information from state responses to present best practices, not to develop scores.

[10] The six regional energy efficiency organizations (REEOs) are the Midwest Energy Efficiency Alliance (MEEA), Northeast Energy Efficiency Partnerships (NEEP), Northwest Energy Efficiency Alliance (NEEA), Southeast Energy Efficiency Alliance (SEEA), South-Central Partnership for Energy Efficiency as a Resource (SPEER), and Southwest Energy Efficiency Project (SWEEP). The REEOs work through funded partnerships with the US DOE and with various stakeholders, such as utilities and advocacy groups, to provide technical assistance to states and municipalities in support of efficiency policy development, program design, and program implementation.

[11] ACEEE defines incremental savings as new savings from programs implemented in a given year. Incremental savings are distinct from cumulative savings, which are the savings in a given program year from all the measures implemented under the programs in that year and in prior years that are still saving energy.

benefits programs is approximately 40% of the total energy savings potential of all policy areas scored. Studies suggest that electricity programs typically achieve at least three times the primary energy savings of natural gas programs (Eldridge et al. 2009; Geller et al. 2007; Elliott et al. 2007a; Elliott et al. 2007b). Utility-sector potential studies generally indicate significant untapped possible savings for natural gas efficiency programs (Neubauer et al. 2011; PG&E 2006; Mosenthal et al. 2014; GDS 2013; Cadmus 2010). Therefore we allocated 9.5 points to metrics for electricity programs measuring annual savings and spending and 4.5 points to metrics for natural gas and unregulated fuels programs measuring annual savings and spending. In an effort to recognize state policies and programs aimed at strengthening energy efficiency among low-income households—a historically underserved segment of the population—we introduced in the 2017 *State Scorecard* a 1-point scoring category to capture these state efforts. At that time, we shifted 0.5 points each away from utility spending on electricity and natural gas efficiency programs.

Hawaii consumes almost no natural gas (EIA 2019a), so it aims energy efficiency efforts at electricity only. To address this, we awarded Hawaii points for natural gas efficiency spending, savings, and regulatory structures equivalent to the proportion of points it earned for corresponding electricity programs and policies.

We continue our practice of reporting programs' incremental energy savings (savings from measures installed in a given year) rather than their total annual—or cumulative—energy savings (those achieved in a year from measures installed that year and in prior years). We report incremental savings in the *State Scorecard* for two reasons. First, basing our scoring on total annual savings or cumulative energy savings would involve levels of complexity that are beyond the scope of the *State Scorecard*, including identifying the start year for the cumulative series and accurately accounting for the life of energy efficiency measures and the persistence of savings. Second, the *State Scorecard* aims to provide a snapshot of states' current energy efficiency programs, and incremental savings give a clearer picture of recent efforts.

There are some other possible metrics we did not use for scoring. For instance, we did not attempt to include program cost effectiveness or level of spending per unit of energy savings. All states have cost-effectiveness requirements for energy efficiency programs. However the wide diversity of measurement approaches across states makes comparison less than straightforward. Also, several states require program administrators to pursue all cost-effective efficiency. Although some states have prioritized low acquisition costs and encouraged maximizing the *degree* of cost effectiveness, promoting larger *amounts* of marginally cost-effective energy savings is another valid approach. We also did not adjust savings for variations in avoided costs of energy across states, as there are examples of achieving deep energy savings in both high- and low-cost states.

Note that scores are for states as a whole and therefore may not be representative of the specific efforts of each utility within a state. A single utility or a small set of utilities may do very well in terms of energy efficiency programs and associated metrics (spending and savings), but when viewed in combination with all utilities in that state, such efforts can be masked in the *State Scorecard* by other utilities with lower performance. For more information on the energy savings performance of individual utilities, refer to *The 2017 Utility Energy Efficiency Scorecard* (Relf, Baatz, and Nowak 2017), published by ACEEE.

Table 5 lists states' overall utility scores. Explanations of each metric follow.

Table 5. Summary of state scores for utility and public benefits programs and policies

State	2018 electricity program savings (7 pts.)	2018 natural gas & fuels program savings (3 pts.)	2018 electricity EE spending (2.5 pts.)	2018 gas program spending (1.5 pts.)	2019 opt-out provision (–1 pt.)	2019 energy efficiency resource standard (3 pts.)	2019 performance incentives & fixed-cost recovery (2 pts.)	2019 low-income energy efficiency programs (1 pt.)	2019 total score (20 pts.)
Massachusetts	7	3	2.5	1.5	0	3	2	1	20
Rhode Island	7	3	2.5	1.5	0	3	2	1	20
Vermont	7	1.5	2.5	1.5	0	2.5	2	1	18
California	5.5	3	1.5	1	0	1.5	2	1	15.5
Minnesota	4.5	3	1	1	0	2	2	1	14.5
Michigan	5	3	1	1	0	1.5	1.5	1	14
New York	4	2	1.5	1	0	2.5	2	1	14
Connecticut	4.5	1	1	1.5	0	1.5	2	1	12.5
Maryland	6.5	0.5	1.5	0	0	2	1	1	12.5
Illinois	5.5	1	1.5	0.5	–1	2	1	1	11.5
Hawaii	5	2	0.5	0.5	0	1	2	0	11
Maine	3.5	1.5	1.5	1	–1	2.5	0.5	1	10.5
Oregon	3	1.5	1.5	1	0	1.5	1	1	10.5
Arizona	4	1	0.5	0	0	2.5	1	0.5	9.5
Colorado	3.5	0.5	1	0.5	0	2	1.5	0.5	9.5
District of Columbia	4	2	0.5	0.5	0	0	1.5	1	9.5
New Hampshire	2.5	0.5	1	1.5	0	1.5	1.5	1	9.5
Iowa	3.5	2	1	1.5	–1	1	0	1	9
Washington	4	0.5	1.5	0.5	0	1	1	0.5	9
Wisconsin	2	1.5	0.5	0.5	0	1	1	1	7.5
Arkansas	2	1.5	0.5	0.5	–1	1.5	1.5	0.5	7
New Jersey	1	0.5	0.5	1	0	2	0.5	1	6.5
Utah	2	2	0.5	0.5	0	0	1	0.5	6.5
Idaho	2.5	0	1.5	0.5	0	0	0.5	0.5	5.5
New Mexico	1.5	0	0.5	0.5	0	1	1	1	5.5
Oklahoma	1.5	1.5	0.5	0.5	–1	0	1.5	1	5.5
Nevada	1.5	0	0.5	0	0	1	0.5	1	4.5
Ohio	3.5	0	0.5	0	–1	0	1	0.5	4.5
Pennsylvania	2.5	0	0.5	0	0	0.5	0	1	4.5

State	2018 electricity program savings (7 pts.)	2018 natural gas & fuels program savings (3 pts.)	2018 electricity EE spending (2.5 pts.)	2018 gas program spending (1.5 pts.)	2019 opt-out provision (–1 pt.)	2019 energy efficiency resource standard (3 pts.)	2019 performance incentives & fixed-cost recovery (2 pts.)	2019 low-income energy efficiency programs (1 pt.)	2019 total score (20 pts.)
Indiana	1.5	0.5	0.5	0.5	–1	0	1	0.5	3.5
Montana	1.5	0	0.5	0.5	0	0	0	1	3.5
Delaware	0	1	0.5	0.5	0	0	0	1	3
North Carolina	2	0	0.5	0	–1	0	1	0.5	3
Missouri	2	0	0.5	0	–1	0	0.5	0.5	2.5
Florida	0	0	0.5	1	0	0	0	0.5	2
Georgia	0.5	0	0	0	0	0	1	0.5	2
Mississippi	0.5	0.5	0	0	0	0	0.5	0.5	2
South Dakota	0.5	0	0	0	0	0	1.5	0	2
South Carolina	1.5	0	0	0	–1	0	0.5	0.5	1.5
Alaska	0	0	0	0	0	0	0	1	1
Kentucky	0	0	0	0	–1	0	1.5	0.5	1
Tennessee	0	0	0	0	0	0	0.5	0.5	1
Texas	0.5	0	0	0	–1	0	0.5	1	1
Wyoming	0.5	0	0	0	0	0	0.5	0	1
Kansas	0	0	0	0	0	0	0	0.5	0.5
Louisiana	0	0	0	0	0	0	0.5	0	0.5
Nebraska	0.5	0	0	0	0	0	0	0	0.5
Virginia	0	0	0	0	–1	0	0.5	1	0.5
Alabama	0	0	0	0	0	0	0	0	0
North Dakota	0	0	0	0	0	0	0	0	0
West Virginia	0.5	0	0	0	–1	0	0	0	–0.5

DISCUSSION

History of Utility and Public Benefits Programs and Policies

The structure and delivery of customer-funded electric energy efficiency programs have changed dramatically over the past three decades, mostly in conjunction with electric industry restructuring efforts.[12] In the 1980s and 1990s, such programs were almost exclusively the domain of utilities, but efforts in the mid-1990s to restructure and deregulate the electric utilities led numerous states to implement public benefits charges as a new source of funding for efficiency. These public benefits approaches established new structures under which utilities—or, in some states, separate efficiency utilities or other third parties—were tasked with administering and delivering energy efficiency, renewable energy, and low-income programs.[13]

Despite such public benefits programs, restructuring still resulted in a precipitous decline in funding for energy efficiency programs in the late 1990s, primarily due to regulatory uncertainty and the expected loss of cost-recovery mechanisms for those programs.[14] Generally, utilities did not see customer-funded energy efficiency programs as being compatible with competitive retail markets.

After restructuring efforts slowed in some states, utility commissions renewed their focus on energy efficiency programs. From their low point in 1998, annual investments in electricity programs had increased more than fourfold by 2010, from approximately $900 million to $3.9 billion. More recently, growth in annual investments in energy efficiency has slowed, then leveled. In 2018 total spending for electricity efficiency programs was roughly $6.65 billion. Adding natural gas program spending of $1.4 billion, we estimate total efficiency program spending of approximately $8.0 billion in 2018 (see figure 2), similar to 2017 levels.

[12] By *customer-funded energy efficiency programs*—also known as *ratepayer-funded energy efficiency programs*—we mean energy efficiency programs funded through charges wrapped into customer rates or appearing as some type of fee on customer utility bills. This includes both utility-administered programs and public benefits programs administered by other entities. We do not include data on separately funded low-income programs, load management programs, or energy efficiency R&D.

[13] States that have established nonutility administration of efficiency programs include Delaware, District of Columbia, Hawaii, Maine, New Jersey, New York, Oregon, Vermont, and Wisconsin.

[14] Under traditional regulatory structures, utilities do not have an economic incentive to help their customers become more energy efficient because their revenues and profits decline in line with falling energy sales resulting from energy efficiency programs. To address this disincentive, state regulators allow utilities to recover, at a minimum, the costs of running energy efficiency programs through charges on customer bills. For more on this issue, see York and Kushler (2011).

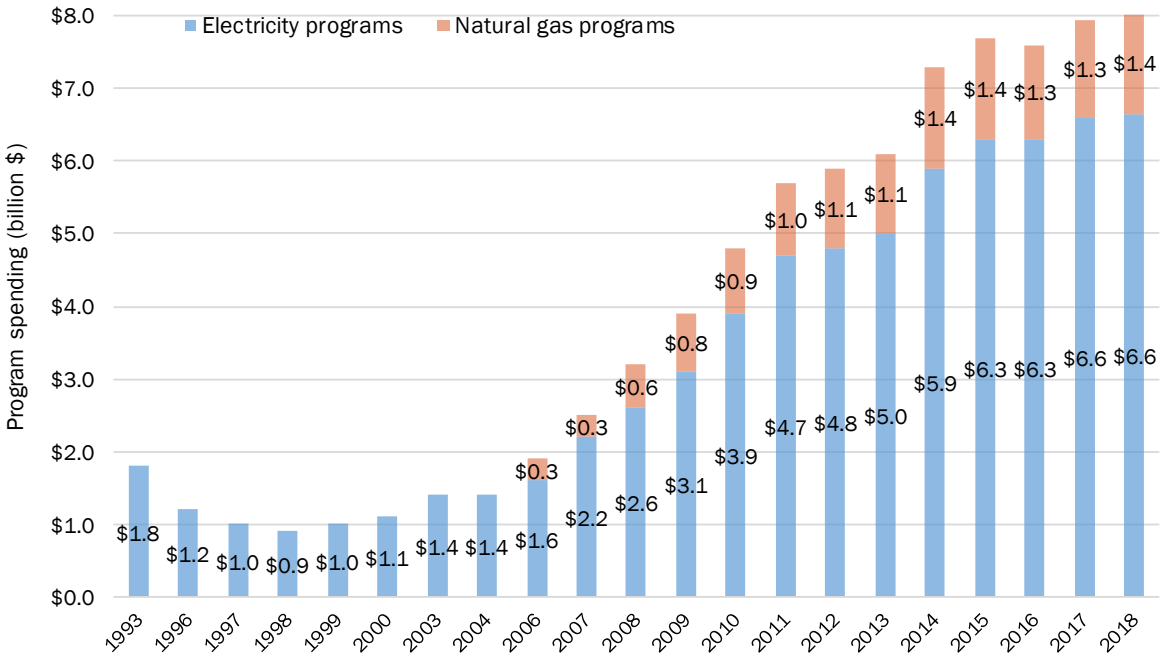

Figure 2. Annual electric and natural gas energy efficiency program spending. Natural gas spending is not available for the years 1993–2004. *Sources:* Nadel, Kubo, and Geller 2000; York and Kushler 2002, 2005; Eldridge et al. 2007, 2008, 2009; CEE 2012, 2013, 2014, 2015, 2016, 2017, 2018; Gilleo et al. 2015b; Berg et al. 2016, 2017, 2018.

Nationwide reported savings from utility and public benefits electricity programs in 2018 similarly remained level, totaling 27.1 million MWh, equivalent to 0.73% of sales. However the total annual impact of efficiency programs continues to grow, since most efficiency measures continue to generate savings for residents and businesses for years after they are installed. As figure 3 shows, the total impact of ratepayer-funded energy efficiency programs was almost 259 million MWh in 2018, including the 27.1 million MWh of incremental savings plus savings still accruing from measures implemented in prior years.[15] These large-scale savings are equivalent to approximately 6.95% of 2018 electricity consumption.

[15] Based on annual *State Scorecard* data as cited in figure 2. Assumes an average measure life of 10 years.

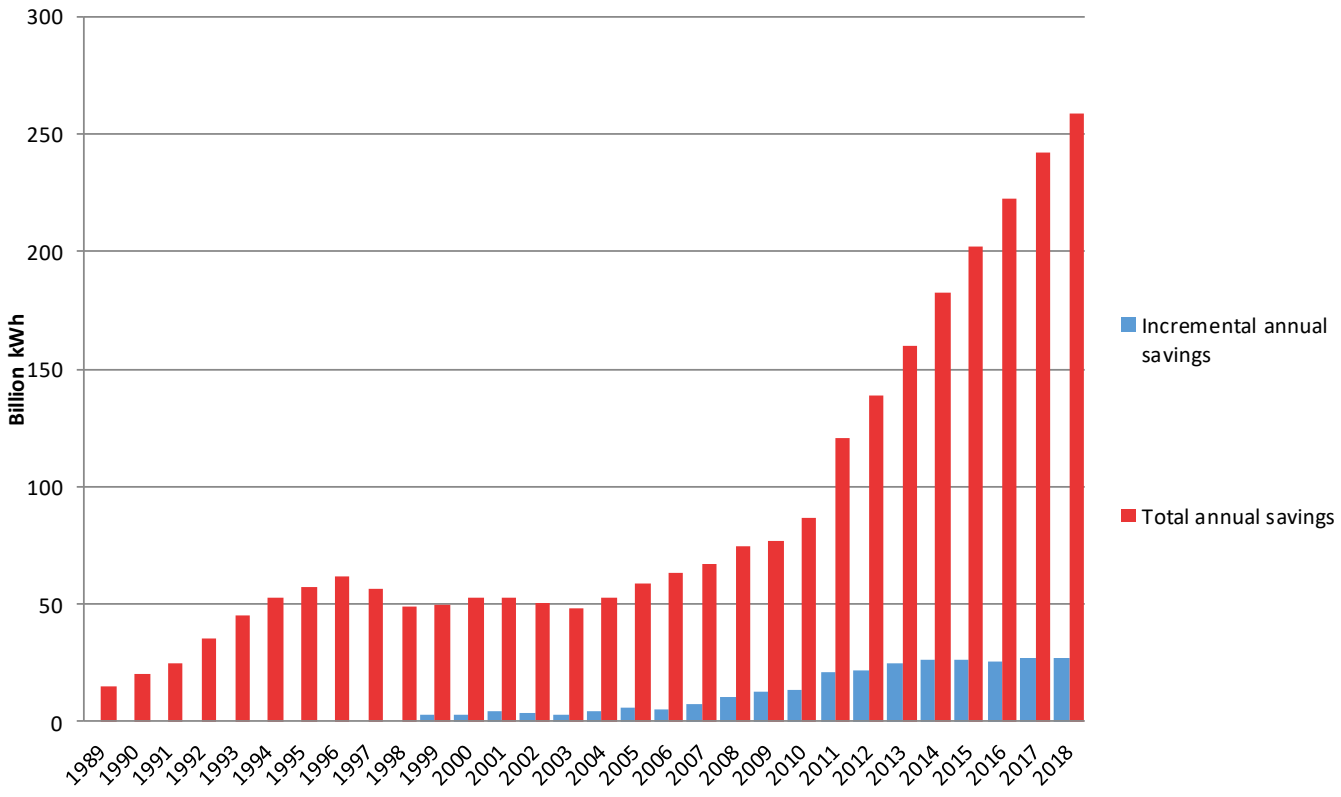

Figure 3. Electric savings from utility-sector energy efficiency programs by year.

Major Updates to State Utility Policies and Programs

It was a year of important transitions and evolution for many utilities in 2019. Despite relatively little federal-level progress on clean energy, many states joined a growing call to modernize and decarbonize the electric grid. The result was a slate of new legislative proposals to cut carbon pollution, not just by substituting renewable energy for carbon-emitting fossil fuels, but also by ramping up investment in cost-effective energy efficiency.

NORTHEAST

In the Northeast, New York policymakers have been particularly busy since a 2018 Earth Day call by the governor for a new and stronger state energy efficiency goal targeting 185 Tbtus of fuel-neutral site energy savings by 2025. In response the PSC convened a series of 13 technical conferences as well as a formal stakeholder comment process, building up to a December 2018 order clarifying the statewide Tbtu goal. This order included sub-targets for electricity savings as well as clean heating and spending requirements for low- and moderate-income customers. The savings target of 185 Tbtus by 2025 was later codified within the New York Climate Leadership and Community Protection Act, signed in July, targeting 100% carbon-free electricity by 2040 and economy-wide, net-zero carbon emissions by 2050.

Massachusetts also approved new multiyear goals, including a transition to a broader fuel-neutral million-Btu (MMBtu) metric following 2018 legislation that expanded the definition of energy efficiency. The new approach allows program administrators to claim credit for a wider variety of measures—such as energy storage, renewable energy, and strategic electrification—and gives flexibility in leveraging energy efficiency to reduce emissions. In

addition to the fuel-neutral goal and individual targets for electricity and natural gas savings, goals have been added for reducing summer and winter peak demand and for installation of air source heat pumps.

In New Jersey, policymakers and utilities were also busy in the wake of last year's Clean Energy Act to redesign and scale up energy efficiency offerings to meet the bill's targets to reduce electricity and natural gas use by 2% and 0.75%, respectively. PSE&G, the state's biggest utility, filed its energy efficiency plan in May 2019. It is pending approval as the state Board of Public Utilities works to develop new efficiency regulations.

MIDWEST

Some midwestern states took ambitious steps in an effort to expand and reshape energy efficiency policies and programs, while others took major steps backward.

In Michigan, the two major utilities achieved electric savings above 1.5% per year in response to a new incentive structure established in 2016. Under the new governor, each has filed integrated resource plans to reduce carbon emissions by 80–90% by 2040, including energy efficiency savings approaching 2% per year.

Ohio, meanwhile, made significant cutbacks to renewable energy and energy efficiency with the passage of HB 6, signed in July. The legislation effectively terminates the state's EERS by 2020 by lowering utility savings targets from 22% to 17.5%, a level that most utilities are on the verge of meeting. HB 6 also prohibits the state PUC from approving a cost recovery mechanism after utilities meet their targets, making it unlikely that even voluntary energy efficiency programs will continue.

Programs in Iowa also continued their slide backward following last year's passage of SF 2311, which capped efficiency spending by IOUs and allowed customers to opt out of programs. The result was a series of scaled-back utility efficiency plans for the new program cycle. This year's passage of SF 638 dealt another blow to efficiency by hardening the soft caps originally placed on energy efficiency spending under SF 2311. It prohibits the utility regulator from approving efficiency plans that exceed spending of 1.5% and 2.0% of expected annual retail-rate revenue for gas and electric utilities, respectively.

SOUTHEAST

Virginia continued to offered one of the biggest stories in energy efficiency in 2019 as policymakers and utilities hammered out plans to fulfill the Grid Transformation and Security Act (GTSA) of 2018 (HB 1558/SB 966). The GTSA aims to increase spending on savings programs more than threefold to more than $1 billion through 2028. In May of this year, the State Corporation Commission approved a portfolio of 11 new energy efficiency and demand response programs for the state's largest investor-owned utility, set to run through mid-2024.

Other southeastern states revisiting their energy efficiency efforts in 2019 included Louisiana, Georgia, and Florida. Although Louisiana's public service commission enacted rules in 2013 pushing IOUs to offer quick-start programs, their progress had lagged in recent years. New rules proposed this year would expand and develop programs in a more comprehensive Phase II. In Georgia, regulators approved Georgia Power's new 2019 integrated resource plan (IRP) featuring a 15% increase in energy efficiency savings relative to previous IRPs, a

significant increase in funding for low-income weatherization, and the addition of new programs for residential and commercial customers. In Florida, the PSC held hearings for new utility energy reduction goals, which are set every five years per the state's Energy Efficiency and Conservation Act (FEECA). However four out of seven utilities subject to FEECA proposed goals of zero, seriously threatening the future of customer programs. The PSC's final decisions are expected later this year.

WEST

Energy efficiency gained ground on multiple fronts in the Southwest, especially in New Mexico, Colorado, and Nevada, where new governors signed major clean energy bills. In New Mexico, HB-291 established energy savings requirements of no less than 5% of 2020 sales by 2025, a substantial increase beyond those of previous years. The law also expanded the cap on efficiency spending and, by establishing decoupling, removed the disincentive for utilities to save energy.

In Colorado, following last year's decision by the PUC to raise efficiency targets 25% for Xcel Energy, the new governor signed an ambitious series of bills to further strengthen efficiency in the state. These included SB 236, requiring electric utilities to use a carbon emissions cost of at least $46 per ton of carbon dioxide in evaluations of electric generation and heating resources. This decision was expected to strengthen the position of energy efficiency and demand response programs in cost-effectiveness screening. Meanwhile in Nevada, NV Energy entered a new phase of increased energy savings under strengthened targets established last year in the utility's joint IRP.

California also had a busy year, with the state energy commission holding a series of workshops in the spring to gather input on the 2019 California Energy Efficiency Action Plan. The plan will address ways to meet SB 350 targets to double savings by 2030 while expanding efficiency efforts in the buildings, industrial, agriculture, and low-income sectors.

Finally, efficiency programs unfortunately suffered a setback in Utah this year following moves by Rocky Mountain Power to scale back targets 20% compared with 2017 in response to changes in forecast savings calculations.

HAWAII AND PUERTO RICO

Hawaii and Puerto Rico also took steps to expand electric efficiency. Hawaii Energy and the state PUC were active via several working groups in revisiting and potentially reshaping energy efficiency targets to help decarbonize the grid, improve equity, and increase the use of renewables. In May the PUC also approved a new performance-based regulatory framework for installing clean energy technologies and battery storage. In the same month, Puerto Rico's governor signed the Climate Change Mitigation, Adaption, and Resiliency Law, which calls for a transition to 100% renewable energy by 2050, sets a target of 10% energy savings by 2030, and promotes lead-by-example efficiency efforts in public buildings.

Savings from Electricity and Natural Gas Efficiency Programs

We assess the overall performance of electricity and natural gas energy efficiency programs by the amount of energy saved. Utilities and nonutility program administrators pursue numerous strategies to achieve energy efficiency savings. Program portfolios may initially concentrate on the most cost-effective and easily accessible measure types, such as energy-

efficient lighting and appliances. As utilities gain experience, as technologies mature, and as customers become aware of the benefits of energy efficiency, the number of approaches increases. Utilities estimate program energy savings, which are then subject to internal or third-party evaluation, measurement, and verification (EM&V) and are typically reported to the public utility commission on a semiannual or annual basis.

In states ramping up funding in response to aggressive EERS policies, programs typically shift focus from widget-based approaches (e.g., installing new, more-efficient water heaters) to comprehensive deep-savings approaches that seek to generate greater energy efficiency savings per program participant by conducting whole-building or system retrofits. Some deep-savings approaches also draw on complementary efficiency efforts, such as utility support for full implementation of building energy codes.[16] Deep-savings approaches may also promote whole-building retrofits, grid-interactive efficient buildings (GEBs), and comprehensive changes in systems and operations by including behavioral elements that empower customers.

SCORES FOR INCREMENTAL SAVINGS IN 2018 FROM ELECTRIC EFFICIENCY PROGRAMS

We report 2018 statewide net energy efficiency savings as a percentage of 2017 retail electricity sales, scoring the states on a scale of 0 to 7, as we did last year. We relied primarily on states to provide these data. Forty-two states and the District of Columbia completed some or all of our data request form. Where no data for 2018 were available, we used the most recent savings data obtainable, whether from state-reported 2017 savings from the *2018 State Scorecard* or from EIA (2018b).

As we have since 2015, we awarded full points to states that achieved savings of at least 2% of electricity sales. We continue to see examples of states exceeding the 2% mark. Table 6 lists the scoring for each level of savings.

Table 6. Scoring of utility and public benefits electricity savings

2018 savings as % of sales	Score
2% or greater	7
1.86–1.99%	6.5
1.72–1.85%	6
1.58–1.71%	5.5
1.44–1.57%	5
1.30–1.43%	4.5
1.16–1.29%	4
1.02–1.15%	3.5
0.88–1.01%	3
0.74–0.87%	2.5

[16] See Nowak et al. (2011) for a full discussion of this topic.

2018 savings as % of sales	Score
0.60–0.73%	2
0.46–0.59%	1.5
0.32–0.45%	1
0.18–0.31%	0.5
Less than 0.18%	0

Table 7 shows state results and scores. Nationwide reported savings from utility and public benefits electricity programs in 2018 totaled 27.13 million MWh, equivalent to 0.73% of sales. This is approximately 0.5% less than the 27.27 million MWh (0.72% of sales) reported last year.

Table 7. 2018 net incremental electricity savings by state

State	2018 net incremental savings (MWh)	% of 2017 retail sales	Score (7 pts.)
Massachusetts	1,481,359	2.82%	7
Rhode Island	206,209	2.79%	7
Vermont†	124,956	2.30%	7
Maryland	1,109,955	1.87%	6.5
Illinois	2,282,805	1.66%	5.5
California†	4,169,898	1.62%	5.5
Hawaii†*	136,847	1.47%	5
Michigan	1,489,580	1.46%	5
Connecticut	385,817	1.37%	4.5
Minnesota†	889,892	1.33%	4.5
Arizona†[1]	983,626	1.27%	4
District of Columbia	134,382	1.23%	4
Washington†	1,083,813	1.18%	4
New York†	1,675,885	1.16%	4
Ohio†	1,678,118	1.14%	3.5
Iowa†[2]	529,647	1.08%	3.5
Colorado	584,071	1.07%	3.5
Maine†	117,509	1.05%	3.5
Oregon†	473,682	0.95%	3
Idaho†	208,041	0.87%	2.5
New Hampshire†	81,027	0.75%	2.5
Pennsylvania†	1,063,069	0.74%	2.5
Wisconsin	497,489	0.72%	2
Utah	212,798	0.70%	2
Arkansas	315,221	0.68%	2
North Carolina	874,127	0.67%	2
Missouri	469,362	0.61%	2
Nevada†	215,395	0.59%	1.5
New Mexico	129,937	0.56%	1.5
Indiana†	545,412	0.55%	1.5
Montana†	74,823	0.51%	1.5
Oklahoma	302,641	0.50%	1.5
South Carolina†*	385,608	0.49%	1.5
New Jersey†	259,857	0.35%	1
Mississippi	135,937	0.28%	0.5
Nebraska†[3]	80,184	0.26%	0.5
Georgia†	333,437	0.25%	0.5
Wyoming†	40,276	0.24%	0.5
South Dakota†	24,865	0.20%	0.5
West Virginia	60,787	0.19%	0.5
Texas†	706,287	0.18%	0.5
Delaware	16,465	0.15%	0
Tennessee†	123,249	0.13%	0
Kentucky†	86,856	0.12%	0
Florida†	213,557	0.09%	0
Louisiana†	48,225	0.05%	0
Virginia†	52,978	0.05%	0
Alabama†	27,472	0.03%	0
North Dakota†*	2,329	0.01%	0
Alaska†*	273	0.00%	0
Kansas†*	360	0.00%	0
US total	**27,126,392**	**0.73%**	
Median	**215,395**	**0.67%**	

Savings data are from public service commission staff as listed in Appendix A, unless noted otherwise. Sales data are from EIA Form 861 (2018b).
* States for which we did not have 2018 savings data were scored on 2017 state-reported savings or EIA-reported 2017 savings. † At least a portion of savings were reported as gross. We adjusted the gross portion by a net-to-gross factor of 0.8413 to make it comparable with net savings figures reported by other states.
[1] Arizona savings include 2017 Salt River Project savings to approximate 2018 SRP savings, which were not available. [2] Iowa savings include 2018 figures reported by MidAmerican and Interstate Power & Light. EIA-reported savings for 2017 were included for munis and co-ops, for which 2018 data were not available. [3] Nebraska savings include 2018 figures reported by Lincoln Electric System, Municipal Energy Agency of Nebraska, and Nebraska Public Power District. EIA-reported 2017 savings were used for Omaha Public Power District and all other munis and co-ops, for which 2018 data were not available.

States use different methodologies for estimating energy savings, and this can produce inequities when making comparisons (Sciortino et al. 2011). A state's EM&V process plays a key role in determining how savings are quantified. This is particularly true of a state's treatment of free-ridership (savings attributed to a program that would have occurred even in the absence of the program) and spillover (savings *not* attributed to a program that would *not* have occurred without it). States report energy savings as either net or gross, with net savings accounting for free riders and free drivers, and gross savings not accounting for these.[17] The *State Scorecard* specifically focuses on net savings.

In a national survey of evaluation practices, ACEEE researchers found that, of the 45 jurisdictions at the time with formally approved customer-funded energy efficiency programs, 21 jurisdictions reported net savings, 12 reported gross savings, and 9 reported both (Kushler, Nowak, and Witte 2012).[18] This finding points to several important caveats regarding the electric program savings data. A number of states do not estimate or report net savings. In these cases, we applied a standard factor of 0.841 to convert gross savings to net savings (a net-to-gross ratio). [19] Doing so allows a more straightforward comparison with states that report net electricity savings.

SCORES FOR INCREMENTAL SAVINGS IN 2018 FROM NATURAL GAS AND UNREGULATED FUELS EFFICIENCY PROGRAMS

Utilities are increasing the number and size of natural gas programs in their portfolios. However data on savings resulting from these programs are still limited. In this category, we awarded points to states that were able to track savings from their natural gas and unregulated fuels efficiency programs and realized savings of at least 0.17% as a percentage of sales in the residential and commercial sectors. We relied on data from state utility commissions. Table 8 lists scoring criteria for natural gas and unregulated fuels program savings. We awarded a maximum of 3 points to states reporting savings of at least 1.00% of sales.

As we did in the 2018 *State Scorecard*, we have combined the most widely used unregulated fuels' energy savings and consumption data with natural gas data into a single thermal fuels energy savings metric. This is a more consistent way to measure energy efficiency efforts and performance across states with different fuel mixes and policies. Previously, direct comparison of natural gas savings as a percentage of sales across states was complicated by the varying percentage of customers with access to natural gas, incomplete data on unregulated fuels, and varying levels of energy efficiency program funding based on regulated energy sources. These issues are most common in the Northeast, where some states

[17] Free drivers are utility customers who install energy efficiency measures as a result of a program but are not themselves participants in the energy efficiency program.

[18] The 45 jurisdictions included 44 states and the District of Columbia. Three states did not respond to this question.

[19] We based the 0.841 net-to-gross factor used this year on the median net-to-gross ratio calculated from those jurisdictions that reported figures for both net and gross savings in this year's data request. These were Connecticut, Delaware, District of Columbia, Maryland, Massachusetts, Missouri, New York, North Carolina, Oklahoma, Pennsylvania, Utah, Virginia, West Virginia, and Wisconsin. We applied this conversion factor to all states reporting only gross savings. We determined savings to be gross on the basis of Kushler, Nowak, and Witte (2012) as well as on responses to our survey of public utility commissions.

have a larger share of residential and commercial customers using fuel oil and other unregulated fuels for heating.

To integrate unregulated fuels, we collected 2018 savings data on fuel oil, kerosene, propane, and wood from public service commissions and added these to the natural gas savings reported for each state. Similarly, we obtained consumption data by state for each fuel type from EIA and added this to the natural gas energy sales for residential and commercial customers. We converted all energy units to MMBtu and divided savings by sales to create the common metric.

Table 8. Scoring of natural gas and unregulated fuel program savings

Savings as % of sales	Score
1.00% or greater	3
0.84–0.99%	2.5
0.67–0.83%	2.0
0.50–0.66%	1.5
0.34–0.49%	1
0.17–0.33%	0.5
Less than 0.17%	0

Table 9 shows states' scores for natural gas and fuel program savings.[20]

[20] As we did with electric savings, we applied a net-to-gross (NTG) factor to all states reporting only gross natural gas savings. In this case, the NTG factor was 0.900 based on states that reported figures for both net and gross natural gas savings in this year's data request. These were Connecticut, District of Columbia, Maryland, Massachusetts, New York, Oklahoma, and Wisconsin.

Table 9. State scores for 2018 natural gas and fuel efficiency program savings

State	2018 net incremental fuel savings (MMBtu)*	% of commercial and residential retail sales**	Score (3 pts.)
Michigan	8,430,000	1.47%	3
Minnesota†	3,564,000	1.20%	3
Rhode Island‡	548,839	1.17%	3
Massachusetts‡	3,828,733	1.12%	3
California	7,940,000	1.01%	3
District of Columbia	235,409	0.78%	2
Iowa†	1,046,022	0.72%	2
Utah	870,000	0.71%	2
New York‡	6,656,366	0.68%	2
Hawaii**	–	0.00%	2
Arkansas	560,000	0.63%	1.5
Vermont‡	312,837	0.63%	1.5
Wisconsin	1,790,000	0.60%	1.5
Oregon†	729,000	0.59%	1.5
Maine†‡	471,210	0.51%	1.5
Oklahoma	550,000	0.50%	1.5
Connecticut‡	875,010	0.49%	1
Arizona†	344,501	0.42%	1
Illinois	2,620,000	0.40%	1
Delaware†	117,000	0.38%	1
New Hampshire†‡	255,487	0.33%	0.5
Maryland	577,548	0.31%	0.5
Indiana	718,893	0.30%	0.5
New Jersey†	1,242,000	0.29%	0.5
Colorado†	544,435	0.26%	0.5
Washington†	507,600	0.24%	0.5
Mississippi	110,015	0.22%	0.5
New Mexico	115,282	0.16%	0
Montana	90,000	0.13%	0
South Dakota†	27,000	0.08%	0
North Carolina†	135,000	0.08%	0
Idaho	53,100	0.07%	0
Florida†	53,405	0.05%	0
Pennsylvania†	171,000	0.03%	0
Alabama	0	0	0
Alaska	0	0	0
Georgia	0	0	0
Kansas	0	0	0
Kentucky	0	0	0
Louisiana	0	0	0
Missouri	0	0	0
Nebraska	0	0	0
Nevada	0	0	0
North Dakota	0	0	0
Ohio	0	0	0
South Carolina	0	0	0
Tennessee	0	0	0
Texas	0	0	0
Virginia	0	0	0
West Virginia	0	0	0
Wyoming	0	0	0
US total	**46,089,692**	**0.47%**	
Median	**135,000**	**0.22%**	

Savings data were reported by contacts at public utility commissions as listed in Appendix A, unless otherwise noted. All sales data are from EIA Form 176 (EIA 2018d).
** Hawaii uses very limited natural gas and therefore earned points commensurate with electric efficiency savings scores. † At least a portion of savings reported as gross; we adjusted the gross portion by a net-to-gross factor of 0.900 to make it comparable to net savings figures reported by other states. ‡ States reporting some level of unregulated fuel savings.

Electricity and Natural Gas Efficiency Program Funding

In this category, we scored states on 2018 electricity and natural gas efficiency program spending for customer-funded energy efficiency programs. These programs are funded through charges included on utility customers' bills.[21] Our data include spending by investor-owned, municipal, and cooperative utilities; public power companies or authorities; and public benefits program administrators. We did not collect data on federal grant allocations received by states through the DOE's Weatherization Assistance Program. We did include revenues from the Regional Greenhouse Gas Initiative (RGGI), which contributes to customer-funded energy efficiency program portfolios of member states and to energy efficiency programs funded through AB 32 and Proposition 39 in California.[22] Where RGGI funds were channeled to energy efficiency initiatives implemented by state governments, we included them in Chapter 6, "State Government–Led Initiatives."

For states that did not provide data for 2018 spending on energy efficiency programs for electric or natural gas utilities, we used expenditure data from EIA-861 or information supplied by our state contacts in their 2017 utility data request responses.

Spending data are subject to variation across states, and this poses an ongoing challenge to our efforts to equitably score states based on a common and reliable metric. Several states report performance incentives paid to utilities or other program administrators as part of utility efficiency program spending, resulting in higher spending numbers. While most performance incentives are based on shared net benefits—viewed as an expense—the relative amounts of the incentives are in the range of 5–15% of program spending (Nowak et al. 2015). For this reason we asked states to disaggregate program spending from these incentives. We did not credit this spending in our scoring in an effort to more accurately reflect funds directly dedicated to energy efficiency measures. As in past years, we sent spending data gathered from the above sources to state utility commissions for review. Tables 11 and 13 below report electricity and natural gas efficiency program spending, respectively.

SCORES FOR ELECTRIC PROGRAM SPENDING

States could receive up to 2.5 points for their energy efficiency spending as a percentage of 2017 electric utility revenues, with the threshold for the maximum achievable points set at 5.0% of revenues.[23] For every 1.05 percentage points less than 5%, a state's score decreased by 0.5 points. Table 10 lists the scoring bins for each spending level.

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[21] Some of these programs target unregulated fuels or are fuel-blind to household heating sources. Spending for this type of program is typically captured in our electric efficiency spending metric.

[22] AB 32 is California's GHG reduction bill that resulted in a cap-and-trade program. Proposition 39 grants significant funding to energy efficiency programs targeting schools. Both programs are subject to evaluation, measurement, and verification at least as stringent as the EM&V for utility programs.

[23] Statewide revenues are from EIA Form 861 (EIA 2018b). We measure spending as a percentage of revenues to normalize the level of energy efficiency spending. Blending utility revenues from all customer classes gives a more accurate measure of utilities' overall spending on energy efficiency than does expressing budgets per capita, which might skew the data for utilities that have a few very large customers. Statewide electric energy efficiency spending per capita is presented in Appendix B.

Table 10. Scoring of electric efficiency program spending

2018 spending as % of revenues	Score
5.00% or greater	2.5
3.95–4.99%	2
2.90–3.94%	1.5
1.85–2.89%	1
0.80–1.84%	0.5
Less than 0.80%	0

Table 11 shows state-by-state results and scores for this category.

Table 12. 2018 electric efficiency program spending by state

State	2018 elec. spending ($ million)	% of statewide elec. revenues	Score (2.5 pts.)
Vermont	61.8	7.80%	2.5
Rhode Island	88.1	7.26%	2.5
Massachusetts	577.1	6.42%	2.5
Washington	269.7	3.70%	1.5
Oregon	156.6	3.55%	1.5
California	1,369.4	3.31%	1.5
Illinois	420.5	3.23%	1.5
Maryland	217.3	3.06%	1.5
Maine	44.3	3.03%	1.5
Idaho	59.0	3.00%	1.5
New York	633.5	2.97%	1.5
Minnesota	171.6	2.49%	1
Connecticut	121.3	2.46%	1
Iowa	104.1	2.44%	1
Michigan	252.3	2.19%	1
Colorado	116.9	2.13%	1
New Hampshire	35.2	2.02%	1
Arkansas	67.3	1.77%	0.5
Utah	44.3	1.68%	0.5
New Mexico	32.8	1.49%	0.5
Nevada	46.8	1.46%	0.5
New Jersey	129.3	1.32%	0.5
Oklahoma	65.2	1.31%	0.5
North Carolina	152.5	1.28%	0.5
Pennsylvania	184.9	1.28%	0.5
Ohio	183.9	1.27%	0.5
Wisconsin	92.0	1.24%	0.5
District of Columbia	15.8	1.23%	0.5
Missouri	93.2	1.21%	0.5
Indiana	101.8	1.05%	0.5
Arizona	82.4	1.00%	0.5
Montana	12.2	0.93%	0.5
Delaware	10.8	0.89%	0.5
Hawaii*	20.8	0.86%	0.5
Florida	195.4	0.80%	0.5
Wyoming	10.0	0.72%	0
South Carolina*	53.8	0.69%	0
Texas	165.5	0.49%	0
Georgia	60.5	0.46%	0
West Virginia	12.2	0.43%	0
Kentucky	24.3	0.39%	0
Mississippi	16.5	0.38%	0
Nebraska	9.7	0.35%	0
South Dakota	4.3	0.35%	0
Tennessee	24.3	0.26%	0
Virginia*	20.6	0.20%	0
Louisiana	11.1	0.16%	0
Alabama*	5.4	0.06%	0
North Dakota*	0.2	0.01%	0
Kansas*	0.3	0.01%	0
Alaska*	0.0	0.00%	0
US total	**6,648.7**	**1.70%**	
Median	**61.8**	**1.27%**	

2017 statewide revenues are from EIA Form 861 (EIA 2018b). Spending data are from public service commission staff as listed in Appendix A.
* Where 2018 spending was not available, we substituted 2017 spending as reported by states or EIA-861 (EIA 2018b).

SCORES FOR NATURAL GAS PROGRAM SPENDING

We scored states on natural gas efficiency program spending by awarding up to 1.5 points based on 2018 program spending data gathered from a survey of state utility commissions and independent statewide administrators. Previously a 2-point category, this metric received a 0.5-point decrease in 2017 to help accommodate the addition of a 1-point category for utility support of low-income energy efficiency programs. To directly compare spending data among the states, we normalized spending by the number of residential natural gas customers in each state in 2018, as reported by EIA (2018d).[24] Table 12 shows scoring bins for natural gas program spending. As in last year's *State Scorecard*, states posting spending of at least $50 per customer were awarded the maximum number of points.

Table 12. Scoring of natural gas utility and public benefits spending

2018 gas spending per customer	Score
$50 or greater	1.5
$27.50–49.99	1
$5.00–27.49	0.5
Less than $5.00	0

After a significant uptick in 2014, natural gas program spending levels have remained relatively flat in recent years. In 2018, spending was $1.4 billion, very similar to 2017 levels. Natural gas efficiency spending remains significantly lower than spending for electricity energy efficiency programs. Table 13 shows states' scores.

[24] We used spending per residential customer for natural gas because reliable natural gas revenue data are sparse, and use of per capita data unfairly penalizes states that offer natural gas service to only a portion of their population (such as Vermont). State data on the number of residential customers are from EIA (2018d).

Table 13. 2018 natural gas efficiency program spending by state

State	2018 gas spending ($ million)	$ per 2017 residential customer	Score (1.5 pts.)
Massachusetts	249.3	$165.03	1.5
Rhode Island	27.2	$112.65	1.5
Connecticut	42.9	$78.05	1.5
New Hampshire	7.9	$74.52	1.5
Vermont	2.9	$64.05	1.5
Iowa	48.6	$52.60	1.5
Maine	1.5	$43.56	1
Florida	28.4	$38.36	1
Minnesota	58.1	$38.12	1
Oregon	24.9	$33.65	1
California	357.9	$32.52	1
New Jersey	90.1	$32.36	1
New York	141.7	$31.54	1
Michigan	97.1	$29.71	1
Arkansas	14.9	$26.90	0.5
Utah	23.4	$25.25	0.5
District of Columbia	3.7	$24.48	0.5
Washington	27.3	$23.25	0.5
Oklahoma	16.6	$17.60	0.5
Illinois*	55.4	$14.19	0.5
Wisconsin	23.0	$13.08	0.5
Montana	2.9	$10.53	0.5
New Mexico	5.8	$9.89	0.5
Colorado	15.4	$8.77	0.5
Indiana	13.6	$7.83	0.5
Idaho	2.8	$7.16	0.5
Delaware	1.2	$6.97	0.5
Hawaii**	0.0	$0.00	0.5
Mississippi	2.3	$4.94	0
Missouri	6.3	$4.57	0
Arizona	5.5	$4.41	0
South Dakota	0.7	$3.73	0
Pennsylvania	8.8	$3.18	0
North Carolina	2.0	$1.59	0
Maryland	1.4	$1.22	0
Nevada	0.7	$0.81	0
Alabama	0.0	$0.00	0
Alaska	0.0	$0.00	0
Georgia	0.0	$0.00	0
Kansas	0.0	$0.00	0
Kentucky	0.0	$0.00	0
Louisiana	0.0	$0.00	0
Nebraska	0.0	$0.00	0
North Dakota	0.0	$0.00	0
Ohio	0.0	$0.00	0
South Carolina	0.0	$0.00	0
Tennessee	0.0	$0.00	0
Texas	0.0	$0.00	0
Virginia	0.0	$0.00	0
West Virginia	0.0	$0.00	0
Wyoming	0.0	$0.00	0
US total	**1,412.1**		
Median	**2.9**		

Spending data are from public service commission staff as listed in Appendix A, unless noted otherwise. * Where 2018 spending data were not available, we substituted 2017 spending as reported by public service commission staff. ** Hawaii was awarded points commensurate with points received for electricity spending.

Opt-Out Provisions for Large Customers

As we have since the *2014 State Scorecard*, we provide an assessment of opt-out and self-direct provisions for large customers. Increasingly, large customers are seeking to opt out of utility energy efficiency programs, asserting that they have already captured all the energy efficiency that is cost effective. However this is seldom the case (Chittum 2011). Opt-out differs from self-direct in that customers who opt out do not have to pay into energy efficiency funds at all; self-direct allows some customers to spend their efficiency fees internally, within their own business operations. Some state policies go beyond opt-out to fully exempt customers from participating in utility energy efficiency programs. In these cases, the customers are excluded and may not opt in.

Opt-out and exemption policies have several negative consequences. Failure to include large-customer programs in an energy efficiency portfolio increases the cost of energy savings for all customers and reduces the benefits (Baatz, Relf, and Kelly 2017). In effect, allowing large customers to opt out forces other consumers to indirectly subsidize them: those who have opted out share some of the system benefits, but only the smaller customers are paying to support energy efficiency programs. It also prevents utilities from capturing all highly cost-effective energy savings; this can contribute to higher overall system costs through the use of more expensive supply resources. While the ideal solution is for utilities to offer programs that respond to the needs of these large consumers, ACEEE's research suggests that this does not always happen (Chittum 2011). When it does not, we suggest giving these customers the option of self-directing their energy efficiency program dollars.[25] This option provides a path for including large-customer energy efficiency in the state's portfolio of savings. We provide examples of self-direct programs in Appendix C.

SCORES FOR LARGE-CUSTOMER OPT-OUT PROVISIONS

We include opt-out as a category in which states may lose rather than gain points. We subtracted 1 point for states that allow electric or natural gas customers, or both, to opt out of energy efficiency programs.[26] Opt-out policies vary in terms of eligibility requirements and impacts; in Indiana, for example, 40% or more of load is eligible to opt out.

We did not subtract points for self-direct programs. When implemented properly, these programs can effectively meet the needs of large customers. Self-direct programs vary from state to state, with some requiring more stringent measurement and verification of energy savings than others (Chittum 2011). In the future, we may examine these programs with a more critical eye and subtract points from states that lack strong evaluation and measurement. Table 14 shows states with opt-out programs.

[25] Self-direct programs allow some customers, usually large industrial or commercial ones, to channel energy efficiency fees usually paid on utility bills directly into energy efficiency investments in their own facilities instead of into a broader, aggregated pool of funds. These programs should be designed to include comparable methods to verify and measure investments and energy savings. For more information, see aceee.org/sector/state-policy/toolkit/industrial-self-direct.

[26] By default, most large gas customers already are opted out because they take wholesale delivery (frequently directly from transmission) and are thus outside the purview of state government. We did not subtract points in these cases.

Table 14. States allowing large customers to opt out of energy efficiency programs

State	Opt-out description	Score
Arkansas	Under Act 253, passed in 2013, customers with more than 1 MW or 70,000 MMBtu in monthly demand may opt out. Large manufacturers that file under Act 253 do not have to offer documentation of planned or achieved savings. However large commercial and industrial customers not meeting the definition of manufacturing and customers that have filed under Section 11 of the state's Rules for Conservation and Energy Efficiency Programs must file an application showing how savings have been or will be achieved. More than 50 large customers have opted out, constituting a significant share of overall sales that varies by utility. In 2017, HB 1421 added state-supported higher-education institutions to the list of customers eligible to opt out.	–1
Illinois	Illinois specifically exempts large customers under recent electric savings targets passed in SB 2814. These exemptions remove an estimated 10% of ComEd's and 25% of Ameren's load from programs. The exemption weakens participation even more than an opt-out policy in that these electric utility customers cannot participate in programs even if they wish to.	–1
Indiana	Opt-out applies to the five investor-owned electric utilities. Eligible customers are those that operate a single site with at least one meter constituting more than 1 MW demand for any one billing period within the previous 12 months. Documentation is not required. No evaluation is conducted. Approximately 70–80% of eligible load has opted out.	–1
Iowa	Iowa enacted Senate File 2311 in May 2018, allowing any customer of any rate-regulated utility to request an exemption from participation in the five-year energy efficiency plan if the cumulative cost effectiveness of the combined energy efficiency and demand response plan does not pass the Ratepayer Impact Measure (RIM) test. This applies to all customers, not only large ones. Utilities must allow the exemption (opt-out) beginning in the year following the year in which the request was made. Utilities may request modifications of their energy efficiency plans due to reductions in funding resulting from customer exemptions.*	–1
Kentucky	Opt-out is statewide for the industrial rate class. Documentation is not required. Approximately 80% of eligible load has opted out, with the remaining 20% made up primarily of TVA customers.	–1
Maine	Large customers that take transmission and sub-transmission service are automatically opted out of Maine's efficiency programming. These customers do not pay into Maine's cost-recovery mechanism. However federal stimulus funds and money collected from the RGGI have allowed Efficiency Maine to offer energy efficiency programming to the state's largest industrial customers.	–1
Missouri	Opt-out is statewide only for investor-owned electric utilities. Eligibility requires one account greater than 5 MW, or aggregate accounts greater than 2.5 MW and demonstration of the customer's own demand-side savings. Also, interstate pipeline pumping stations of any size are eligible to opt out. To maintain opt-out status, documentation is required for customers whose aggregate accounts are greater than 2.5 MW. The staff of the Missouri Public Service Commission perform a desk audit of all claimed savings and may perform a field audit. No additional EM&V is required.	–1

State	Opt-out description	Score
North Carolina	All industrial-class electric customers are eligible to opt out. Also, by Commission Rule R8-68 (d), large commercial-class operations with 1 million kWh of annual energy consumption are eligible to opt out. Customers electing to opt out must notify utilities that they have implemented or plan to implement energy efficiency. Opted-out load represents approximately 40–45% of industrial and large commercial load.	–1
Ohio	Beginning in January 2017, Ohio Senate Bill 310 allows certain customers to opt out of energy efficiency programs entirely. Large customers may opt out of a utility's energy efficiency provisions if they receive service above the primary voltage level (e.g., sub-transmission and transmission rate schedules). They may opt out if they are a commercial or industrial customer with more than 45 million kWh usage through a meter, or through more than one meter at a single location, for the preceding calendar year. HB 6, signed in 2019, expanded the opt-out to include any C&I customer that uses more than 700 MWh annually or is part of a national account involving multiple facilities in one or more states. A written request is required to register as a self-assessing purchaser pursuant to section 5727.81 of the Revised Code.	–1
Oklahoma	All transportation-only gas customers are eligible to opt out. For electric utilities, all customers whose aggregate usage (which may include multiple accounts) is at least 15 million kWh annually may opt out. Some 90% of eligible customers opt out.	–1
South Carolina	Industrial, manufacturing, and retail commercial customers with at least 1 million kWh annual usage are eligible to opt out. Only self-certification is required. Approximately 50% of eligible companies opt out, representing roughly 50% of the eligible load.	–1
Texas	In Texas, for-profit customers that take electric service at the transmission level are not allowed to participate in utilities' energy efficiency programs and therefore do not contribute to them. Manufacturers that qualify for a tax exemption under Tax Code §151.317 may also apply to opt out for three years, and opt-out status can be renewed.	–1
Virginia	Certain large customers are exempt from paying for the costs of new energy efficiency programs. Dominion Power customers may qualify by having average demand between 500 kW and 10 MW; customers with more than 10 MW do not participate in the state's energy efficiency programming by law. Once customers opt out, they cannot take advantage of existing programming nor be charged for it. Customers must show that they have already made energy efficiency investments or plan to in the future. Customers must submit measurement and verification reports yearly in support of their opting out of programs funded by a cost-recovery mechanism.	–1
West Virginia	Opt-out is developed individually by utilities. Customers with demand of 1 MW or greater may opt out. Participants must document that they have achieved similar/equivalent savings on their own to retain opt-out status. Claims of energy and/or demand reduction are certified to utilities, with future evaluation by the Public Service Commission to take place in a later proceeding. The method has not been specified. Twenty large customers have opted out.	–1

*** The RIM test treats reduced energy sales as a cost, which means that the more energy a measure saves, the less cost effective it is. It is likely that the plans will not meet this impact measure, raising the possibility that many customers will opt out and thereby reduce efficiency funding by the amount they otherwise would have paid.**

Energy Efficiency Resource Standards

Energy efficiency targets for utilities, often called EERS, are critical to encouraging savings over the near and long terms. States with an EERS policy in place have shown average energy efficiency spending and savings levels more than three times as high as those in states without such a policy (Molina and Kushler 2015). Savings from states with EERS policies in place accounted for approximately 80% of all utility savings reported across the United States in 2016 and 2017 (Gold et al. 2019). There are 26 states with EERS policies establishing specific energy savings targets that utilities and program administrators must meet through customer energy efficiency programs. This is one fewer than the 27 reported in the *2018 State Scorecard*, due to the July signing of HB 6 in Ohio, effectively terminating the state's EERS beyond 2020.

EERS policies set multiyear targets for electricity or natural gas savings, such as 1% or 2% incremental savings per year or 20% cumulative savings by 2025.[27] They differ from state to state, but each is intended to establish a sustainable, long-term role for energy efficiency in the state's overall energy portfolio. ACEEE considers a state to have an EERS if it has a policy in place that

- Sets clear, long-term (3+ years) targets for utility-sector energy savings
- Makes targets mandatory
- Includes sufficient funding for full implementation of programs necessary to meet targets

Several states mandate all cost-effective efficiency, requiring utilities and program administrators to determine and invest in the maximum amount of cost-effective efficiency feasible.[28] ACEEE considers states with such requirements to have EERS policies in place once these policies have met all the criteria listed above.

EERS policies aim explicitly for quantifiable energy savings, reinforcing the idea that energy efficiency is a utility system resource on par with supply-side resources. These standards help utility system planners more clearly anticipate and project the impact of energy efficiency programs on utility system loads and resource needs. Energy savings targets are generally set at levels that push efficiency program administrators to achieve higher savings than they otherwise would, with goals typically based on analysis of the energy efficiency savings potential in the state to ensure that the targets are realistic and achievable. EERS policies maintain strict requirements for cost effectiveness so that efficiency programs are guaranteed to provide overall benefits to customers. These standards help to ensure a long-term

[27] *Multiyear* is defined as spanning three or more years. EERS policies may set specific targets as a percentage of sales, as specific gigawatt-hour energy savings targets without reference to sales in previous years, or as a percentage of load growth.

[28] The seven states that require all cost-effective efficiency are California, Connecticut, Maine, Massachusetts, Rhode Island, Vermont, and Washington. Connecticut sets budgets first, then achieves all cost-effective efficiency within that limit, which is a lower savings target. New Hampshire's EERS sets forth a long-term goal of achieving all cost-effective efficiency, which is anticipated to be met through planning and goal-setting in future implementation cycles.

commitment to energy efficiency as a resource, building essential customer engagement as well as the workforce and market infrastructure necessary to sustain the high savings levels.[29]

States are increasingly seeking strategies to meet GHG reduction goals, for example through grid decarbonization and the electrification of buildings and vehicles. These efforts bring opportunities to adapt EERS policies to encourage resource-specific savings while also promoting technologies that may increase grid demand but result in net reductions in emissions. Redesigning goals and establishing new targets can help meet multiple policy objectives in these cases. Examples include establishing peak demand targets and fuel-neutral goals. These remove prohibitions on fuel switching to provide more flexibility and enable energy efficiency from beneficial electrification.

SCORES FOR ENERGY EFFICIENCY RESOURCE STANDARDS

A state could earn up to 3 points for its EERS policy. As table 15 shows, we scored states according to their electricity savings targets. States could earn an additional 0.5 points if natural gas was included in their savings goals.

Some EERS policies contain cost caps that limit spending, thereby reducing the policy's effectiveness. This year, we did not subtract points for the existence of a cost cap, although we do note whether a cost cap is in place in the results below (table 16). Most of the states with these policies in place have found themselves constrained. As a result, regulators have approved lower energy savings targets. In these cases, we score states on the lower savings targets approved by regulators that take the cost cap into account, rather than on the higher legislative targets.

In an effort to distinguish states pushing the boundaries of innovation in energy efficiency with ambitious goals, in 2017 we raised the threshold for the highest number of points to energy savings targets of 2.5% of sales or greater. Multiple states have proved that long-term savings of more than 2% are feasible and cost effective.

Table 15. Scoring of energy savings targets

Electricity savings target	Score
2.5% or greater	2.5
2–2.49%	2
1.5–1.99%	1.5
1–1.49%	1
0.5–0.99%	0.5
Less than 0.5%	0

Additional consideration	Score
EERS includes natural gas	+0.5

To aid in comparing states, we estimated an average annual savings target over the period specified in the policy. For example, in 2010 Arizona set a goal of achieving 22% cumulative

[29] The ACEEE report *Next-Generation Energy Efficiency Standards* analyzed current trends in EERS implementation and found that utilities in 20 out of the 25 states analyzed had met or exceeded their savings targets in 2017 (Gold et al. 2019).

savings by 2020, so the average incremental savings target is 2.1% per year, taking into account somewhat lower targets established for the state's electric cooperatives.

States with pending targets had to be on a clear path toward establishing a binding mechanism to earn points in this category. Examples of a clear path include draft decisions by commissions awaiting approval within six months, and agreements among major stakeholders on targets. For example, while the California legislature passed legislation in 2015 to double utility energy efficiency, the CPUC has deferred adoption of cumulative goals until staff assess methods for calculating savings persistence, to be developed by the California Energy Commission. The current average electric savings target of 1.3% per year through 2030 is based on the most recent CPUC order approving goals for the three major investor-owned utilities (CPUC 2017).

Leadership, sustainable funding sources, and institutional support are required for states to achieve their long-term energy savings targets. Several states currently have (or in the past have had) EERS-like structures in place but have lacked one or more of these enabling elements and thus have undercut the achievement of their savings goals. One state in this situation is Florida, which did not earn points in this category this year.[30] Most states with EERS policies or other energy savings targets have met their goals and are on track to meet future goals (Gold et al. 2019).

At the same time, some states, such as Maine, have fallen short of EERS targets. We have scored these states on the basis of their policies, not on current performance, because they are losing points in other metrics such as spending and savings. We may change our scoring methodology in the future to reduce points allocated if a state does not hit savings targets.

EERS policies can vary widely with regard to the portion of statewide sales that they regulate. In several states, such as Colorado and New Mexico, an EERS may apply only to investor-owned utilities, meaning that smaller municipal utilities and electric cooperatives are exempt from meeting savings targets. While our scoring does not currently account for this variation in EERS coverage, we may revise our methodology to do so in the future. Table 16 lists scores, and Appendix D includes full policy details.

Table 16. State scores for energy efficiency resource standards

State	% of sales covered within EERS policy	Approximate average annual electric savings target	Cost cap	Natural gas	Score (3 pts.)
Massachusetts	85%	2.7%		•	3
Rhode Island	~99%	2.5%		•	3
Maine	100%	2.4%		•	2.5
Vermont	98%	2.4%		•	2.5

[30] In 2014 Florida utilities proposed reducing electric efficiency efforts from 2010 levels by at least 80%. The Florida Public Service Commission approved this proposal.

State	% of sales covered within EERS policy	Approximate average annual electric savings target	Cost cap	Natural gas	Score (3 pts.)
Arizona	~56%	2.1%		•	2.5
New York	100%	2.0%		•	2.5
Maryland	97%	2.0%			2
Colorado	56%	1.7%		•	2
Illinois	89%	1.7%	•	•	2
Minnesota	100%	1.5%		•	2
New Jersey	100%	1.5%		•	2
California	~73%	1.3%		•	1.5
New Hampshire	100%	1.3%		•	1.5
Oregon	63%	1.3%		•	1.5
Arkansas	~50%	1.2%		•	1.5
Connecticut	93%	1.1%		•	1.5
Michigan	100%	1.0%		•	1.5
Hawaii	100%	1.4%			1
Nevada	88%	1.1%			1
New Mexico	69%	1.0%			1
Iowa	75%	0.9%	•	•	1
Washington	83%	0.9%		•	1
Wisconsin	100%	0.7%	•	•	1
Pennsylvania	96%	0.8%	•		0.5
North Carolina	100%	0.4%			0
Texas	74%	0.2%	•		0

States with voluntary targets are not listed in this table. Targets in states with cost caps reflect the most recent approved savings levels under budget constraints. See Appendix D for details and sources.

Utility Business Model and Energy Efficiency: Earning a Return and Fixed-Cost Recovery

Under traditional regulatory structures, utilities do not have an economic incentive to promote energy efficiency. They typically have a disincentive because falling energy sales from energy efficiency programs reduce utilities' revenues and profits—an effect referred to as *lost revenues* or *lost sales*. Because utilities' earnings are usually based on the total amount of capital invested in certain asset categories—such as transmission and distribution infrastructure and power plants—and the amount of electricity sold, the financial incentives are very much tilted in favor of increased electricity sales and expanding supply-side systems.

This dynamic has led industry experts to devise ways of addressing the possible loss of earnings and profit from customer energy efficiency programs and thereby removing utilities' financial disincentive to promote energy efficiency. Three key policy approaches properly align utility incentives and remove barriers to energy efficiency. The first is to ensure that utilities can recover the direct costs associated with implementing energy efficiency programs. This is a minimum threshold requirement for utilities and related organizations to fund and offer efficiency programs; every state meets it in some form. Given the wide acceptance of program cost recovery, we do not address it in the *State Scorecard*.

The other two mechanisms are fixed-cost recovery (which comes in two general forms: full revenue decoupling and lost revenue adjustment mechanisms) and performance incentives. Revenue decoupling—the disassociation of a utility's revenues from its sales—aims to make the utility indifferent to decreases or increases in sales, removing what is known as the *throughput incentive*. Although decoupling does not necessarily make the utility more likely to promote efficiency programs, it removes or reduces the disincentive for it to do so.[31] Additional mechanisms for addressing lost revenues include modifications to customers' rates that permit utilities to collect these revenues, through either a lost-revenue adjustment mechanism (LRAM) or other ratemaking approach. LRAM allows the utility to recover lost revenues from savings resulting from energy efficiency programs while simultaneously increasing sales overall. LRAM does not eliminate the throughput incentive. ACEEE prefers the decoupling approach for addressing the throughput incentive and considers LRAM appropriate only as a short-term solution.

Performance incentives are financial incentives that reward utilities (and in some cases nonutility program administrators) for reaching or exceeding specified program goals. These may be performance incentives based on achievement of energy savings targets, or incentives based on spending goals. Of the two, ACEEE recommends incentives based on achievement of energy savings targets. As table 18 shows, a number of states have enacted mechanisms that align utility incentives with energy efficiency.[32]

SCORES FOR UTILITY BUSINESS MODEL AND ENERGY EFFICIENCY

A state could earn up to 2 points in this category: up to 1 point for implementing performance incentive mechanisms and up to 1 point for implementing full revenue decoupling for its electric and natural gas utilities. We give only partial credit to LRAM policies for the reason discussed above. Table 17 describes our scoring methodology. Information about individual state decoupling policies and financial incentive mechanisms is available in ACEEE's State and Local Policy Database (ACEEE 2019).

[31] Straight fixed variable (SFV) rate design is sometimes considered a simple form of decoupling that collects all costs considered fixed in a fixed monthly charge and collects all variable costs in volumetric rates. However SFV collects the same monthly charge (and fixed costs) for all customers within a class, regardless of customer size. ACEEE discourages the use of SFV as it is not cost-based and sends poor price signals to customers to conserve electricity. For this reason, the *Scorecard* does not recognize SFV in its scoring methodology in this section.

[32] For a detailed analysis of performance incentives, see Nowak et al. (2015). For a detailed analysis of LRAM, see Gilleo et al. (2015a).

Table 17. Scoring of utility financial incentives

Decoupling	Score
Decoupling is in place for at least one major utility for both electric and natural gas.	1
Decoupling is in place for at least one major utility, either electric *or* natural gas. There is an LRAM or ratemaking approach for recovery of lost revenues for at least one major utility for both electric and natural gas.	0.5
No decoupling policy has been implemented, although the legislature or commission may have authorized one. An LRAM or ratemaking approach for recovery of lost revenues has been established for a major utility for either electric or natural gas.	0
Performance incentives	**Score**
Performance incentives have been established for a major utility (or statewide independent administrator) for both electric and natural gas.	1
Performance incentives have been established for a major utility (or statewide independent administrator) for either electric *or* natural gas.	0.5
No incentive mechanism has been implemented, although the legislature or commission may have authorized or recommended one.	0

This year, 28 states offer a performance incentive for at least one major electric utility, and 17 states have incentives for natural gas energy efficiency programs. Some states with third-party program administrators have performance incentives for the administrator rather than for the utilities. Thirty-one states have addressed disincentives for investment in energy efficiency for electric utilities. Of these, 15 have a lost revenue adjustment mechanism and 17 have implemented decoupling (Ohio has both), with the most recent addition to the latter being New Mexico. For natural gas utilities, 7 states have implemented an LRAM and 24 have a decoupling mechanism. Table 18 outlines these policies.

Table 18. Utility efforts to address lost revenues and financial incentives

	Decoupling or LRAM			Performance incentives			
State	Electric	Natural gas	Score (1 pt.)	Electric	Natural gas	Score (1 pt.)	Total score (2 pts.)
California	Yes	Yes	1	Yes	Yes	1	2
Connecticut	Yes	Yes	1	Yes	Yes	1	2
Hawaii[1]	Yes	—	1	Yes	—	1	2
Massachusetts	Yes	Yes	1	Yes	Yes	1	2
Minnesota	Yes	Yes	1	Yes	Yes	1	2
New York	Yes	Yes	1	Yes	Yes	1	2
Rhode Island	Yes	Yes	1	Yes	Yes	1	2

State	Decoupling or LRAM			Performance incentives			
	Electric	Natural gas	Score (1 pt.)	Electric	Natural gas	Score (1 pt.)	Total score (2 pts.)
Vermont	Yes	Yes	1	Yes	Yes	1	2
Arkansas	Yes†	Yes†	0.5	Yes	Yes	1	1.5
Colorado	Yes	Yes†	0.5	Yes	Yes	1	1.5
District of Columbia	Yes	No	0.5	Yes	Yes	1	1.5
Kentucky	Yes†	Yes†	0.5	Yes	Yes	1	1.5
Michigan	No	Yes	0.5	Yes	Yes	1	1.5
New Hampshire	Yes†	Yes*	0.5	Yes	Yes	1	1.5
Oklahoma	Yes†	Yes	0.5	Yes	Yes	1	1.5
South Dakota	Yes†	Yes†	0.5	Yes	Yes	1	1.5
Arizona	Yes†	Yes*	0.5	Yes	No	0.5	1
Georgia	No	Yes	0.5	Yes	No	0.5	1
Illinois	No	Yes	0.5	Yes	No	0.5	1
Indiana	Yes†	Yes	0.5	Yes	No	0.5	1
Maryland	Yes	Yes	1	No	No	0	1
New Mexico	Yes	No	0.5	Yes	No	0.5	1
North Carolina	Yes†	Yes	0.5	Yes	No	0.5	1
Ohio	Yes*	No	0.5	No	Yes	1	1
Oregon	Yes	Yes	1	No	No	0	1
Utah	No	Yes	0.5	Yes	No	0.5	1
Washington	Yes	Yes	1	No	No	0	1
Wisconsin	No	No	0	Yes	Yes	1	1
Idaho	Yes	No	0.5	No	No	0	0.5
Louisiana	Yes†	No	0	Yes	No	0.5	0.5
Maine	Yes	No	0.5	No	No	0	0.5
Mississippi	Yes†	Yes†	0.5	No	No	0	0.5
Missouri	Yes†	No	0	Yes	No	0.5	0.5
Nevada	Yes†	Yes	0.5	No	No	0	0.5
New Jersey	No	Yes	0.5	No	No	0	0.5
South Carolina	Yes†	No	0	Yes	No	0.5	0.5
Tennessee	No	Yes	0.5	No	No	0	0.5
Texas	No	No	0	Yes	No	0.5	0.5
Virginia	No	Yes	0.5	No	No	0	0.5
Wyoming	No	Yes	0.5	No	No	0	0.5
Alabama	No	No	0	No	No	0	0
Alaska	No	No	0	No	No	0	0
Delaware	No	No	0	No	No	0	0
Florida	No	No	0	No	No	0	0
Iowa	No	No	0	No	No	0	0

State	Decoupling or LRAM			Performance incentives			
	Electric	Natural gas	Score (1 pt.)	Electric	Natural gas	Score (1 pt.)	Total score (2 pts.)
Kansas	Yes†	No	0	No	No	0	0
Montana	No	No	0	No	No	0	0
Nebraska	No	No	0	No	No	0	0
North Dakota	No	No	0	No	No	0	0
Pennsylvania	No	No	0	No	No	0	0
West Virginia	No	No	0	No	No	0	0

* Both decoupling and lost revenue adjustment mechanism in place. † No decoupling, but lost revenue adjustment mechanism in place. A *yes* with neither asterisk nor dagger indicates that only decoupling is in place. [1] Hawaii received full points for both gas and electric because it uses minimal amounts of natural gas.

Support of Low-Income Energy Efficiency Programs

It is well documented that low-income households live in less-efficient housing and devote a greater proportion of their income to utility bills than do higher-income households. ACEEE research has found that in low-income, African-American, Latino, and renter households, the percentage of income spent on home energy is up to three times that of an average household. Some low-income households spend nearly 20% of their income on utility bills (Drehobl and Ross 2016).

A variety of factors contribute to this disparity, exacerbating the home energy burden faced by these households. Many residents live in older, poorly insulated homes with inefficient heating systems. In addition, people living in rental households may lack control over heating and/or cooling systems and appliances, which makes it difficult to influence decisions that might improve the efficiency of their homes. ACEEE research has found that for low-income households, including those in multifamily buildings, bringing their housing stock up to the efficiency level of the median household could eliminate 35% of their excess energy burden (Drehobl and Ross 2016). Beyond simply lowering energy bills—thereby providing families with more disposable income for other necessities beyond energy—efficiency upgrades can also improve health and comfort. In fact, in its evaluation of the Weatherization Assistance Program, DOE found that the value of nonenergy benefits greatly exceeded the value of energy savings (Tonn et al. 2014).

Efforts to improve the reach of energy efficiency programs that serve income-qualified customers face several unique challenges. Among them are the relatively prohibitive up-front costs of such programs and the split incentive between renters and landlords—that is, the lack of motivation for landlords to invest in efficiency upgrades when they do not themselves pay for utilities. To help overcome these challenges, regulators can play a key role in encouraging utilities to carefully consider and expand the role of income-qualified energy efficiency programs within their portfolios.

In recognition of the efforts undertaken by states to strengthen low-income energy efficiency programs offered by utilities, we added an additional scoring metric to last year's *State Scorecard* to highlight examples of effective policy drivers that we continue to score, including:

- The adoption of state legislation, regulations, or commission orders establishing a savings goal or minimum required level of spending on low-income energy efficiency programs
- The development of cost-effectiveness rules that account for the additional benefits that energy efficiency delivers to income-qualified customers, such as NEB quantification, adders, or exemption of these programs from cost-effectiveness testing.

States can utilize a variety of policy mechanisms to ensure that levels of investment in or savings from energy efficiency programs for income-qualified customers meet a minimum threshold. In the case of Pennsylvania, the Public Utility Commission has incorporated a savings target specific to low-income programs within the state's EERS. It requires each utility to obtain a minimum of 5.5% of its total consumption reduction target from the low-income sector.

In most cases, however, low-income program requirements take the form of some sort of legislative spending set-aside, through either the creation of a separate fund that receives a minimum annual contribution from ratepayers or a requirement that utilities spend a minimum amount or percentage of their revenues on low-income programs. For example, the Future Energy Jobs Act (SB 2814) passed in Illinois in December 2016 directed ComEd and Ameren Illinois to invest $25 million and $8.35 million per year, respectively, on low-income energy efficiency measures. Similarly, in August 2016, the New Hampshire Public Utilities Commission, in an approved settlement agreement establishing a statewide EERS, increased the minimum low-income share of the overall energy efficiency budget from 15.5% to 17%. Minnesota legislation requires municipal gas and electric utilities to spend at least 0.2% of their gross operating revenue from residential customers on income-qualified programs, and investor-owned natural gas utilities must spend 0.4% of their gross operating revenue from residential customers on such programs. In other states, such as Connecticut and Michigan, utilities are simply required to see that budgets allocated to low-income programs are proportional to the revenues that are expected to be collected from that sector. Descriptions of state rules and regulations establishing minimum levels of investment in low-income energy efficiency can be found in Appendix K.

Our scoring metric also recognizes public utility commissions that encourage investment in low-income energy efficiency programs by adapting cost-effectiveness screening and testing to give added consideration to the multiple important nonenergy benefits these programs produce, such as health and safety improvements. In some states, such as Illinois, Iowa, and Michigan, regulations clearly state that low-income programs are exempt from cost-effectiveness tests; in other states these exemptions may be granted in practice without being clearly stated or codified. Given the variation in policies and practices treating the cost effectiveness of income-qualified programs, some of which are established implicitly rather than explicitly within commission orders, we have tried to exercise flexibility in assigning points within this category.

Other approaches taken by program administrators to accommodate the higher costs and unique benefits of low-income programs include lowering the cost-effectiveness threshold for such programs or incorporating a percentage adder to approximate the nonenergy benefits that may otherwise be lost in a given cost–benefit calculation (as in Colorado and Vermont).

In other cases, states have established methods to measure and calculate specific nonenergy benefits for inclusion in program screening. Still other states take a hybrid approach, utilizing an adder as well as incorporating NEBs that are easy to measure. Descriptions of each state's utility cost-effectiveness rules specific to low-income programs can be found in Appendix L.

SCORES FOR SUPPORT OF LOW-INCOME ENERGY EFFICIENCY PROGRAMS

In ACEEE's data request to states and utility commissions, we asked for information about the policy instruments discussed above. We also asked for specific levels of spending on low-income energy efficiency programs by states and utilities. This is distinct from funding provided by federal sources, such as DOE grant allocations for the Weatherization Assistance Program.

A state could earn up to 1 point in this category. To earn full credit, a state must have a legislative or regulatory requirement establishing minimum spending and/or savings levels for efficiency programs aimed specifically at low-income households, as well as established cost-effectiveness screening practices that accommodate or recognize the multiple nonenergy benefits of low-income energy efficiency programs. Alternatively, a state could earn full credit by demonstrating that utility spending for such programs equaled or exceeded $13 per income-qualified resident, based on the number of state residents below 200% of the federal poverty level according to the US Census Bureau and Bureau of Labor Statistics.

States could earn 0.5 points if they had in place at least one of the two aforementioned policy instruments, or if they demonstrated that spending on low-income programs equaled or exceeded $6.50 per income-qualified resident.

Table 19 describes the scoring methodology. Information about individual states' low-income energy efficiency programs is available in Appendixes K and L and in ACEEE's State and Local Policy Database (ACEEE 2019).

Table 19. Scoring of support of low-income energy efficiency programs

Scoring criteria for low-income energy efficiency programs	Score
Legislative/regulatory requirements have established minimum spending or savings levels for low-income energy efficiency programs, *and* utility cost-effectiveness rules or exceptions have been established to provide flexibility for low-income programs. or Levels of spending on low-income energy efficiency equal or exceed $13 per income-qualified resident.	1
Legislative/regulatory requirements have established minimum spending or savings levels for low-income energy efficiency programs, *or* utility cost-effectiveness rules or exceptions have been established to provide flexibility for low-income programs. or Levels of spending on low-income energy efficiency are between $6.50 and $12.99 per income-qualified resident.	0.5

Table 20 shows the results of ACEEE's analysis, including levels of ratepayer-funded spending on low-income energy efficiency programs for states that provided this information through the *Scorecard* data request. These amounts are distinct from bill assistance programs and refer specifically to programs designed to improve energy efficiency through measures such as home energy assessments, insulation, and air sealing. These amounts are also separate from federal funding, such as federal Weatherization Assistance Program (WAP) grant allocations. However, where utility or state funds have been deployed to support or supplement WAP programs or projects, we do include these in table 20.

It is important to note that states rely on a variety of funding sources to support energy efficiency measures in low-income households; these include both ratepayer dollars and general funds. For example, although Alaska reports little utility funding for low-income programs, state investment in weatherization on a per capita basis is among the highest in the nation, thanks to appropriations by the state legislature administered through the Alaska Housing Finance Corporation. In order to credit these efforts within the *State Scorecard* and avoid penalizing states that draw from diverse funding streams, any state-subsidized low-income funds reported by state energy offices in their answers to our data request have been combined with ratepayer funding for low-income programs and annotated accordingly in table 20.

Table 20. State scores for support of low-income energy efficiency programs

State	Requirements for minimum level of state or utility support of low-income programs	Special cost-effectiveness screening provisions or exceptions for low-income programs	2018 utility spending on low-income programs	2018 state spending on low-income programs per income-qualified resident*	Score (1 pt.)
Massachusetts	Yes[a]	Yes[d]	$131,072,043†	$82	1
Vermont	Yes[a]	Yes[g]	$10,060,547	$63	1
Rhode Island	No	Yes[d]	$12,462,500	$44	1
Connecticut	Yes[abc]	Yes[e]	$26,935,615	$34	1
New Hampshire	Yes[a]	Yes[e]	$7,615,050†	$30	1
Pennsylvania	Yes[bc]	Yes[e]	$93,901,749	$27	1
Alaska	No	No	$4,770,000†	$23	1
Illinois	Yes[a]	Yes[e]	$73,500,000‡	$22	1
District of Columbia	Yes[a]	Yes[g]	$4,128,200	$22	1
Montana	Yes[a]	Yes[e]	$5,621,360‡	$20	1
Maryland	No	Yes[e]	$20,989,946‡	$17	1
Oregon	Yes[a]	Yes[e]	$16,500,000†	$14	1
Iowa	No	Yes[e]	$9,371,564	$13	1
New Jersey	No	Yes[e]	$30,000,000	$13	1
Maine	Yes[a]	Yes[d]	$4,856,236†	$13	1

State	Requirements for minimum level of state or utility support of low-income programs	Special cost-effectiveness screening provisions or exceptions for low-income programs	2018 utility spending on low-income programs	2018 state spending on low-income programs per income-qualified resident*	Score (1 pt.)
New York	Yes[a]	Yes[e]	$66,445,562	$11	1
Delaware	Yes[a]	Yes[d]	$2,434,979	$10	1
Minnesota	Yes[a]	Yes[e]	$11,426,728	$9	1
Michigan	Yes[a]	Yes[e]	$23,121,048	$8	1
Oklahoma	Yes[a]	Yes[f]	$9,880,390	$7	1
New Mexico	Yes[a]	Yes[g]	$2,668,032	$3	1
Nevada	Yes[a]	Yes[e]	$3,350,000†	$3	1
California	Yes[c]	Yes[f]	–	–	1
Texas	Yes[a]	Yes[e]	–	–	1
Virginia	Yes[a]	Yes[e]	–	–	1
Wisconsin	Yes[a]	Yes[e]	–	–	1
Utah	No	Yes[g]	$8,013,566†	$11	0.5
Missouri	No	Yes[e]	$14,758,730	$8	0.5
Colorado	No	Yes[g]	$9,402,102‡	$7	0.5
Idaho	No	Yes[g]	$4,179,766	$7	0.5
Washington	No	Yes[e]	$12,040,102†	$7	0.5
Tennessee	No	Yes[e]	$5,475,185	$3	0.5
Arizona	No	Yes[e]	$4,213,451‡	$2	0.5
North Carolina	No	Yes[e]	$6,218,638	$2	0.5
Florida	No	Yes[e]	$7,373,052	$1	0.5
Georgia	No	Yes[e]	$2,545,063	$1	0.5
Arkansas	No	Yes[e]	–	–	0.5
Indiana	No	Yes[e]	–	–	0.5
Kansas	No	Yes[e]	–	–	0.5
Kentucky	No	Yes[e]	–	–	0.5
Mississippi	No	Yes[e]	–	–	0.5
Ohio	No	Yes[e]	–	–	0.5
South Carolina	No	Yes[e]	–	–	0.5
West Virginia	No	No	$687,962	$1	0
Nebraska	No	No	$313,181	$1	0
Louisiana	No	No	$616,649‡	$0	0

State	Requirements for minimum level of state or utility support of low-income programs	Special cost-effectiveness screening provisions or exceptions for low-income programs	2018 utility spending on low-income programs	2018 state spending on low-income programs per income-qualified resident*	Score (1 pt.)
Wyoming	No	No	$4,418‡	$0	0
Alabama	No	No	–	–	0
Hawaii	No	No	–	–	0
North Dakota	No	No	–	–	0
South Dakota	No	No	–	–	0

* 2017 low-income population based on number of residents below 200% of the federal poverty level, according to US Census Bureau and Bureau of Labor Statistics 2017 Current Population Survey (CPS) Annual Social and Economic (ASEC) Supplement. † At least a portion of spending includes non-ratepayer/state-subsidized program funds. ‡ 2017 ratepayer funds. [a] A required level of spending on low-income energy efficiency has been established. [b] A required savings goal for low-income energy efficiency has been established. [c] A customer participation goal has been established. [d] Quantifiable low-income NEBs included in cost–benefit calculations. [e] Low-income programs not required to pass, or exempted from passing, cost-effectiveness test. [f] Cost-effectiveness threshold lowered to accommodate low-income programs. [g] Multiplicative adder applied to approximate low-income NEBs.

Leading and Trending States: Low-Income Energy Efficiency Programs

Colorado. Xcel Energy's Low-Income Program provides a range of weatherization services and other energy efficiency measures for income-qualified customers through a multipronged approach and partnership with several nonprofit organizations. As administrator, Xcel Energy performs engineering analysis to determine cost effectiveness and approve rebates. The utility works with Energy Outreach Colorado (EOC), an independent nonprofit created by the state. EOC leverages multiple funding sources to create and expand low-income energy assistance programs. For example, Xcel and EOC developed a single-family program serving households making 80% of area median income to reach previously ineligible participants. Since 2009, the partnership among Xcel, EOC, and other participants has served 38,000 households, leveraged $5 million in outside funding, and saved 45 GWh and 5 million therms.

District of Columbia. The DC Council's adoption of the Clean and Affordable Energy Act (CAEA) of 2008 authorized the DC Sustainable Energy Utility (DCSEU) to establish a separate Energy Assistance Trust Fund (EATF). The EATF was to be used solely to fund low-income programs in the amount of $3.3 million annually. For the 2017–2021 program cycle, the low-income spending requirement was raised to 20% of expenditures ($3.9 million), with the addition of an annual low-income goal to save 46,556 MMBtus in electricity and natural gas. DCSEU's Low-Income Multifamily Custom Program, which began in October 2017, has already shown success in providing improvements to 20 properties comprising 1,770 housing units in its first year while building a strong network of key multifamily stakeholders. The DC Department of Energy and Environment helped publicize the program and connect low-income developers to DCSEU (Samarripas and York 2019).

Pennsylvania. Phase III of Act 129's Energy Efficiency and Conservation Program, approved in 2015, increased the state's commitment to energy efficiency in low-income households. In addition to establishing a cumulative five-year utility energy consumption reduction target of 5.7 million MWh, the order requires that utilities obtain at least 5.5% of the target from low-income programs. Thanks to this improved mandate, the electric utilities' budget for energy efficiency measures for low-income multifamily housing and other low-income households has increased to more than $32 million and $150 million, respectively, over the next five years. In addition, in January 2019, the PUC issued a report regarding affordable home energy burdens for low-income Pennsylvanians. The commission is currently considering whether to establish a standardized bill policy for utilities' Customer Assistance Program and other Universal Service programs.

Massachusetts. According to Massachusetts's 2008 Green Communities Act, a minimum of 10% of electric utility budgets and 20% of gas utility budgets must serve income-qualified residents. These programs are delivered by the Low-Income Energy Affordability Network (LEAN), an association of community action agencies. LEAN coordinates administration of government- and utility-funded energy efficiency services to income-qualified customers, leveraging multiple funding sources and standardizing various program rules and eligibility requirements. LEAN also regularly hosts meetings in which utilities and nonprofit agencies discuss program and funding consistency and review potential new measures. In 2017 LEAN was expected to oversee the delivery of approximately $120 million in ratepayer and federal funds to low-income weatherization and energy efficiency programs.

ADDITIONAL POLICIES

Data Access

The scope of energy usage data that utilities make available to customers and third parties is an area of growing interest first introduced to the *State Scorecard* in 2015. Data access can help customers save energy in homes, large buildings, and communities. Giving customers and building owners access to utility consumption information can provide a baseline for

comparing future performance and help inform their decisions about investing in energy efficiency. Utilities, public utility commissions, or state legislators can advance access to utility consumption information for customers, building owners, and authorized third parties by developing recommended guidelines or requirements that standardize and streamline data access electronically across a utility territory or state. These guidelines and regulations can also facilitate or require data transmission directly from utilities to third parties with customer permission, while also addressing privacy concerns that may pose barriers to data sharing.

Beyond providing individual customer data to consumers, building owners, and authorized third-party service providers, multiple other use cases exist for which state and local governments should facilitate data sharing. By working with utilities, they can identify ways to clarify conditions and guidelines for aggregated energy data or related information. For example, a California Public Utilities Commission rulemaking recognizes specific use cases for local governments seeking access to aggregate data in creating climate action plans; for research institutions seeking anonymous energy consumption data to evaluate energy policies; and for environmental groups seeking customer data regarding energy efficiency measures pre- and post-retrofit (CPUC 2014).

Although state policies can encourage data sharing, the absence of explicit state policies does not mean utilities cannot act. After all, some utilities consider it simply a customer-service obligation to empower consumers to access and share their own energy data in a digital world. Even without an overt policy mandate, utilities in several states give customers access to their own energy use data through an online portal, offering them the option of electronically and automatically releasing it to third parties for greater analysis.

The data requests we distributed to utility commission contacts posed the following questions.

Do utilities provide energy usage data for customers to download in an electronic format such as Green Button? Are they required to do so? Here we identify those states in which utilities let customers download and access their energy use data in an electronic format, giving them usage information that is often a prerequisite to their investing in energy efficiency. We also identify those states in which utility commissions are going a step further and explicitly requiring utilities to provide energy use data to customers in a standardized electronic format. Doing so helps to facilitate sharing with third-party energy management services. For example, utilities are increasingly supporting Green Button, a technical standard for exchanging energy usage data that, as the name suggests, enables customers to download energy usage data by simply clicking on a green button.[33]

Are guidelines or requirements in place regarding the process for third-party access to customer energy use data? Such policies remove perceived technical and policy barriers to third-party

[33] Green Button comes in two varieties: Green Button Download My Data, which allows customers to download their energy use data (and upload it to a third-party application), and Green Button Connect My Data, which allows customers to automate the secure transfer of their usage data to third parties.

access, specifically by addressing privacy concerns among consumers and liability concerns among utilities.

Are utilities required to provide aggregated energy use data to owners of separately metered commercial or multifamily properties, or to public agencies? If so, what are the terms and details of the requirements? Separately metered buildings make up a significant portion of the built environment in many cities and therefore represent a significant opportunity to promote energy efficiency. By having access to whole-building energy data, building owners can benchmark energy consumption and identify opportunities to improve energy efficiency. Unfortunately, when attempting to track energy use data within buildings where tenants are the utility customers of record, owners and operators often encounter privacy-related obstacles. Clarifying privacy protection and information-sharing practices through data aggregation requirements can help address these concerns.

Table 21 summarizes the responses to these questions. We did not score states on their responses this year, although we hope to score this metric in the future.[34]

Table 21. Guidelines and requirements for provision of energy usage data

State	Guidelines established regarding process for third-party access to customer energy data	Requirement for provision of individual energy use data to customers in a common electronic format (e.g., Green Button)	Requirement for provision of individual energy use data to third parties upon customer authorization	Utilities provide energy usage data for customers to download in an electronic format	Requirement for provision of aggregate data to owners of multitenant buildings	Requirement for provision of aggregate data to public agencies
Alabama				•		
California	•	•	•	•	•	•
Connecticut	•			•		•
District of Columbia	•			•		•
Georgia				•		
Idaho				•		
Illinois	•	•	•	•		•
Maine	•	•	•	•		
Maryland	•	•		•		
Massachusetts	•			•		
Minnesota	•		•	•		
Nebraska	•		•	•	•	•
Nevada				•		
New Hampshire	•	•	•	•	•	•

[34] Complete information on data access as reported by states can be found at database.aceee.org.

State	Guidelines established regarding process for third-party access to customer energy data	Requirement for provision of individual energy use data to customers in a common electronic format (e.g., Green Button)	Requirement for provision of individual energy use data to third parties upon customer authorization	Utilities provide energy usage data for customers to download in an electronic format	Requirement for provision of aggregate data to owners of multitenant buildings	Requirement for provision of aggregate data to public agencies
New Jersey	•		•	•		•
New York					•	•
North Carolina	•			•		
North Dakota				•		
Oklahoma	•	•	•	•		
Oregon			•			
Pennsylvania	•		•	•		
Rhode Island				•		
Texas	•			•		
Utah				•		
Vermont	•			•		
West Virginia				•		

States that have no policies in place or that did not provide responses are not included in this table. Complete information on data access policies can be found in the ACEEE State and Local Policy Database (ACEEE 2019).

States that have taken notable steps toward clarifying guidelines for the provision of customer energy usage data are described below.

Leading and Trending States: Data Access

Michigan. In 2017 the Michigan Public Service Commission (MPSC) updated its administrative rules to call for regulated utilities to develop policies and clear instructions regarding the method by which customers and third parties they have authorized may obtain usage data. By January 2019, all Michigan utilities had submitted and received commission approval for their respective data privacy tariffs. A March 2019 stakeholder forum explored privacy and accessibility issues (MPSC 2019). Discussion topics included functionality of the Green Button Download My Data and Green Button Connect My Data standards as well as presentations from the Illinois Citizens Utility Board regarding utility regulations and implementation of similar data accessibility procedures. Consumers Energy planned to add Green Button Connect My Data functionality to its web portal by September 2019. The MPSC will continue to explore the implementation and rollout of the utilities' data accessibility solutions, including customer usability issues and policies for addressing aggregated and anonymized data.

Hawaii. In 2018 regulators approved Hawaiian Electric Companies' $205 million grid modernization plan, including a strategic distribution of advanced meters rather than the system-wide approach rejected by the PUC in an earlier version of the plan. Earlier this year the PUC approved $86.3 million for the plan's first phase, which will include a meter data management system that collects and stores data received from advanced metering infrastructure (AMI), as well as an online energy portal with Green Button functionality for accessing advanced meter data. The March 2019 Order (No. 36230) also directed the utilities to develop a data access and privacy policy through a collaborative stakeholder process and to file it by the fall.

North Carolina. Duke Energy has begun a rollout of advanced meter infrastructure based on its 2016 Smart Grid Technology Plans and its Power/Forward Carolinas initiative. The North Carolina Sustainable Energy Association had previously expressed concern that Duke had not adequately addressed data access issues in its plans. With the approval of the plans, the utilities commission required additional information and action from the utility. Duke Energy convened stakeholders in May 2018 to discuss issues such as customer privacy, liability, and third-party and affiliate data transactions. A report on the meeting will be released, and the commission may open a formal rulemaking procedure on the topic.

Texas. Texas was one of the first states to deploy advanced meter technology and a statewide data portal. Smart Meter Texas (SMT) allows customers to access their data and share them with third parties. However few customers have taken advantage of this difficult-to-use platform. In May 2018, in an effort to build participation, regulators approved improvements to the SMT that will be available early in 2020. The changes will streamline the data portal to simplify sign-up and improve customer experience. The updates will also make it easier for customers to choose third-party energy service providers and will facilitate the use of services like energy management and energy efficiency. Additionally, they will align the portal's design with the national Green Button interface, which supports large data sets.

Chapter 3. Transportation Policies

Authors: Eric Junga and Emma Cooper

INTRODUCTION

Transportation energy use accounts for approximately 29% of overall energy consumption in the United States and is the biggest consumer of energy economy wide (EIA 2019a). At the federal, state, and local levels, a comprehensive approach to transportation energy efficiency must address both individual vehicles and the transportation system as a whole, including its interrelationship with land-use policies. Starting with EISA 2007, the federal government has addressed vehicle energy use through joint GHG and fuel economy standards for light- and heavy-duty vehicles. However the federal government recently proposed freezing the federal light-duty standards, putting a spotlight on the role of states in maintaining progress on fuel efficiency. States and local governments continue to lead the way in creating policies for other aspects of transportation efficiency.

The energy efficiency score for the transportation category reflects state actions that go beyond federal policies to achieve a more energy-efficient transportation sector. These may be measures to improve the efficiency of vehicles purchased or operated in the state, policies to promote more-efficient modes of transportation, or the integration of land-use and transportation planning to reduce the need to drive.

SCORING AND RESULTS

At the national level, standards requiring 4–5% improvement annually in fuel economy and GHG emissions for light-duty vehicles are in place through 2025. Any weakening of these standards would make the states' role in ensuring continued progress toward high-efficiency vehicles all the more critical.[35] We awarded states that have adopted California's vehicle-emissions standards 1 point. Colorado is the most recent state to adopt these standards. Given the efficiency gains achievable through vehicle electrification, we gave states that also adopted California's Zero-Emission Vehicle (ZEV) program 0.5 points. States with more than 30 registered EVs per 100,000 people qualified for an additional 0.5 points, and those with more than 70 EVs per 100,000 earned a full additional point. We awarded 0.5 points to states with consumer incentives for the purchase of high-efficiency vehicles.

States can also lead the way in improving the efficiency of transportation systems more broadly. This includes taking steps to promote the use of less energy-intensive transportation modes. States that have a dedicated revenue stream for public transit earned 0.5 points in this year's *State Scorecard*. Twenty-five states have statutes that provide sustainable funding sources for transit-related capital and/or operating expenses. For details, see Appendix G. States also received points based on the magnitude of their transit spending. Per capita spending of $100 or more received 1 point, while expenditures of $20 to $100 per capita received 0.5 points.

Policies that promote compact development and ensure the accessibility of major destinations are essential to reducing transportation energy use in the long term. States with smart growth statutes earned 1 point. Twenty-three states earned points in this category. These statutes

[35] Fuel economy standards adopted for model years 2022–2025 were provisional, and both fuel economy and GHG emissions standards for these model years, as well as for MY 2021, are currently under review.

include the creation of zoning overlay districts, such as the Massachusetts Chapter 40R program, as well as various other incentives to encourage development patterns that reduce the need to drive. See the ACEEE State and Local Policy Database for further details (ACEEE 2019).

States that adopted reduction targets for vehicle miles traveled (VMT) or transportation-specific GHG reduction goals statewide were also eligible for 1 point. Only eight states earned points in this category. We also calculated the percentage change in VMT over a 10-year period for three time frames (2007–2016, 2008–2017, and 2009–2018) and averaged them to evaluate a given state's trend in VMT growth. We awarded 1 point to states whose average 10-year VMT per capita figure fell by 5% or more between 2016 and 2018. A reduction of 1% to 5% earned 0.5 points. Nine states earned the full point for this metric. We also awarded 0.5 points to states with complete streets statutes, which ensure adequate attention to the needs of pedestrians and cyclists in all road projects.

Regarding freight system efficiency, we changed our methodology in 2017 so that states could earn 0.5 points if their freight plans addressed multimodal freight strategies and another 0.5 points if their freight plans included an energy intensity, GHG reduction, or mode share goal. We continued that practice this year. In previous years California was the only state to earn 0.5 points for a freight-related GHG reduction goal. However we awarded this point in error as the state's Freight Mobility Plan does not contain an explicit goal.

We also evaluated state policies that encourage equitable access to efficient transportation options. States earned 0.5 points if they have policies in place to encourage inclusion of low-income housing in transit-oriented neighborhoods and an additional 0.5 points if they use distance from transit facilities as a criterion for awarding federal low-income tax credits to qualifying property owners.

Table 22 shows state scores for transportation policies. ACEEE recognizes that due to variations in states' geography and urban/rural composition, some states cannot feasibly implement some of the policies mentioned in this chapter. Nevertheless, every state can make additional efforts to reduce its transportation energy use, and this chapter illustrates several approaches. Additional details on incentives for the purchase of high-efficiency vehicles, state transit funding, and transportation legislation are included in Appendixes E, F, and G.

Table 22. State scores for transportation policies

State	GHG tailpipe emissions standards and ZEV program (1.5 pts.)[1]	EV registrations per 100,000 people (1 pt.)[2]	High-efficiency vehicle consumer incentives (0.5 pts.)[3]	VMT targets/GHG reduction goals (1 pt.)[4]	Average % change in VMT per capita (1 pt.) [5]	Integration of transportation and land-use planning (1 pt.)[6]	Complete streets legislation (0.5 pts.)[7]	Transit funding (1 pt.)[8]	Dedicated transit revenue stream (0.5 pts.)[9]	Freight system efficiency goals (1 pt.)[10]	Policies encouraging equitable access to transportation (1 pt.) [11]	Total score (10 pts.)
District of Columbia	1.5	1	0.5	1	1	1	0.5	1	0	0.5	1	9
California	1.5	1	0.5	1	0.5	1	0.5	0.5	0.5	0.5	1	8.5
Massachusetts	1.5	1	0.5	1	0	1	0.5	1	0.5	0.5	1	8.5
New York	1.5	1	0.5	1	1	1	0.5	1	0.5	0	0.5	8.5
Connecticut	1.5	1	0.5	0	0.5	1	0.5	1	0	0.5	1	7.5
Maryland	1.5	1	0.5	0	0.5	1	0.5	0.5	0.5	0.5	1	7.5
Oregon	1.5	1	0.5	1	0.5	1	0.5	0	0.5	0.5	0.5	7.5
Washington	1	1	0.5	1	0.5	1	0.5	0	0.5	0.5	0.5	7
Vermont	1.5	1	0.5	1	0.5	1	0.5	0	0	0.5	0	6.5
New Jersey	1.5	1	0.5	0	0	1	0.5	0.5	0	0.5	0.5	6
Rhode Island	1.5	0.5	0	0	0.5	1	0.5	0.5	0	0.5	1	6
Maine	1.5	0.5	0.5	0	0	1	0.5	0	0.5	0.5	0.5	5.5
Minnesota	0	1	0	1	0.5	0	0.5	0.5	0.5	0.5	1	5.5
Pennsylvania	1	0.5	0.5	0	1	0	0.5	1	0.5	0.5	0	5.5
Delaware	1	1	0.5	0	0	1	0.5	1	0	0	0	5
Illinois	0	1	0	0	0	1	0.5	1	0.5	0.5	0.5	5
Virginia	0	1	0	0	0.5	1	0.5	0.5	0.5	0.5	0.5	5
Colorado	1	1	0.5	0	0.5	0	0.5	0	0.5	0	0.5	4.5
Florida	0	1	0	0	1	0	0.5	0	0.5	0.5	1	4.5
Arizona	0	1	0.5	0	0.5	1	0	0	0	0.5	0.5	4
Georgia	0	1	0.5	0	0.5	0	0.5	0	0.5	0.5	0.5	4
Hawaii	0	1	0	0	0	1	0.5	0	0.5	0.5	0.5	4
Alaska	0	1	0	0	1	0	0	1	0	0.5	0	3.5
Michigan	0	0.5	0	0	0	1	0.5	0	0.5	0.5	0.5	3.5

State	GHG tailpipe emissions standards and ZEV program (1.5 pts.)[1]	EV registrations per 100,000 people (1 pt.)[2]	High-efficiency vehicle consumer incentives (0.5 pts.)[3]	VMT targets/GHG reduction goals (1 pt.)[4]	Average % change in VMT per capita (1 pt.) [5]	Integration of transportation and land-use planning (1 pt.)[6]	Complete streets legislation (0.5 pts.)[7]	Transit funding (1 pt.)[8]	Dedicated transit revenue stream (0.5 pts.)[9]	Freight system efficiency goals (1 pt.)[10]	Policies encouraging equitable access to transportation (1 pt.) [11]	Total score (10 pts.)
North Carolina	0	1	0	0	0	1	0.5	0	0.5	0.5	0	3.5
Tennessee	0	0.5	0	0	0	1	0.5	0	0.5	0.5	0.5	3.5
New Hampshire	0	1	0	0	0.5	1	0	0	0	0.5	0	3
Texas	0	1	0.5	0	0.5	0	0.5	0	0	0.5	0	3
Utah	0	1	0.5	0	0	0	0.5	0	0.5	0.5	0	3
Indiana	0	0.5	0	0	0	0	0.5	0	0.5	0.5	0.5	2.5
Iowa	0	0.5	0	0	0	1	0	0	0.5	0.5	0	2.5
Missouri	0	0.5	0	0	0	0	0.5	0	0	0.5	1	2.5
Nevada	0	1	0	0	0	0	0.5	0	0	0.5	0.5	2.5
Oklahoma	0	1	0	0	1	0	0	0	0	0.5	0	2.5
Mississippi	0	0	0	0	1	0	0.5	0	0	0.5	0	2
South Carolina	0	0.5	0	0	0.5	0	0.5	0	0	0.5	0	2
West Virginia	0	0	0	0	0.5	0	0.5	0	0.5	0.5	0	2
Kansas	0	0.5	0	0	0	0	0	0	0.5	0.5	0	1.5
Kentucky	0	0	0	0	0	0	0	0	0	0.5	1	1.5
Louisiana	0	0	0.5	0	0	0	0.5	0	0	0.5	0	1.5
New Mexico	0	0.5	0	0	0	0	0	0	0	0.5	0.5	1.5
North Dakota	0	0	0	0	0	1	0	0	0	0.5	0	1.5
Wyoming	0	0	0	0	1	0	0	0	0	0.5	0	1.5
Alabama	0	0	0	0	0	0	0	0	0.5	0.5	0	1
Arkansas	0	0	0	0	0	0	0	0	0.5	0.5	0	1
Idaho	0	0.5	0	0	0	0	0	0	0	0.5	0	1
Nebraska	0	0.5	0	0	0	0	0	0	0	0.5	0	1
Ohio	0	0.5	0	0	0	0	0	0	0	0.5	0	1
South Dakota	0	0	0	0	1	0	0	0	0	0	0	1

State	GHG tailpipe emissions standards and ZEV program (1.5 pts.)[1]	EV registrations per 100,000 people (1 pt.)[2]	High-efficiency vehicle consumer incentives (0.5 pts.)[3]	VMT targets/GHG reduction goals (1 pt.)[4]	Average % change in VMT per capita (1 pt.) [5]	Integration of transportation and land-use planning (1 pt.)[6]	Complete streets legislation (0.5 pts.)[7]	Transit funding (1 pt.)[8]	Dedicated transit revenue stream (0.5 pts.)[9]	Freight system efficiency goals (1 pt.)[10]	Policies encouraging equitable access to transportation (1 pt.) [11]	Total score (10 pts.)
Wisconsin	0	0.5	0	0	0	0	0	0	0	0.5	0	1
Montana	0	0.5	0	0	0	0	0	0	0	0	0	0.5

[1] ICCT 2019. [2] IHS Automotive Polk 2019; state data requests. [3] DOE 2019b. [4] State legislation. [5] FHWA 2019. [6] State legislation. [7] NCSC 2018. [8] AASHTO 2019. [9] State legislation. [10] State freight plans. [11] State legislation.

DISCUSSION

Tailpipe Emissions Standards and the Zero-Emission Vehicle Program

The US Department of Transportation (DOT) has regulated the fuel economy of automobiles since Corporate Average Fuel Economy (CAFE) standards were adopted in 1975. States are not permitted to adopt fuel efficiency standards per se. As a longtime leader in vehicle emissions reduction, however, California has authority to set its own vehicle emissions standards, including for GHG emissions. Other states may choose to follow federal or California standards. In 2002, California passed the Pavley Bill (AB 1493), the first law in the United States to address GHG emissions from vehicles. The GHG reductions from this law were expected to be achieved largely through improved fuel efficiency, making these standards, to a large degree, energy efficiency policies. Given auto manufacturers' preference for regulatory regimes that allow them to offer identical vehicles in every state, California's program has been instrumental in prodding the federal government to continue to increase the stringency of vehicle standards, drawing new efficiency technologies into the market.

Pursuant to the *Massachusetts v. Environmental Protection Agency* court decision in 2007, the EPA began regulating vehicle GHG emissions as well. Starting with model year 2012, the EPA, DOT, and the California Air Resources Board (CARB) have had harmonized standards for fuel economy and GHG emissions. In 2010 the agencies set new GHG and fuel economy standards for model years 2012 through 2016. In 2012 the agencies extended the standards to model years 2017–2025, projecting a fleetwide GHG emissions average of 54.5 miles per gallon by 2025. The DOT standards for model years 2022–2025 were provisional, and all three agencies were to participate in a midterm review of the appropriateness of the final four years of the standards. In early 2017, EPA and CARB determined that these standards remained appropriate.

The Trump administration reopened EPA's midterm review shortly after the inauguration in 2017, and in April 2018 the EPA released a new determination that these future standards were no longer appropriate. A joint DOT and EPA rule proposing to freeze the standards at model-year 2020 levels and revoke California's authority to set GHG standards is expected to be finalized in fall 2019. Hence other states' adoption and support of California's standards will be critical in maintaining California's authority and progress toward clean, fuel-efficient vehicles. California has also updated its Zero-Emission Vehicle (ZEV) program, requiring a more ambitious increase in sales of plug-in hybrid, battery electric, and fuel-cell vehicles from 2018–2025 in order to reduce GHG and criteria pollutant emissions. Manufacturers of passenger cars and light trucks (up to 8,500 pounds) must earn a certain number of ZEV credits by meeting state requirements regarding the number and type of ZEVs they must produce and deliver for sale (C2ES 2017).

Fourteen states (besides California) and the District of Columbia now use California's GHG regulations: Colorado, Connecticut, Delaware, the District of Columbia, Maine, Maryland, Massachusetts, New Jersey, New York, Oregon, Pennsylvania, Rhode Island, Vermont, and Washington (ICCT 2019). (Arizona and Florida also adopted California's standards but repealed them in 2012.) Colorado is the most recent state to adopt these standards, finalizing its rule in November 2018. Nine of these states and the District of Columbia have adopted California's ZEV requirements as well (ICCT 2019).

Electric Vehicle Registrations

As more EVs become available to drivers, states can help remove the barriers to their widespread adoption. In addition to reducing the higher up-front costs of these vehicles, states can provide incentives for the construction of the required fueling infrastructure. Additionally, states can offer nonfinancial benefits—such as emissions testing exemptions—that make it more convenient to own an EV. The number of EV registrations per capita in a given state is indicative of the success of the state's policies to increase the uptake of electric vehicles.

Incentives for High-Efficiency Vehicles

When fuel-efficient vehicles contain new, advanced technologies, high purchase cost is a barrier to their entry into the marketplace. To encourage consumers to purchase fuel-efficient vehicles, states may offer a number of financial incentives, including tax credits, rebates, and sales tax exemptions. Several states offer tax incentives to purchasers of alternative-fuel vehicles—including those that run on compressed natural gas, ethanol, propane, or electricity—and in some cases to purchasers of hybrid vehicles (electric or hydraulic). Although alternative-fuel vehicles can provide environmental benefits by reducing pollution, they are not necessarily more fuel efficient, and we did not include policies to promote their purchase in the *State Scorecard*. However we did include incentives for plug-in vehicles and hybrids, which do generally have high fuel efficiency. With the arrival of a wide range of these vehicles in recent years, tax credits are playing an important role in spurring their adoption.

We did not give credit for the use of high-occupancy vehicle lanes and preferred parking programs for high-efficiency vehicles, as they promote increased vehicle use and consequently may not deliver net energy benefits.

Vehicle Miles Traveled (VMT) Growth and VMT Reduction Targets

Improved vehicle efficiency will not adequately address energy use in the transportation sector in the long term if growth in total VMT goes unchecked. EIA predicts a 20% increase in light-duty VMT between 2018 and 2050 due to rising incomes and population growth. VMT for all vehicle types is expected to increase by 1.1% annually over the next 20 years (EIA 2019a). Reducing VMT growth is key to managing transportation energy use, and several states have taken on this challenge by setting VMT reduction targets.

Integration of Land-Use and Transportation Planning

Success in achieving VMT reduction targets requires the coordination of transportation and land-use planning. Successful strategies vary among states due to differences in their infrastructure, geography, and political environment. However all states benefit from adopting core principles of smart growth and integrating transportation and land-use planning in order to increase transportation system efficiency. Integrated approaches include measures that encourage:

- Transit-oriented development, including mixed land use (combining jobs, stores, and housing) and good street connectivity to make neighborhoods friendly to all modes of transportation
- Areas of compact development

- Convenient modes of transportation that provide alternatives to driving
- Centers of activity where popular destinations are close together and accessible by multiple transportation modes

Complete Streets Policies

Complete streets policies focus on street connectivity and aim to create safe, easy access to roads for all pedestrians, bicyclists, motorists, and public transportation users. Such policies foster increased use of alternatives to driving and thus can contribute to reducing fuel consumption. According to the National Complete Streets Coalition, modest increases in biking and walking could save 2.4 billion gallons of fuel annually across the country (NCSC 2012). A complete streets policy directs states' transportation agencies to evaluate and incorporate complete streets principles and tasks transportation planners with ensuring that all roadway infrastructure projects allow for equitable access to and use of those roadways.

State Transit Funding

While states receive some federal funds for public transit, a significant proportion of transit funding comes from state budgets. A state's investment in public transit is a key indicator of its interest in promoting energy-efficient modes of transportation.

Dedicated Transit Revenue Streams

As states face increasingly uncertain federal funding streams and federal transportation policies that remain highway-focused, many have taken the lead in finding dedicated funding sources for long-term public transit expenditures. A number of states have taken a legislative approach to generating a sustainable stream of capital and operating funds. For instance, in 2018 Alabama established a trust fund under the Alabama Public Transportation Act to increase public transportation options in the state.

Freight

Many states have freight transportation plans in place. The federal Fixing America's Surface Transportation (FAST) Act, adopted in 2015, superseded the Moving Ahead for Progress in the 21st Century (MAP-21) Act. FAST requires states to develop short- and long-range freight plans in order to receive federal funds for freight projects. Final plans were required by December 2017. Additionally, FAST created a separate pot of money for intermodal and rail freight projects. Each state is allowed to set aside up to 10% of federally awarded funds for eligible non-highway projects (FAST 2015). Pursuant to FAST, states must include multimodal strategies in their freight plans, but these did not need to be finalized by the December 2017 deadline. Still, many states have already incorporated multimodalism into their freight plans.

These plans can be strengthened by adopting concrete targets or performance measures that establish energy efficiency as a priority for goods movement. Such measures involve tracking and reporting the fuel used for freight movement in the state as a whole and encourage the use of energy efficiency as a criterion for selecting or evaluating freight projects. States can formulate these performance targets in terms of gallons per ton-mile of freight moved, for example, or grams of GHG emitted per ton-mile of freight, and targets should reflect performance across all freight modes.

Equitable Access to Transportation

As cities have sprawled and jobs have moved away from urban cores in the United States, many low-income communities have become geographically more isolated and inadequately served by affordable, efficient transportation. Here personal vehicles have become the only option for travel—and expenditures for vehicles, including fuel, insurance, and maintenance, can be large and unpredictable. As a result, household transportation costs as a percentage of total income are higher than average for these communities (Pew Charitable Trusts 2016).

States can use policy levers in a number of ways to ensure fair and equitable access to public transportation and newer shared-use services. Providing incentives to developers who set aside a fixed percentage of low-income housing in transit-served areas helps align housing and transportation choices. Similarly, proximity to transit services is a key measure that many states use in disbursing federal low-income tax credits to qualifying property owners, ensuring that low-income communities are served by a variety of transportation alternatives.

PROPOSED METRICS FOR 2020

State-Based EV Fees

As electric vehicle sales begin to ramp up across the country and projections call for a steep increase in the rate of EV penetration, some states have applied additional registration fees to these vehicles. To date, 24 states have done so, including Arkansas, Connecticut, Maine, North Dakota, and Rhode Island. Bills on the table across the country propose annual fees ranging anywhere from $25 (New Mexico) to $1,000 (Illinois). Judging from a review of a small sample of state bills, the primary motivation for these fees is to replace lost future gasoline tax revenues that fund road-related maintenance. One state, Washington, intends to use the funds for a different purpose: building out EV charging infrastructure to support increased deployment.

While it makes sense for all vehicle owners to contribute to the maintenance of the roads they drive on, there are several issues that these surcharges bring to light. First, EV fees can be at odds with state targets for EV deployment. As states and cities take the lead in pursuing aggressive climate goals, EVs can play a critical role in achieving GHG emissions reductions. Numerous states have tax credits in place to encourage EV sales (see Appendix E) yet also have high additional registration costs for EV drivers, policies that work against each other (Tomich 2019).

Moreover, these fees in some cases exceed what the driver of an average gasoline-fueled car pays in gas taxes. Some states' EV fees are based on inaccurate tax calculations that use high annual VMT figures and low average vehicle fuel economy. As an example, North Carolina's proposed EV fee was set by assuming that the average vehicle in the state drives 15,000 miles a year and gets 20 miles per gallon—and therefore pays more than $270 annually in gasoline taxes (Stradling 2019). Finally, EV fees in many states do not take into consideration that EV owners pay other taxes that owners of gasoline-powered vehicles do not.

In any case, there is little justification for high surcharges on advanced-technology vehicles, and such charges will disincentivize the development of technologies that reduce emissions. In fact, some EV fee proposals appear to be designed for that purpose. The American Legislative Exchange Council (ALEC), which receives funding from fossil fuel interests, pushed for steep EV fees in states and campaigned against the federal EV tax credit in 2018 and 2019 (Lunetta 2018).

The aim of our scoring approach proposed for next year is to balance the need for states to promote EV sales in what is still a relatively new market with the need for users to pay their fair share of road costs. We propose to score states by comparing their EV fees with the amount of gasoline tax revenue collected for the average car. We will use the Department of Energy's Alternative Fuels Data Center and the Atlas EV Hub website to collect data on state EV fees (DOE 2019b; Atlas Public Policy 2019). For now, we have used Atlas EV Hub's estimation of gas tax revenues in our sample analysis below. However the basis of Atlas's gas tax revenue calculation is unclear. Therefore, given the fact that most EVs are cars, we may consider using average car fuel economy to do our own calculation in 2020 instead.

For 2020, we propose to award 1 point to states that have no EV fee or a fee that is less than or equal to 100% of the annual average gasoline tax revenue. States where the EV fee is from 101% to 125% of gasoline tax revenues would earn no points, and those with an EV fee greater than 125% of gasoline revenues would lose a point from their overall score. Table 23 shows current data on EV fees and gas tax revenues.

We recognize that this is not a full accounting of the fees that an EV driver might pay compared to a driver of a conventional vehicle; for instance, we know EV drivers pay state taxes on the electricity they use to charge their vehicles (albeit a very small charge compared with gasoline tax spending). Still, we think this is a simple and reasonable methodology.

Table 23. State EV fees

State	Current annual EV fee	Estimated annual gas tax revenues	Ratio of EV fee to gas tax revenues
Alaska	–	–	–
Arizona	–	–	–
Connecticut	–	–	–
Delaware	–	–	–
District of Columbia	–	–	–
Florida	–	–	–
Hawaii	–	–	–
Iowa	–	–	–
Kansas	–	–	–
Kentucky	–	–	–
Louisiana	–	–	–

State	Current annual EV fee	Estimated annual gas tax revenues	Ratio of EV fee to gas tax revenues
Maine	–	–	–
Maryland	–	–	–
Massachusetts	–	–	–
Montana	–	–	–
Nevada	–	–	–
New Hampshire	–	–	–
New Jersey	–	–	–
New Mexico	–	–	–
New York	–	–	–
Oklahoma	–	–	–
Pennsylvania	–	–	–
Rhode Island	–	–	–
South Dakota	–	–	–
Texas	–	–	–
Vermont	–	–	–
Illinois	$100	$198.78	0.50
Nebraska	$75	$137.91	0.54
Minnesota	$75	$137.04	0.55
California	$100	$181.33	0.55
Colorado	$50	$89.30	0.56
Wisconsin	$100	$142.37	0.70
South Carolina	$60	$81.60	0.74
Washington	$150	$190.66	0.79
Utah	$90	$111.64	0.81
North Carolina	$130	$159.46	0.82
Tennessee	$100	$111.02	0.90
Virginia	$64	$70.75	0.90
Oregon	$110	$115.59	0.95
Missouri	$75	$74.50	1.01
Idaho	$140	$132.31	1.06
Michigan	$135	$122.75	1.10
West Virginia	$200	$169.78	1.18
Indiana	$150	$122.98	1.22
North Dakota	$120	$96.54	1.24

State	Current annual EV fee	Estimated annual gas tax revenues	Ratio of EV fee to gas tax revenues
Georgia	$200	$124.17	1.61
Ohio	$200	$124.03	1.61
Mississippi	$150	$83.57	1.79
Wyoming	$200	$101.06	1.98
Arkansas	$200	$87.16	2.29
Alabama	$200	$80.03	2.50

Sources: Atlas Public Policy 2019; DOE 2019b

Public EV Charging Infrastructure

To evaluate whether states are addressing the barriers to EV adoption posed by inadequate charging infrastructure, we propose to add a metric in 2020 that scores states on the number of publicly available charging stations per 100,000 people. Using data from the Alternative Fuel Data Center's Station Locator map, we propose to award 1 point to states that have 10 or more public chargers per 100,000 people. States with 5 to 9 such chargers per 100,000 people will receive 0.5 points. Table 24 shows data for this proposed 2020 metric.

Table 24. EV public charging stations

State	Number of public charging stations	Stations per 100,000 people
Vermont	205	32.73
Hawaii	267	18.80
District of Columbia	120	17.08
Oregon	597	14.25
California	5,120	12.94
Colorado	702	12.33
Maine	157	11.73
Washington	872	11.57
Maryland	598	9.90
Connecticut	333	9.32
Massachusetts	607	8.79
Wyoming	49	8.48
Nevada	252	8.30
New Hampshire	112	8.26
Rhode Island	86	8.13
Georgia	780	7.41

State	Number of public charging stations	Stations per 100,000 people
Utah	216	6.83
Missouri	413	6.74
Virginia	570	6.69
New York	1,242	6.36
Kansas	184	6.32
Arizona	443	6.18
Tennessee	390	5.76
North Carolina	590	5.68
Florida	1,190	5.59
Delaware	49	5.07
Minnesota	276	4.92
West Virginia	87	4.82
South Carolina	244	4.80
Montana	46	4.33
Nebraska	81	4.20
Michigan	407	4.07
Idaho	71	4.05
Texas	1,134	3.95
South Dakota	34	3.85
Illinois	487	3.82
Ohio	441	3.77
Wisconsin	209	3.60
Iowa	112	3.55
Pennsylvania	440	3.44
New Mexico	71	3.39
New Jersey	301	3.38
Indiana	209	3.12
North Dakota	21	2.76
Kentucky	115	2.57
Arkansas	76	2.52
Alabama	120	2.46
Alaska	16	2.17
Mississippi	58	1.94

State	Number of public charging stations	Stations per 100,000 people
Louisiana	89	1.91
Oklahoma	71	1.80

Source: DOE 2019a

Chapter 4. Building Energy Efficiency Policies

Author: Chris Perry

INTRODUCTION

Buildings consume 75% of the electricity and 40% of the total energy used in the United States and account for 36% of US carbon dioxide emissions (EIA 2018c).[36] This makes buildings an essential target for energy savings. Because buildings have long life spans and retrofits are often complex or costly, encouraging building efficiency measures during design and construction is one of the most effective ways to reduce building energy consumption. Mandatory building energy codes require a minimum level of energy efficiency for new residential and commercial buildings in addition to setting requirements related to health and safety. Benchmarking and transparency policies also promote efficiency by informing building owners about their energy consumption. Policies encouraging energy rating and labeling of homes can help to further transform the market by enabling prospective buyers to make informed decisions about the true long-term energy costs they would be taking on.

Building Energy Code Adoption

In 1978 California enacted the first statewide building energy code in its Title 24 Building Standard. Several states (including Florida, New York, Minnesota, Oregon, and Washington) followed with their own codes in the 1980s. During the 1980s and 1990s, the International Code Council® (ICC) and the regional code development organizations that preceded it developed the Model Energy Code (MEC), later renamed the International Energy Conservation Code® (IECC). Today most states use a version of the IECC for their residential buildings.

Most commercial building codes are based on ASHRAE 90.1 standards, jointly developed by ASHRAE (formerly the American Society of Heating, Refrigerating and Air-Conditioning Engineers) and the Illuminating Engineering Society (IES). The IECC commercial building code tends to adopt many of the prescriptive and performance requirements of the ASHRAE 90.1 code to ensure continuity between the two codes.

With the publication of each new edition of the IECC and ASHRAE standards, DOE issues determinations on the codes that ascertain their relative impact compared with older standards and establish, if justified, the latest iteration as the base code that all states must comply with. Within two years of the final determination, states are required to send letters either certifying their adoption, requesting an extension, or explaining their decision not to comply. Several states, such as Maryland, Massachusetts, and Illinois, are required by statute to adopt the most recent version of the IECC within 12–18 months of publication.

On July 25, 2017, DOE released its most recent commercial code determination showing that ASHRAE Standard 90.1-2016, which includes changes to the building envelope and lighting and mechanical standards, will lead to 6.7% greater site energy savings than the 2013 edition. On May 2, 2019, DOE published its preliminary determination of the 2018 IECC.

[36] From an analysis of 2018 totals from residential, commercial, industrial, and transportation end uses.

The new code included modest improvements, including stricter requirements on windows, and clarified minimum levels of efficiency for homes using onsite renewable energy. These measures resulted in a 1.7% increase in site energy savings over the 2015 IECC.[37]

Stimulus funding provided through the DOE State Energy Program under the American Recovery and Reinvestment Act of 2009 (ARRA) spurred the majority of states to adopt at least the 2009 IECC and ASHRAE 90.1-2007 standards. ARRA required that each state accepting stimulus funding for code implementation and compliance have a plan to achieve compliance with these codes in 90% of new and renovated residential and commercial building space by 2017. While these federal efforts were successful in leading states to update to 2009 model codes in the years after ARRA, more recent adoption efforts have been the result of direct state leadership.

A number of states have adopted the latest versions of the codes, including Nebraska, Illinois, Massachusetts, Maryland, Nevada, and Ohio. Meanwhile Colorado, a home rule state, passed HB 19-1260 requiring local jurisdictions to adopt one of the three most recent versions of the IECC.

Building energy codes have historically taken a prescriptive approach, requiring compliance with a specific portfolio of building specifications and efficiency measures. However recent years have seen codes become increasingly performance based, allowing builders flexibility to chart their own course as long as the building meets a minimum standard of modeled energy performance. For residential buildings, an additional type of performance path called the Energy Rating Index (ERI) was introduced in the 2015 IECC. This path involves target scores in a range of 0 to 100, where 100 represents the 2006 IECC and 0 represents a zero-energy building. The required score differs among climate zones. The path gives home builders more flexibility to meet required energy performance than does a prescriptive approach.

At the same time, a number of states and communities have taken steps to move toward zero-energy standards for new and existing construction. A zero-energy (ZE) building is one that produces as much energy as it uses, usually measured over the course of a year. This performance is achieved through energy efficiency and renewable energy technologies.

In recent years, the concept of ZE has increasingly taken hold among building designers and clean energy communities, prompting a growing pursuit of ZE-related targets and certifications, such as the American Institute of Architects' 2030 Challenge, the International Living Future Institute's Living Building Challenge, and DOE's Zero Energy Ready Home program. States and localities have also developed more stringent building energy codes. Examples include the District of Columbia's proposed zero-energy building code path; Delaware's legislated requirement that all new residential and commercial building construction be zero energy–capable by 2025 and 2030, respectively; Oregon's executive order that requires zero energy–ready home equivalence by 2023 (Oregon 2017); and city- and county-led efforts in Idaho and Colorado. Beyond mandating that all new homes be superefficient, California also requires rooftop PV for new construction. For the past decade

[37] For details see www.energycodes.gov/development/determinations.

the emphasis has been on advancing zero net energy buildings. The state is now pivoting to code requirements for low-GHG buildings, using metrics that will focus design and construction on decarbonization and demand flexibility to integrate with California's evolving clean energy grid (CEC 2019). Other active ZE plans are in place in Vermont, Rhode Island, the District of Columbia, New York, and Massachusetts. As building energy codes are amended to deepen energy savings and move states closer to ZE goals, interest is growing regarding outcome-based codes and the importance of calculating building energy savings.[38]

Building Energy Code Compliance

Robust implementation and enforcement are necessary to ensure that states will reap the benefits of adopted codes. A support network that includes DOE, the Pacific Northwest National Laboratory (PNNL), regional energy efficiency organizations (REEOs), and a variety of other local, regional, and national stakeholder groups provides technical training, educational resources, and advocacy to help states and communities reach their compliance goals.

DOE provides many resources to guide states in code compliance. In addition to funding compliance activities through grants, DOE provides technical assistance—such as model adoption policies, compliance software, and training modules—through its Building Energy Codes Program. Among its most recent efforts is an ongoing three-year residential energy code field study in eight states that seeks to establish baseline energy use and determine the degree to which investment in building energy code education, training, and outreach programs can produce a significant, measurable change in residential building energy savings.[39] Also ongoing is a DOE-led single- and multifamily residential energy code field study that will develop an approach to better assess energy code compliance in buildings (DOE 2017).

REEOs work closely and collaboratively within their regions and with one another to coordinate code-related activities that support adoption and compliance. They include Northeast Energy Efficiency Partnerships (NEEP), the Southeast Energy Efficiency Alliance (SEEA), the Midwest Energy Efficiency Alliance (MEEA), the South-Central Partnership for Energy Efficiency as a Resource (SPEER), the Southwest Energy Efficiency Project (SWEEP), and the Northwest Energy Efficiency Alliance (NEEA).[40] REEOs have served a vital role in providing technical policy information and analysis regarding cost effectiveness and potential energy savings of energy codes to help inform code adoption efforts. Other pivotal REEO-led initiatives include increasing access to energy code training for builders, code officials, and architects; and overseeing energy code stakeholder groups and collaboratives. The REEOs have also been key contributors to DOE's ongoing residential energy code field

[38] While the focus of building energy codes historically has been to design energy-efficient buildings, outcome-based codes attempt to consider building operation and methods to measure ongoing energy use.

[39] Since the initial eight-state pilot study, nearly 20 additional states have replicated the DOE methodology and conducted similar studies of their own.

[40] These organizations cover all states except California, Hawaii, and Alaska.

studies in Kentucky, Arkansas, Texas, Tennessee, Virginia, Alabama, Colorado, Georgia, and many other states.

Other important stakeholders providing leadership and technical expertise on code adoption and enforcement include the Building Codes Assistance Program (BCAP), the National Association of State Energy Officials (NASEO), and the Responsible Energy Codes Alliance (RECA), among others.

In addition to participating in these regional and national efforts, states can take other measures to support code compliance. These include the following:

- Conducting a study—preferably every three to five years—to determine actual rates of energy code compliance, identify compliance patterns, and create protocols for measuring compliance and developing best-practice training programs
- Establishing a system, including programs and an evaluation methodology, that encourages utilities and other stakeholders to support code compliance and claim energy savings from doing so
- Offering training programs and/or adopting policies establishing minimum certification requirements for code enforcement officials in order to increase the number and effectiveness of contractors and officials who implement codes and monitor and evaluate compliance. These programs and policies are most effective when based on data collected in compliance field studies. Additionally, professionals' participation in state-specific licensing, certification, and continuing education credit programs has been shown to be higher than their participation in national programs.

Utilities can promote compliance with state and local building codes in a number of ways. Many utilities across the country offer energy efficiency programs that target new construction. A handful of jurisdictions with EERS policies, including California, Massachusetts, Rhode Island, the District of Columbia, New York, and Arizona, have established programs that allow utilities to claim savings for code enhancement activities, both for adoption and for compliance. Utilities can fund and administer training and certification programs, assist local jurisdictions with implementing tools that streamline enforcement, provide funding for purchasing diagnostic equipment, and help with compliance evaluation. They also can combine code compliance efforts with initiatives to improve energy efficiency beyond code requirements. To encourage utilities to participate, prudent regulatory mechanisms, such as program cost recovery or shared savings policies, must be in place to compensate them for their efforts.

Building Energy Use Transparency and Home Energy Labeling

A significant challenge to improving efficiency in the housing sector has been a relatively low level of awareness and understanding among home buyers of the energy costs and energy-saving features of homes on the market. While miles-per-gallon stickers and Energy Guide labels have become dependable fixtures of the vehicle and home appliance markets, a lack of transparent energy use information has historically plagued the housing sector. Market signals are insufficient to direct consumers to the most efficient homes, leading to uninformed purchasing decisions, and home buyers end up saddled with higher long-term

costs than anticipated. This critical information gap has far-reaching ramifications that include not just bloated utility bills, but also the undervaluation of efficiency services, a concealment of vital knowledge about a home's maintenance and repair needs, and an excessive energy burden that may cause homeowners to forgo other important purchases.

Efficiency advocates and government agencies at all levels have worked to devise residential energy labeling programs and policies that inform home buyers and real estate stakeholders about a home's energy performance. Given differences in priorities among regions and stakeholders, a diverse patchwork of ratings, each with varying metrics and areas of focus, has arisen to meet the challenge. Examples include:

- *Residential Energy Services Network (RESNET) Home Energy Rating System (HERS).*[41] Considered the industry standard, the HERS rating is required for a home to qualify for ENERGY STAR certification, DOE Zero Energy Ready Home certification, and many energy efficiency programs that target new construction (Cluett and Amann 2013). ANSI/RESNET/ICC Standard 301-2014, known as the Energy Rating Index, is based on the HERS rating system; it is formally referenced as its own compliance path in the 2015 and 2018 IECC. This means that states and communities updating their codes have the opportunity to increase uptake of the HERS rating. This in turn allows builders flexibility in meeting code requirements and provides home sellers an opportunity to demonstrate the added energy-saving value of the home by including the score in real estate listings.
- *DOE Home Energy Score (HES).* Launched in 2012, HES has been used primarily for existing homes. HES rates homes on a 1–10 scale, with 10 being the most efficient, and provides guidance on recommended upgrades and how the upgrades will improve the home's score. The score has been incorporated into voluntary labeling initiatives in states including Alabama, Colorado, Connecticut, Massachusetts, and Oregon.[42] Starting in 2018, HES became mandatory in Portland, Oregon, at the time a property is listed for sale, with scores posted to the Multiple Listing Service.
- *Energy Trust of Oregon Energy Performance Score (EPS).* The EPS is a program for new homes served by Energy Trust, and it is allowed in place of HES in the mandatory Portland home scoring program through 2019. The EPS scale is based on home energy use of natural gas and electricity and generation from solar photovoltaics.

To help consumers navigate the varied and sometimes confusing landscape of residential energy labeling protocols, a number of state energy offices have partnered with organizations like NASEO and NEEP to strengthen the regional consistency of energy rating practices. These efforts include:

- *Energy Metrics to Promote Residential Energy Scorecards in States (EMPRESS).* An initiative led by state energy offices and supported by DOE and private partners, EMPRESS aims to coordinate and harmonize the software platforms for DOE's HES

[41] RESNET is a national not-for-profit standard-setting membership organization accredited by the American National Standards Institute (ANSI) as a Standard Development Organization.

[42] Many communities are also considering incorporating HES into their climate action plans as a way to spur retrofits.

and RESNET's HERS ratings as well as to foster voluntary use of residential energy data by real estate market stakeholders and others (NASEO 2018). States currently involved in EMPRESS include Rhode Island, Massachusetts, Missouri, Arkansas, and Oregon.

- *Home Energy Labeling Information eXchange (HELIX).* Led by NEEP and supported by DOE, the six New England states and New York have together developed a database to help bridge the energy information gap between home sellers and the market by auto-populating real estate listings with verified independent home energy information from home energy labels, such as HES and HERS, and other available energy data (NEEP 2019). As of 2019, HELIX is available for states to use as a policy management tool and to connect to local branches of the Multiple Listing Service.
- *Home Energy Information Accelerator.* One of 13 Better Buildings Accelerators launched by DOE since 2013, the Home Energy Information Accelerator is a collaboration among national, regional, state, and local leaders aimed at expanding the availability and use of reliable home energy information in residential real estate transactions, such as through listing services and other reports. Other goals include providing data standards and technical assistance.

Mandates for residential home energy labeling are more common in local jurisdictions than at the state level. However voluntary state programs in Connecticut, Massachusetts, and Vermont have found success through a variety of policy levers, such as piggybacking labels onto existing energy efficiency programs. This can help increase exposure to consumers and build a case for more widespread implementation through demonstration of the increased market value associated with improved energy transparency (Faesy et al. 2014). By convening stakeholders and real estate interests to share perspectives, challenges, and opportunities through a consistent governance structure, states can help craft a successful labeling program that integrates with regional listing services and has the support of both home buyers and home sellers.

On the commercial side, a growing number of jurisdictions—including more than 25 cities—have established building energy benchmarking and transparency laws (IMT 2019). These require property owners, builders, or sellers to compile information about their buildings' energy use or energy efficiency characteristics and report these data to a central database and/or to prospective buyers at the time of sale. This information can then be used to evaluate building energy use patterns and identify energy efficiency opportunities. Several studies have demonstrated that benchmarking and transparency policies can be associated with a 3–8% reduction in energy consumption or energy use intensity (EPA 2012; Mims et al. 2017).[43] Energy use transparency requirements are a fairly recent policy innovation. Commercial transparency policies are uncommon at the state level, with only California,

[43] A study by the EPA showed that benchmarking energy use led to a 7% decrease in consumption across a sample of more than 35,000 buildings (EPA 2012). A Lawrence Berkeley National Lab (LBNL) review of state and local benchmarking and transparency studies found that most of the studies indicated a 3–8% reduction in gross energy consumption or energy use intensity over a two- to four-year period of building and transparency policy implementation. The LBNL review, however, suggested that additional research be conducted to confirm energy impacts and determine causal relationships (Mims et al. 2017).

Washington, the District of Columbia, and New Jersey requiring energy use disclosure upon sale or lease. Local governments are more likely to pursue these policies, but state governments can also use them to incentivize building stock upgrades.

Cities, states, and jurisdictions are increasingly supplementing energy consumption metrics with carbon and GHG emissions metrics. For instance, New York City recently passed a landmark bill called the Climate Mobilization Act that requires buildings of more than 25,000 square feet to cut their carbon emissions by 40% from 2005 levels by 2030 and by more than 80% by 2050. This bill also includes sizable fines for failure to meet the requirements (New York City Council 2019).

GHG reduction goals go hand in hand with energy efficiency. As more jurisdictions start considering these new metrics, ACEEE intends to investigate the best methods for incorporating them into the *State Scorecard*.

METHODOLOGY

Our review of state building energy code stringency is based predominantly on publicly available information, such as that provided by BCAP, the DOE Building Energy Codes Program, the New Buildings Institute (NBI), RECA, and the national network of REEOs. It draws as well on the expert knowledge of individuals who are active in state building energy code policy and evaluation. We also rely on primary data collection to verify publicly available data, particularly for very recent or forthcoming code adoptions. We distributed a data request to energy offices and knowledgeable officials in each state, soliciting information on their efforts to measure and enforce code compliance.

While model codes are determined at the national level, states often amend these codes during the adoption process, thereby affecting the energy use intensity (EUI) of buildings constructed to that code. To more accurately capture the energy savings impact of these amendments, ACEEE worked with NBI to score building energy code stringency according to the modeled EUI of each code as measured by NBI's Zero Energy Performance Index (zEPI). A zEPI score of zero indicates a zero-energy building.[44]

SCORING AND RESULTS

States earned credit on the basis of two measures of building energy codes: the stringency of residential and commercial codes and the level of efforts to support code compliance. We also awarded points for efforts to improve the transparency of building energy use. This included awarding points for benchmarking and energy use transparency laws. We also continued to use a new metric introduced in 2018 that tracks the number of home energy labels distributed annually as a percentage of new home construction, based on information received through our annual data request and from publicly available data from RESNET. We awarded points as follows:

[44] The zEPI system is based on a scale presented in a paper by Charles Eley, an energy efficiency advocate and New Buildings Institute fellow. The scale establishes zero net energy as the absolute goal and enables the measurement of a building's progress toward zero net energy performance, as opposed to the traditional percentage-better-than-code metric. To learn more about this scale, see Eley (2009). To learn more about the zEPI methodology, see newbuildings.org/code_policy/zepi/.

- Code stringency
  - Residential energy code (2 points)
  - Commercial energy code (2 points)
- Code compliance
  - Compliance study (1 point)
  - Other compliance activities (1.5 points)
- Building energy use transparency and home energy labeling
  - Residential and/or commercial benchmarking/transparency policies (1 point)
  - Energy rating and labeling of homes (0.5 points)

As in past *Scorecards*, states could earn a maximum of 4 points for stringency. Our new recognition of residential energy labeling efforts, as well as an additional metric dedicated to states requiring training certification for code officials, resulted in some scoring adjustments, such that a half point was shifted from the compliance category to the building energy use transparency category.

Table 25 lists states' overall building energy code scores. Explanations of each metric follow.

Table 25. State scores for building energy efficiency policies

State	Residential code stringency (2 pts.)	Commercial code stringency (2 pts.)	Compliance study (1 pt.)	Additional compliance activities (1.5 pts.)	Benchmarking and transparency (1 pt.)	Energy rating and labeling of homes (0.5 pts.)	Total score (8 pts.)
California	2	2	1	1.5	1	0	7.5
Connecticut	2	2	1	1.5	0	0.5	7
Massachusetts	2	2	1	1.5	0	0.5	7
Pennsylvania	2	2	1	1.5	0	0.5	7
Texas	2	2	1	1.5	0	0.5	7
New York	2	2	1	1	0.5	0	6.5
Oregon	2	1.5	1	1.5	0	0.5	6.5
Washington	2	2	1	1	0.5	0	6.5
Alabama	1.5	2	1	1	0	0.5	6
District of Columbia	1.5	1.5	1	1	1	0	6
Florida	1.5	2	1	1.5	0	0	6
Illinois	2	2	1	1	0	0	6
Maryland	2	2	1	0.5	0	0.5	6
Michigan	2	2	1	0.5	0	0.5	6
Minnesota	2	1.5	1	1	0	0.5	6
Nebraska	2	2	1	1	0	0	6
New Jersey	1.5	2	0.5	1	0.5	0.5	6

State	Residential code stringency (2 pts.)	Commercial code stringency (2 pts.)	Compliance study (1 pt.)	Additional compliance activities (1.5 pts.)	Benchmarking and transparency (1 pt.)	Energy rating and labeling of homes (0.5 pts.)	Total score (8 pts.)
Vermont	2	2	1	1	0	0	6
Colorado	1.5	1.5	1	1	0	0.5	5.5
Hawaii	1.5	1.5	1	1	0.5	0	5.5
Idaho	1.5	2	1	1	0	0	5.5
Montana	2	1.5	1	1	0	0	5.5
Rhode Island	1.5	1.5	1	1	0	0.5	5.5
Utah	1.5	2	1	1	0	0	5.5
Virginia	1.5	2	1	0.5	0	0.5	5.5
Delaware	2	1.5	0	1	0	0.5	5
Iowa	2	1.5	0	1	0	0.5	5
North Carolina	1.5	1.5	1	0	0	0.5	4.5
Arizona	1.5	1.5	0	0.5	0	0.5	4
Kentucky	1	1.5	1	0.5	0	0	4
Missouri	1	1	1	1	0	0	4
Nevada	1.5	1.5	0	0.5	0	0.5	4
Kansas	1	1	0	0.5	0.5	0.5	3.5
New Hampshire	1	1	0	1	0	0.5	3.5
Ohio	1.5	1.5	0	0	0	0.5	3.5
South Dakota	1.5	1.5	0	0	0.5	0	3.5
Tennessee	1	1.5	1	0	0	0	3.5
Wisconsin	1.5	2	0	0	0	0	3.5
Arkansas	1	1	1	0	0	0	3
Georgia	1	1	1	0	0	0	3
North Dakota	1.5	1.5	0	0	0	0	3
South Carolina	1.5	1	0	0	0	0.5	3
West Virginia	1	1	1	0	0	0	3
Indiana	1	1	0	0	0	0.5	2.5
Maine	1	1	0	0	0.5	0	2.5
New Mexico	1	1	0	0	0	0.5	2.5
Alaska	1	0	0	0	0.5	0.5	2
Louisiana	1	1	0	0	0	0	2
Mississippi	0	1.5	0	0	0	0	1.5

State	Residential code stringency (2 pts.)	Commercial code stringency (2 pts.)	Compliance study (1 pt.)	Additional compliance activities (1.5 pts.)	Benchmarking and transparency (1 pt.)	Energy rating and labeling of homes (0.5 pts.)	Total score (8 pts.)
Oklahoma	1	0	0	0	0	0.5	1.5
Wyoming	0	0	0	0	0	0	0

Sources: Stringency scores derived from data request responses (Appendix A), the Building Codes Assistance Program (BCAP 2019), and discussions with code experts as of August 2019. Compliance and enforcement scores are based on information gathered in surveys of state building energy code contacts. See the ACEEE State and Local Policy Database for more information on state codes and compliance (ACEEE 2019).

DISCUSSION

Stringency

We assigned each state 0 to 2 points for residential building energy codes and another 0 to 2 points for commercial building energy codes, with 2 being assigned to those with the lowest (i.e., most efficient) scores as measured by NBI's zEPI scale. We grouped the zEPI code impact scores into awarded point values generally according to their alignment with similar corresponding model codes.[45] For detailed information on building code stringency in each state, visit ACEEE's State and Local Policy Database. The zEPI Jurisdictional Score uses data from PNNL, calculating expected energy use intensity in kBtus per square foot by accounting for building type and distribution and regional climate zones for each state.[46] zEPI sets the scale's zero value at zero energy consumption, with a baseline roughly equivalent to the average building in the year 2000. Minor credits are awarded for stretch code adoption in local jurisdictions, which has the effect of improving the overall performance level of mandatory energy code adoptions within a state base.

Table 26 summarizes our scoring methodology for code stringency. Lower zEPI scores indicate lower projected energy use intensity owing to more stringent building energy codes. Residential zEPI scores between 49.7 and 59.6 earned the maximum of 2 points; these generally correspond with states that have adopted codes aligned with the 2015 IECC. Scores between 59.7 and 65.5 earned 1.5 points, generally reflecting states that have adopted the 2012 IECC. Scores between 65.6 and 70.0 earned 1 point and hew roughly to those states that have adopted codes matching the 2009 IECC. We applied a similar approach to point distributions for commercial buildings. However state-specific amendments strengthening or weakening certain sections of the code—such as adjusting the number of air changes

[45] We have not developed a quantitative method for comparing the interstate impact of jurisdictional code adoptions, in part because of a lack of consistent data across states. We recognize that our methodology is limited, and we do not intend to dismiss this local progress by assigning a lower score to these states.

[46] Pacific Northwest National Laboratory (PNNL) conducts state-level technical analysis based on a methodology established by DOE. PNNL reviews state energy codes based on the IECC and Standard 90.1, including any significant amendments. This helps states understand how their codes compare with the national model codes and provides a portrait of national code adoption. A quantitative analysis is performed to assess the energy savings impacts within a given state. The calculated energy use intensity (EUI) of buildings constructed to a particular state code is compared with the energy use of the model energy code. This comparison allows a categorization of each state, with categories based on recent editions of the model codes.

allowed per hour, or altering the amount of insulation required—can positively or negatively impact a state's zEPI value, and in turn its score.

Some home-rule states that have no mandatory state code and adopt building energy codes at the local level lacked sufficient data to allow calculation of a zEPI value.[47] These states could still earn points if they demonstrated a significant percentage of local adoption of a particular code. Within Arizona, for example, more than 60% of new construction occurs in jurisdictions that have enacted the 2012 IECC or better, according to SWEEP. For detailed information on building code stringency in each state, visit ACEEE's State and Local Policy Database.

Table 26. Scoring of state residential and commercial building energy code stringency

Residential zEPI score	Score (2 pts.)	Commercial zEPI score	Score (2 pts.)
49.4–59.6	2	50.3–55.7	2
59.7–65.5 or adoption of 2015 IECC in major jurisdictions	1.5	55.8–65.6 or adoption of 2015 IECC or ASHRAE 90.1-2013 in major jurisdictions	1.5
65.6–70.0 or adoption of 2012 IECC in major jurisdictions	1	65.7–70.0 or adoption of 2012 IECC or ASHRAE 90.1-2010 in major jurisdictions	1
Adoption of 2009 IECC or equivalent in major jurisdictions	0.5	Adoption of 2009 IECC or ASHRAE 90.1-2007 in major jurisdictions	0.5

Table 27 shows state-by-state scores for this category. We should note that some states have adopted more-efficient codes in recent months, too late to have new zEPI scores calculated in time for *Scorecard* publication. We note these states with an asterisk and award them points based on the anticipated zEPI score generally corresponding with the adopted title code.

[47] Home rule decentralizes power, allowing a locality to exercise certain prerogatives of governance within its own administrative area. See database.aceee.org for more information on building codes in home-rule states.

Table 27. State scores for code stringency

State	zEPI score	Score (Pts.)	Residential code	State	zEPI score	Score (Pts.)	Commercial code
CA		2	2019 Building Energy Efficiency Standards	CA		2	2019 Building Energy Efficiency Standards
IL*		2	2018 IECC	IL*		2	2018 IECC
MA*		2	2018 IECC w/ strengthening amendments	NE*		2	2018 IECC
NE*		2	2018 IECC	MD*		2	2018 IECC
MD*		2	2018 IECC	WA		2	2015 Washington State Energy Code (>2015 IECC/ASHRAE 90.1 2013)
OR		2	2017 Oregon Residential Specialty Code	HI		1.5	2015 IECC (county adoption pending)
OH*		1.5	2018 IECC w/ weakening amendments	OR	-	1.5	2014 Oregon Energy Efficiency Specialty Code
HI		1.5	2015 IECC (county adoption pending)	MI	50.3	2	2015 IECC with amendments and 90.1.2013 with amendments
VT	49.4	2	2015 IECC with amendments	PA	50.6	2	2015 IECC and 90.1-2013
MN	51.2	2	2012 IECC with amendments	CT	51.6	2	2015 IECC with amendments and 90.1-2013
NY	52.6	2	2015 IECC	MA	51.7	2	2015 IECC with amendments and 90.1-2013
DE	53.1	2	2012 IECC	NJ	52.0	2	90.1-2013
IA	54.9	2	2012 IECC with amendments	TX	52.9	2	2015 IECC and 90.1-2013
WA	55.1	2	2015 Washington State Energy Code	FL	53.4	2	2015 IECC with amendments and 90.1-2013
CT	55.5	2	2015 IECC with amendments	AL	53.7	2	90.1-2013
MI	56.1	2	2012 IECC with amendments	WI	53.8	2	2015 IECC with amendments and 90.1-2013 with amendments
MT	56.5	2	2012 IECC with amendments	ID	53.9	2	2015 IECC and 90.1-2013
PA	58.0	2	2015 IECC with amendments	VA	54.4	2	2015 IECC and 90.1-2013
TX	58.1	2	2015 IECC	VT	55.0	2	2015 IECC with amendments and 90.1-2013 with amendments
FL	60.7	1.5	2015 IECC with amendments	UT	55.4	2	2015 IECC and 90.1-2013
VA	62.2	1.5	2015 IECC with amendments	NY	55.7	2	2015 IECC with amendments and 90.1-2013 with amendments
AL	62.5	1.5	2015 IECC with amendments	MS	56.8	1.5	90.1-2010
NJ	62.7	1.5	2015 IECC with amendments	IA	57.2	1.5	2012 IECC and 90.1-2010
NC	62.9	1.5	2015 IECC with amendments	MN	57.3	1.5	2012 IECC with amendments and 90.1-2010
WI	63.6	1.5	2009 IECC with amendments	NC	57.6	1.5	2009 IECC with amendments and 90.1-2010
DC	63.6	1.5	2012 IECC with amendments	KY	58.6	1.5	2012 IECC and 90.1-2010
ID	64.5	1.5	2012 IECC with amendments	OH	59.0	1.5	2012 IECC with amendments and 90.1-2010 with amendments
SC	64.5	1.5	2009 IECC	TN	59.2	1.5	2012 IECC and 90.1-2010
RI	64.9	1.5	2012 IECC	DE	59.7	1.5	2012 IECC and 90.1-2010
UT	65.5	1.5	2015 IECC with amendments	MT	60.0	1.5	2012 IECC and 90.1-2010
OK	65.6	1	2009 IECC with amendments	RI	60.0	1.5	2012 IECC with amendments
ME	66.5	1	2009 IECC	DC	65.6	1.5	2012 IECC with amendments and 90.1-2010
KY	67.3	1	2009 IECC	ME	66.3	1	2009 IECC and 90.1-2007
GA	67.7	1	2009 IECC with amendments	AR	66.5	1	2009 IECC and 90.1-2007
NM	67.8	1	2009 IECC	NH	66.8	1	2009 IECC and 90.1-2007
WV	67.9	1	2009 IECC	GA	66.9	1	2009 IECC with amendments and 90.1-2007
LA	68.0	1	2009 IECC	SC	67.3	1	2009 IECC and 90.1-2007
NH	68.0	1	2009 IECC with amendments	NM	68.5	1	2009 IECC and 90.1-2007
IN	68.5	1	2009 IECC	WV	68.8	1	90.1-2007
AR	68.7	1	2009 IECC with amendments	IN	69.0	1	90.1-2007 with amendments
TN	70.5	1	2009 IECC with amendments	LA	70.0	1	90.1-2007
CO	Home Rule	1.5	Significant adoption of 2015 IECC	OK	74.5	0	2006 IECC and 90.1-2004
AZ	Home Rule	1.5	Significant local adoption of 2012/2018 IECC	CO	Home Rule	1.5	Significant local adoption of 2012/2015 IECC
NV	Home Rule	1.5	Significant local adoption of 2018 IECC	AZ	Home Rule	1.5	Significant local adoption of the 2012/2018 IECC
ND	Home Rule	1.5	Significant local adoption of 2015 IECC	NV	Home Rule	1.5	Significant local adoption of 2018 IECC
SD	Home Rule	1.5	Significant local adoption of 2015 IECC	ND	Home Rule	1.5	Significant local adoption of 2015 IECC
AK		1	Most new construction follows 2012 IECC	SD	Home Rule	1.5	Significant local adoption of 2015 IECC
MO	Home Rule	1	Significant adoption of 2009/2012 IECC	KS	Home Rule	1	No mandatory code, but significant adoption of 2009/2012 IECC
KS	Home Rule	1	Significant adoption of 2009/2012 IECC	MO	Home Rule	1	No mandatory code, but significant adoption of 2009/2012 IECC
WY	Home Rule	0	No mandatory code	AK		0	No mandatory code
MS		0	No mandatory code	WY	Home Rule	0	Significant adoption of IECC 2006 or equivalent

* These states have signed or passed legislation requiring compliance with a new iteration of codes effective by October 1, 2019. We award these states full credit commensurate with the average zEPI score of states that enforce a similar title code. We give additional consideration to impacts of code amendments as determined by review by a working group of subject matter experts.

Some states regularly adopt the latest iterations of the IECC and ASHRAE 90.1 code standards as they are determined. However other states have recently considered statutory or regulatory requirements to extend code adoption cycles. States unable to adopt the latest building energy codes will miss out on significant energy savings opportunities. ACEEE considered removing points from states with extended code adoption cycles, but most states do not actually update building codes every three years (Athalye et al. 2016). We therefore decided not to penalize those with extended cycles.

The *2018 State Scorecard* highlighted a variety of states that had recently updated to the 2015 IECC, including Pennsylvania, Virginia, and Wisconsin. Since then a number of states have turned toward reviewing the 2018 IECC, with Nebraska, Ohio, Maryland, Illinois, and Massachusetts all updating to the new codes this year.

At the other end of the spectrum, 10 states lack mandatory statewide energy codes for new residential and/or commercial construction: Alaska, Arizona, Colorado, Kansas, Mississippi, Missouri, Nevada, North Dakota, South Dakota, and Wyoming. Some of these home-rule states are nonetheless showing high rates of adoption at the jurisdictional level. We awarded these states points accordingly.

Compliance

It is difficult to score states in this area because consistent data on actual compliance rates are lacking, and other compliance metrics are largely qualitative. Still, we continue to seek ways to score states in a manner that reflects tangible improvements in energy savings.

In 2015 we updated our scoring methodology to award more credit to states that had completed compliance studies in recent years. The reasoning was that, as the 2017 deadline under ARRA approached for states to demonstrate 90% compliance with 2009 IECC and ASHRAE 90.1-2007 codes, compliance rates should reflect a state's code enforcement efforts. Although we use the same methodology this year, ACEEE will continue to revisit this metric to determine how it might be improved to equitably score states on the basis of actual levels of compliance reported. For more information on state compliance efforts, visit ACEEE's State and Local Policy Database (ACEEE 2019).

Table 28 shows our scoring methodology for assessing state compliance studies.

Table 28. Scoring of state efforts to assess compliance

Compliance study	Score (1 pt.)
Compliance study has been completed in the past five years, follows standardized protocols, and includes a statistically significant sample.	1
Compliance study has been completed in the past five years but does not follow standardized protocols or is not statistically significant.	0.5
No compliance study has been completed in the past five years.	0

Table 29 shows our scoring methodology for additional activities to improve and enforce energy code compliance. A state could earn 0.5 points for each compliance strategy it engaged in during the past year, up to a total of 1.5 points.

Last year we removed our metric for states that had completed a codes gap analysis in the past five years. While gap analyses have been instrumental in the past for helping states identify opportunities and resource needs to help strengthen energy code adoption and infrastructure, most of these studies were completed close to 10 years ago under funding from the 2009 American Recovery and Reinvestment Act. Because few of these studies have been completed in recent years, we decided to discontinue using it as a metric in our compliance scoring category.

Similarly, last year we stopped awarding points for state support for codes-related training and technical assistance. Again this year we award points only to states that have established specific training certification requirements for code officials, including inspectors, plan reviewers, and/or third-party inspectors. For example, in Oregon anyone providing plan review or inspection services in the state must have an Oregon Inspector Certification (OIC), which can be obtained only by completing a class through the Oregon Inspector Training Program. The California Health and Safety Code (HSC) Section 18949.28 also requires certification for inspectors, plan examiners, and building officials who work for a local buildings department. The majority of local agencies statewide require ICC certification, and a minimum number of hours of continuing education must be completed every three years to maintain certification.

Table 29. Scoring of efforts to improve and enforce code compliance

Additional metrics for state compliance efforts	Score (1.5 pts.)
Stakeholder advisory group or compliance collaborative	0.5
Utility involvement	0.5
Code training requirements	0.5

Several states have completed compliance studies demonstrating 90% or higher compliance rates for residential and/or commercial buildings. It could well be argued that states

demonstrating compliance rates approaching 100% should receive full credit within the above metrics regardless of whether they engage in additional strategies to enforce compliance. However we believe the current methodology is valid in the near term for several reasons. First, while we plan to award more points in the future to states on the basis of their compliance studies' results, we also want to recognize the enormous value in a state's maintaining a robust policy framework. Such a framework can support ongoing efforts to provide training and education to staff, actively monitor code changes, and make up-to-date information available to stakeholders through strong coordination. Second, we want to avoid inadvertently penalizing states with lower compliance rates under newer or more stringent codes; this would work against the *Scorecard*'s goal of rewarding states operating at the leading edge of energy efficiency.

As we look ahead to future *Scorecards*, we plan to address these important methodological questions as well as others—including how best to compare the results of compliance studies conducted using differing methodologies (e.g., prescriptive versus performance-based) and how to update our data request accordingly.

Table 30 shows how states scored for each compliance metric. Details on state activities in these areas are given in the ACEEE State and Local Policy Database (ACEEE 2019).

Table 30. State scores for energy code compliance efforts

State	Compliance study (1 pt.)	Stakeholder group (0.5 pts.)	Utility involvement (0.5 pts.)	Code training requirements (0.5 pts.)	Total score (2.5 pts.)
California	●	●	●	●	2.5
Connecticut	●	●	●	●	2.5
Massachusetts	●	●	●	●	2.5
Oregon	●	●	●	●	2.5
Pennsylvania	●	●	●	●	2.5
Texas	●	●	●	●	2.5
Alabama	●	●	●		2
Colorado	●	●	●		2
District of Columbia	●	●	●		2
Florida	●	●	●		2
Hawaii	●	●	●		2
Idaho	●	●	●		2
Illinois	●	●	●		2
Minnesota	●	●	●		2
Missouri	●	●		●	2
Montana	●	●	●		2
Nebraska	●	●	●		2
New York	●		●	●	2
Rhode Island	●	●	●		2

State	Compliance study (1 pt.)	Stakeholder group (0.5 pts.)	Utility involvement (0.5 pts.)	Code training requirements (0.5 pts.)	Total score (2.5 pts.)
Utah	●	●	●		2
Vermont	●	●	●		2
Washington	●	●	●		2
Kentucky	●	●			1.5
Maryland	●	●			1.5
Michigan	●	●			1.5
New Jersey	○		●	●	1.5
Virginia	●	●			1.5
Arkansas	●				1
Delaware		●		●	1
Georgia	●				1
Iowa		●	●		1
New Hampshire		●	●		1
North Carolina	●				1
Tennessee	●				1
West Virginia	●				1
Arizona			●		0.5
Kansas		●			0.5
Nevada		●			0.5
Alaska					0
Indiana					0
Louisiana					0
Maine					0
Mississippi					0
New Mexico					0
North Dakota					0
Ohio					0
Oklahoma					0
South Carolina					0
South Dakota					0
Wisconsin					0
Wyoming					0

An unfilled circle indicates a state receiving half credit for compliance studies, meaning that the compliance study either does not follow the PNNL methodology or does not use a significant sample size. Data from state responses to data requests (see Appendix A). See State and Local Policy Database (ACEEE 2019) for more details on each activity.

According to our survey results, almost every state in the country makes some effort to support code compliance, whether a statewide code is mandatory or not. Nearly every state that responded uses at least one of the strategies for boosting compliance discussed above, and a growing number use many or all of them. For states that did not respond or provided partial responses to this year's survey, we referred to last year's data to complement information in some cases. States that received zero points for compliance are those that did not respond to our survey or could not report compliance activities.

SCORES FOR BENCHMARKING AND ENERGY TRANSPARENCY REQUIREMENTS

We previously credited this metric under Chapter 6, "State Government–Led Initiatives," but we moved it into this chapter this year because our criteria pertain to private-sector building efficiency. States with mandatory energy use benchmarking and transparency laws received 0.5 points for a policy covering either commercial or residential buildings. States with those policies in place for some or all of their commercial *and* residential buildings received 1 point. Table 31 presents the state disclosure policies.

Table 31. State benchmarking and energy transparency policies

State	Disclosure type	Building energy use transparency requirements	Score (1 pt.)
District of Columbia	Commercial, residential multifamily	The Clean and Affordable Energy Act of 2008 requires privately owned commercial buildings to be benchmarked annually using ENERGY STAR Portfolio Manager. Results are publicly available in the BuildSmart DC database. The Clean Energy DC Omnibus Amendment Act of 2018 lowered the building floor area threshold and set new requirements for third-party verification every three years.	1
California	Commercial, residential multifamily	AB 1103 required nonresidential building owners or operators to benchmark their buildings' energy use with ENERGY STAR Portfolio Manager and to disclose this information to buyers, lenders, and lessees. AB 802 replaces this legislation and expands the requirement to any building with five or more active utility accounts, including residential multifamily buildings.	1
Alaska	Residential	Alaska statute AS.34.70.101 requires the release of utility data for residential buildings at the time of sale.	0.5
Hawaii	Residential	§508D-10.5 requires residential property owners to disclose energy efficiency consumer information at the time of sale or lease.	0.5
Kansas	Residential	HB 2036 requires builders or sellers of new residential single-family homes or multifamily buildings of four units or fewer to disclose information regarding the energy efficiency of the structure to prospective buyers prior to the signing of a purchase contract.	0.5
Maine	Residential rental	HP 1468 requires the disclosure of an energy efficiency checklist upon request by tenant or lessee and allows for the release of audit information on residential rental properties, both at the time of rental.	0.5

State	Disclosure type	Building energy use transparency requirements	Score (1 pt.)
New Jersey	Commercial	AB A3723 (2018) establishes that within five years of enactment, the owner or operator of any commercial building larger than 25,000 square feet must benchmark energy and water use with the ENERGY STAR Portfolio Manager tool.	0.5
New York	Residential	Since 1981, the Truth in Heating law has required the release of residential buildings' utility data upon request by prospective purchasers at the time of sale.	0.5
South Dakota	Residential	SB 64 (2009) established certain energy efficiency disclosure requirements for new residential buildings at the time of sale.	0.5
Washington	Commercial	SB 5854 (2009–10) requires owners of nonresidential buildings larger than 10,000 square feet and qualifying public agency buildings to benchmark their buildings' energy use with ENERGY STAR Portfolio Manager and to disclose this information to buyers, lenders, and lessees.	0.5

Policy information is based on responses to data requests from state energy offices.

Several states have taken the lead in requiring benchmarking and energy use transparency. The most recent is New Jersey, which passed significant renewable energy legislation in 2018 that included requirements for the owners of commercial buildings larger than 25,000 square feet to benchmark energy and water use using the ENERGY STAR Portfolio Manager tool. The District of Columbia and California are the only jurisdictions we surveyed that have such requirements for both the commercial and residential multifamily sectors. As benchmarking and energy use transparency policies become more common, more states will probably expand their scope to target more buildings across both markets. However local jurisdictions are more likely to pursue these policies. Most recently, Kansas City, Missouri; Portland, Oregon; and Reno, Nevada, adopted benchmarking ordinances.[48]

SCORES FOR RESIDENTIAL ENERGY LABELING

Last year we added a new half-point metric to recognize state efforts to make visible the energy consumption and efficiency of homes through issuance or support of residential energy labeling initiatives. While the benchmarking metric is based on the existence of a state policy, the labeling metric is a quantitative measure of how many homes are rated. As mentioned, a variety of energy rating protocols exist, with some state-specific labels having been uniquely adapted from DOE's Home Energy Score. In order to compare states, we used publicly available 2018 RESNET HERS ratings figures as a foundational data set and supplemented it with additional state-provided labeling records gathered through ACEEE's data request to state energy offices (RESNET 2019). We then calculated the number of ratings issued as a percentage of total building permits for residential and multifamily new construction as reported by the US Census Bureau. We awarded 0.5 points to states in which this percentage was equal to or higher than the median of all states. Table 32 shows the results of this analysis.

[48] For more information on how municipalities are encouraging building energy disclosure, see Ribeiro et al. (2015) and Cluett and Amann (2013).

Table 32. Residential energy labeling efforts (2018)

State	Home energy ratings issued*	New residential and multifamily building permits†	Home energy ratings as % of new construction	Score (0.5 pts.)‡
Alaska[1]	1,058	1,698	62.31%	0.5
Massachusetts	8,293	15,255	54.36%	0.5
Arizona	20,128	41,154	48.91%	0.5
Indiana	8,745	21,200	41.25%	0.5
Iowa	4,642	11,595	40.03%	0.5
Delaware	2,390	6,099	39.19%	0.5
Maryland	7,116	18,547	38.37%	0.5
New Mexico	1,919	5,029	38.16%	0.5
Rhode Island	406	1,224	33.17%	0.5
Oklahoma	3,435	10,503	32.70%	0.5
Ohio	7,583	23,826	31.83%	0.5
Colorado	13,930	45,481	30.63%	0.5
Connecticut	1,323	4,570	28.95%	0.5
South Carolina	9,649	35,655	27.06%	0.5
Minnesota	7,014	26,318	26.65%	0.5
Virginia	8,236	31,784	25.91%	0.5
Nevada	4,313	17,543	24.59%	0.5
Texas	44,291	188,161	23.54%	0.5
North Carolina	15,877	68,375	23.22%	0.5
New Hampshire	873	3,780	23.10%	0.5
Kansas	1,591	8,617	18.46%	0.5
New Jersey	5,015	27,639	18.14%	0.5
Pennsylvania	4,445	24,576	18.09%	0.5
Oregon[2]	3,455	19,529	17.69%	0.5
Alabama	2,327	14,323	16.25%	0.5
Michigan	3,166	20,442	15.49%	0.5
Kentucky	2,004	14,370	13.95%	0
Nebraska	1,106	8,193	13.50%	0
Wisconsin	2,436	18,174	13.40%	0
Florida	17,823	142,273	12.53%	0
Illinois	2,611	21,776	11.99%	0
District of Columbia	541	4,615	11.72%	0

State	Home energy ratings issued*	New residential and multifamily building permits†	Home energy ratings as % of new construction	Score (0.5 pts.)‡
Georgia	6,639	57,926	11.46%	0
New York	4,219	37,397	11.28%	0
Vermont	197	1,833	10.75%	0
Utah	2,565	26,232	9.78%	0
Hawaii	325	4,178	7.78%	0
Idaho	1,164	15,229	7.64%	0
West Virginia	198	3,122	6.34%	0
Missouri	907	15,551	5.83%	0
Tennessee	2,111	37,922	5.57%	0
South Dakota	249	4,853	5.13%	0
Montana	198	3,998	4.95%	0
Arkansas	491	10,213	4.81%	0
Washington	1,199	47,356	2.53%	0
North Dakota	67	3,323	2.02%	0
Wyoming	34	1,727	1.97%	0
Louisiana	254	16,117	1.58%	0
California[3]	1,094	117,079	0.93%	0
Mississippi	58	6,989	0.83%	0
Maine	7	4,526	0.15%	0

* 2018 RESNET HERS ratings unless otherwise noted. † 2018 US Census Bureau data prepared by the National Association of Home Builders. ‡ Scores of 0.5 awarded to states in which the number of ratings issued as a percentage of new construction was greater than the median, or 15.49%. [1] During calendar year 2018, 1,058 Alaska Home Energy Ratings were completed. [2] The Energy Trust of Oregon Energy Performance Score for new homes is issued to about 3,000 homes per year. [3] Under the California Home Energy Rating System Program, authorized pursuant to PRC 25942, there were 42 whole-house ratings completed in 2018.

PROPOSED METRIC FOR 2020: GOVERNMENTAL MEMBER VOTING REPRESENTATIVES

Model codes provide a framework for constructing energy-efficient buildings. States, cities, and jurisdictions can help develop these codes to better address their unique circumstances and meet their own goals. Many states do not directly engage in code development, choosing instead to focus on code adoption. However states that do get involved help create codes with more robust options for energy efficiency.

Methods of participating in code development include submitting energy efficiency proposals and attending code hearings to support efficiency proposals. Most sustainability and buildings departments do not have the funding or the resources to participate at this level. However one thing that every state, city, and jurisdiction can do, with a relatively small cost and time commitment, is to vote on code proposals after the final hearings.

An online voting window opens up approximately two weeks after the final ICC committee action hearings in the fall, during which governmental member voting representatives (GMVRs) can vote on code proposals. GMVRs include anyone engaged in "the administration, formulation or enforcement of laws, ordinances, rules or regulations relating to the public health, safety, and welfare" (Energy-Efficient Codes Coalition 2019). This includes local government offices such as building inspection, energy/sustainability, and fire departments.

Depending on the population served by the GMVR, the entity can cast 4, 8, or 12 votes on proposed measures. ACEEE tracks voter registration in each code cycle. Using information from the ICC's voter database, we propose to score each state on the ratio of registered voters to eligible voters. Although we understand there is no guarantee that a registered member will actually vote, it is the best available metric to measure this important aspect of model code development.

Table 33 shows our proposed scoring methodology for assessing registered GMVRs, and table 34 lists data collected from 2018.[49]

Table 33. Proposed scoring of registered GMVRs

Ratio of registered voters to total eligible voters	Score
15–100%	1
6–14.9%	0.5
0–5.9%	0

[49] We use 2018 data for illustrative purposes, since we propose to use data only from code cycle years, such as 2019. We would expect registration to increase substantially during these times.

Table 34. 2018 state GMVR registration

State	Total eligible GMVRs	Registered GMVRs	Ratio of registered voters to total eligible voters
Vermont	16	12	75%
Virginia	892	372	42%
Hawaii	16	6	38%
Maryland	336	112	33%
District of Columbia	144	46	32%
Alaska	92	24	26%
Oregon	448	105	23%
Washington	948	212	22%
Colorado	844	169	20%
Louisiana	316	61	19%
California	2,752	527	19%
Alabama	548	99	18%
Arkansas	596	105	18%
Nevada	212	36	17%
Tennessee	732	106	14%
Montana	124	17	14%
Kentucky	244	33	14%
Kansas	380	50	13%
Delaware	92	12	13%
Utah	564	72	13%
Missouri	968	118	12%
Idaho	324	39	12%
Florida	956	115	12%
North Dakota	92	11	12%
Wisconsin	300	33	11%
Mississippi	280	29	10%
Wyoming	156	16	10%
Minnesota	652	66	10%
Georgia	824	77	9%
Maine	640	57	9%
Iowa	360	32	9%
New Hampshire	324	28	9%
Ohio	1,124	93	8%
New York	1,808	140	8%
Texas	2,052	154	8%

State	Total eligible GMVRs	Registered GMVRs	Ratio of registered voters to total eligible voters
Nebraska	228	17	7%
Massachusetts	220	14	6%
Michigan	1,256	75	6%
Illinois	1,452	84	6%
North Carolina	636	35	6%
Oklahoma	412	21	5%
Pennsylvania	1,548	78	5%
West Virginia	132	6	5%
South Carolina	612	25	4%
Indiana	504	16	3%
South Dakota	128	4	3%
Connecticut	620	18	3%
Arizona	248	7	3%
Rhode Island	144	4	3%
New Jersey	4,040	99	2%
New Mexico	236	2	1%

Source: ICC Membership Database

Chapter 5. Combined Heat and Power

Authors: Grace Relf and Andrew Whitlock

INTRODUCTION

CHP systems generate electricity and thermal energy in a single, integrated system. CHP is more energy efficient than generating electricity and thermal energy separately because heat that is normally wasted in conventional generation is captured as useful energy. That recovered energy can be used to meet demand for onsite thermal processes, such as heating or cooling a building or generating steam to run a manufacturing process. In addition to improving efficiency, CHP systems can yield fewer emissions than separate heat and utility-purchased power and provide economic benefits as well. The majority of CHP systems are fueled by natural gas, but many use biomass, biogas, or other types of fossil fuels.

SCORING AND RESULTS

Financial, technical, policy, and regulatory factors affect the extent to which CHP systems are deployed. Our scoring methodology focuses on approaches that states can take to promote CHP as an energy resource and thereby increase its efficient use.

The energy landscape is changing rapidly as many states work toward their climate goals by deploying low-carbon, renewable energy resources. Each state faces its own unique challenges in doing so because of diverse policy goals, energy prices, and resource availability. To recognize this, we give states multiple ways to earn points in certain categories in this chapter.

CHP continues play an important role in state decarbonization strategies, especially with regard to the efficient use of natural gas. In the long term, the value of CHP in reducing emissions will vary by state, depending on the grid mix. But even states with a higher mix of renewable resources can capture CHP's efficiency benefits, as reflected in our scoring of CHP use with opportunity fuels (described in further detail below).

This year we allocated up to 3 points to this area as opposed to the 4 we awarded in previous years.[50] We gave points across these policy categories:

- Interconnection standards for electrically linking CHP systems to the grid
- Promotion of CHP as a resource
- Incentives for deploying CHP and for energy production from CHP
- Additional supportive policies

[50] We allocated an additional point to the state government–led initiatives chapter this year to account for states that allocate carbon revenues to support energy efficiency.

In greater detail, we awarded points for the following:

- The presence and design of interconnection standards (minus 0.5 points if not in place)
- The extent to which CHP is identified and promoted as an energy resource, based on three subcategories (1 point)
    - Eligibility of CHP within an energy efficiency resource standard or other, similar regulatory requirement
    - The presence of utility-run or program administrator–run CHP programs designed to acquire CHP energy resources
    - The presence of state-approved production goals or program budgets for acquiring a defined amount of kWh savings from CHP
- Incentives for deploying CHP and for energy production from CHP (1 point)
    - Rebates, grants, and financing, or a net metering standard that applies to CHP
    - Access to production incentives, feed-in tariffs, standard offer programs, or other revenue streams linked to CHP system kWh production
    - Promotion of CHP within nonwires alternatives (NWAs) or market policies
- Additional supportive policies (1 point)
    - Efforts to promote CHP for its resilient attributes
    - Policies that encourage the use of renewable or opportunity fuels in conjunction with CHP

We also assessed, but did not score, the number of recent CHP installations in each state and the total CHP capacity installed.

Some states have recently adopted new or improved CHP policies or regulations, while others are still developing or refining them. Generally we did not give credit for a policy unless a legislative body had enacted it or an agency or regulatory body had promulgated it as an order. We considered policies in place as of July 2019 and relied on primary and secondary sources for data collection. Primary sources included public utility commission dockets and responses to data requests from state energy offices. Secondary sources included policy databases such as the Database of State Incentives for Renewables and Efficiency (DSIRE 2019) and the EPA's CHP Policies and Incentives Database (EPA 2019).

Table 35 lists each state's total score and its point distribution in each category. Detailed information on the policies and programs that earned points for this metric is available in the CHP section of the online ACEEE State and Local Policy Database (ACEEE 2019).

Table 35. Scores for CHP

State	Interconnection (–0.5 pts.)	EERS treatment	Programs	Production goal	CHP as a resource (1 pt.)	Deployment incentives	Revenue streams	CHP in NWAs	Incentives (1 pt.)	Resilience	Opportunity fuels	Additional supportive policies (1 pt.)	Total (3 pts.)
CA	0	•	•	•	1	•	•	•	1	•	•	1	3
MD	0	•	•	•	1	•	•		1	•	•	1	3
MA	0	•	•	•	1	•	•	•	1	•	•	1	3
NJ	0	•		•	1	•	•		1	•	•	1	3
RI	0	•	•	•	1	•	•	•	1	•	•	1	3
NY	0	•	•	•	1			•	0.5	•	•	1	2.5
IL	0	•	•	•	1		•		0.5	•	•	1	2.5
CT	0	•			1	•			0.5	•	•	1	2.5
ME	0	•	•	•	1	•	•	•	1		•	0.5	2.5
PA	–0.5	•			0.5	•	•		1	•	•	1	2
WA	0	•			0.5	•			0.5	•	•	1	2
TN	0				0	•		•	1	•	•	1	2
VT	0	•			0.5	•	•	•	1		•	0.5	2
OR	0	•			0.5				0	•	•	1	1.5
AZ	0	•			0.5	•			0.5		•	0.5	1.5
DE	0	•			0.5	•			0.5	•		0.5	1.5
MN	0	•			0.5	•			0.5		•	0.5	1.5
MO	–0.5				0	•			0.5	•	•	1	1
DC	0				0	•			0.5	•		0.5	1
NM	0				0	•			0.5		•	0.5	1
NC	0	•			0.5				0		•	0.5	1
HI	0	•			0.5				0		•	0.5	1
OH	0	•			0.5	•			0.5			0	1
MI	0				0	•			0		•	0.5	1
CO	0				0				0	•		0.5	0.5
IA	0				0				0		•	0.5	0.5

State	Interconnection (–0.5 pts.)	EERS treatment	Programs	Production goal	CHP as a resource (1 pt.)	Deployment incentives	Revenue streams	CHP in NWAs	Incentives (1 pt.)	Resilience	Opportunity fuels	Additional supportive policies (1 pt.)	Total (3 pts.)
NH	–0.5	•			0.5				0		•	0.5	0.5
TX	0				0				0	•		0.5	0.5
UT	0				0				0		•	0.5	0.5
WI	0				0				0		•	0.5	0.5
AK	–0.5				0				0		•	0.5	0
GA	–0.5				0				0		•	0.5	0
ID	–0.5				0				0		•	0.5	0
KS	–0.5				0				0		•	0.5	0
KY	–0.5				0				0		•	0.5	0
LA	–0.5				0				0	•		0.5	0
NV	-0.5				0				0		•	0.5	0
SC	–0.5				0				0		•	0.5	0
FL	–0.5				0	•			0.5			0	0
IN	0				0				0			0	0
MT	0				0				0			0	0
ND	–0.5				0	•			0.5			0	0
SD	0				0				0			0	0
WV	–0.5				0	•			0.5			0	0
MS	–0.5				0				0			0	–0.5
AL	–0.5				0				0			0	–0.5
AR	–0.5				0				0			0	–0.5
NE	–0.5				0				0			0	–0.5
OK	–0.5				0				0			0	–0.5
VA	–0.5				0				0			0	–0.5
WY	–0.5				0				0			0	–0.5

As they did last year, Massachusetts, California, Maryland, and Rhode Island earned full credit. New Jersey joined these states in earning full credit by making targets and budgets for CHP explicit. All of these states promote CHP for its reliability and resiliency attributes, a major driver for CHP deployment in recent years. They all also earned credit for promoting the use of renewable or other opportunity fuels with CHP. This area will continue to grow in importance as the grid fuel mix becomes cleaner.

Connecticut, Maine, New York, and Illinois all earned scores of 2.5, and Pennsylvania, Tennessee, Vermont, and Washington rounded out the top tier of states with scores of 2. The five states that earned full credit for CHP, as well as Maine, New York, and Illinois, were the only ones to receive credit for a state-approved production goal for CHP generation. This policy strongly encourages utilities and program administrators to acquire generation from CHP. Other key policies are favorable interconnection standards, allowing energy savings from CHP to count toward an EERS; promoting CHP for resilience; and promoting the use of opportunity fuels with CHP.

Even the top states can do more to promote CHP. For example, one of California's longest-running efforts to support distributed energy resources, the Self-Generation Incentive Program (SGIP), has focused on promoting storage technologies and mandates that a portion of input fuel for CHP be renewable. In 2019, CHP systems had to have a minimum renewable fuel content of 50% to be eligible for the incentive; in 2020 only projects completely fueled by 100% renewable gas will be eligible (CPUC 2019).

In New York, the New York State Energy Research and Development Authority (NYSERDA) has provided about $100 million to 225 CHP projects over the past six years. NYSERDA announced in February that it would no longer be accepting new applications for its flagship incentive program, reporting that project developers will be able to proceed without subsidies going forward due to market maturity enabled by long-term investments. Additionally, NYSERDA will no longer fund CHP systems fueled only by natural gas. All units must be accompanied by solar or storage systems to be eligible for funding (NYSERDA 2018).

This year we gave credit to states that allow CHP as an eligible measure in nonwires alternatives (NWAs) or that are using CHP for targeted grid needs. Seven states earned credit in this category: California, Massachusetts, New York, Maine, Rhode Island, Vermont, and Tennessee. The first six of these states use codified or commission-approved processes to consider distributed energy resources (DERs) as cost-effective alternatives to new or upgraded transmission and distribution infrastructure. In New York, the Reforming the Energy Vision proceedings have encouraged the inclusion of CHP in utility NWA projects and in other pilot programs, which often include CHP. In particular, ConEdison's Brooklyn-Queens Demand Management (BQDM) has offset the need for new distribution infrastructure by funding customer-sited energy efficiency and DERs, including 3 MW of CHP (16 projects) with another 1.2 MW planned for 2019 (ConEd 2019).

Tennessee also earned credit for consideration of CHP for targeted grid needs. In February 2019, the board of directors of the Tennessee Valley Authority (TVA), the federally owned corporate electricity provider for Tennessee, approved a project that will seek to deploy

CHP, solar, and other technologies to address behind-the-meter customer needs. This project, called the DER Flexibility Research Project, allows member utilities to deploy CHP systems and to enter into a purchased power agreement with TVA for the power provided. The project is capped at 300 MW total, of which a third may be CHP. TVA and the member utility organizations have stated goals for the project of providing high levels of distribution system reliability and resiliency (TVA 2018).

Including Tennessee, 18 states earned credit for promoting CHP specifically for its reliability and resiliency benefits. These efforts are taking place across the country, including on the coasts, in the Midwest, and in the Southeast and Southwest. Efforts in this category vary in their structure and rigor, but all contribute to CHP's consideration in resilience planning. For example, Connecticut and New Jersey fund CHP-anchored microgrids in areas identified as vulnerable to energy risk. Maryland too reserves a portion of its CHP grant money for projects adding resilience to critical infrastructure. Oregon and Missouri are both running workshops on how to integrate CHP into resilience planning for critical facilities such as hospitals and large businesses. Louisiana is conducting research on opportunities to deploy CHP in emergency planning and resilience. Other states have mentioned CHP in statewide energy security plans or are encouraging CHP's inclusion in local resilience planning.

Many of the supportive policies and programs for CHP are not yet widespread but are growing. The majority of states have some kind of policy in place to encourage CHP; only seven lack CHP interconnection standards and have no policies or activities that earned credit this year. Twenty states (including Delaware and New Jersey, which did not earn credit for this metric last year) clearly define energy savings from CHP as eligible to contribute to a statewide energy savings target. Three new states earned credit for offering revenue streams for CHP production (Maine, New Jersey, and Vermont), and New Jersey also earned its first credit for a CHP production goal. New Jersey earned these new points by clarifying the level of available incentives, budgets, and savings targets for its CHP programs. Despite these achievements, states can do even more to promote CHP, such as offering technical assistance for the development of CHP projects.

DISCUSSION

Interconnection Standards

Effective interconnection standards for CHP are critical to the resource's deployment. States lost 0.5 points this year for lacking an interconnection standard that explicitly establishes parameters and procedures for the electrical interconnection of CHP systems. To not lose points in this category, a state's interconnection standard must

- Be adopted by utilities serving the majority of the state's customers
- Cover all forms of CHP, regardless of fuel
- Have multiple tiers of interconnection and some kind of fast-track option for smaller systems
- Apply to systems of 10 MW or greater.

We moved to a possible half-point deduction in this category this year. We did so to accommodate the new intra-category point distribution while still recognizing the

importance of adopting interconnection standards that apply to CHP systems. This action is critical to enabling greater development of CHP.

Having multiple levels (or tiers) of interconnection is important because larger CHP systems are more complex than smaller ones. Because of the potential for impacts on the utility grid, the interconnection of larger systems requires more extensive approvals. These are unnecessary and financially burdensome for smaller systems, which can benefit from a faster and often less expensive path toward interconnection. Scaling transaction costs to project size makes economic sense. Additionally, CHP developers prefer interconnection standards that have higher size limits and are based on widely accepted technical industry standards, such as IEEE 1547.[51]

Encouraging CHP as a Resource

While CHP is known for its energy efficiency benefits, few states actively identify it as an energy resource akin to more traditional sources such as centralized power plants. CHP can offer energy, capacity, and even ancillary services to grids to which they are connected, but to maximize those benefits, states must first identify CHP as a resource and integrate it into system planning and energy resource acquisition efforts.[52] One of the best ways to do this is to include CHP in state energy efficiency goals and utility programs.

States could receive up to 1 point for activities and policies that encourage CHP as an energy resource. States received 1 point for having two or more of these policies and 0.5 points for having one of them. We considered the following subcategories in awarding points:

EERS treatment. States earned credit for this if CHP is clearly defined as eligible in a binding EERS or similar requirement. Most states with EERS policies set goals for future years. These goals are generally a percentage of total electricity sold that must be derived from efficiency resources, with the percentage of these resources increasing over time. To receive credit, a state's EERS must explicitly apply to CHP powered by natural gas, be technology neutral, and be a binding obligation.

CHP resource acquisition program. States earned credit in this category for programs designed to acquire cost-effective CHP in a way similar to the acquisition of other energy efficiency resources. For a state to earn credit, a majority of its energy customers must have access to clearly defined CHP programming offered by major utilities or other program administrators. We did not give credit if only a small selection of customers has access to a CHP program or if a state has a custom commercial or industrial incentive program that

[51] This standard establishes criteria and requirements for interconnection of distributed energy resources with electric power systems. Its requirements are relevant to the performance, operation, testing, safety, and maintenance of the interconnection. For more information, visit www.ieee.org.

[52] The Federal Energy Regulatory Commission (FERC) defines ancillary services as "those services necessary to support the transmission of electric power from seller to purchaser, given the obligations of control areas and transmitting utilities within those control areas, to maintain reliable operations of the interconnected transmission system. Ancillary services supplied with generation include load following, reactive power-voltage regulation, system protective services, loss compensation service, system control, load dispatch services, and energy imbalance services." For more information, visit www.ferc.gov/market-oversight/guide/glossary.asp.

could theoretically be used for CHP but is not marketed as a CHP program. To earn credit, states have to be actively reaching out to potential CHP users and developers to market the program, and they must be acquiring new CHP resources as a result.

Production goal. States earned credit for the existence of either a state-approved production goal (kWh) from CHP resources or a program budget for the acquisition of a defined amount of kWh savings from CHP by utilities or program administrators. The presence of either (or both) of these indicates that a state has identified CHP as a resource and, importantly, has given utilities a clear signal to develop and deploy programming designed to acquire CHP. In many states, utilities report receiving mixed signals about whether their regulators are actually supportive of program spending tied to CHP. This subcategory addresses this particular issue of utility incentives and disincentives to pursue CHP programming.

Incentives for deploying CHP and for energy production from CHP

This category recognizes states' efforts to encourage CHP deployment by improving the financial attractiveness of projects through up-front financing options or incentives for energy output, or by explicitly encouraging CHP resource acquisition through other market mechanisms that address targeted grid needs.

States could receive up to 1 point for incentives for CHP: 1 point for having two or more of these policies and 0.5 points for having one of them. To earn points in any of the subcategories outlined above, a state policy or program must be usable by all customer classes and apply to CHP systems powered by natural gas. Detailed information on the policies and programs that earned points in this category is available in the CHP section of the ACEEE State and Local Policy Database (ACEEE 2019). We considered the following subcategories in awarding points.

Deployment incentives. States could earn credit for the presence of deployment incentives that improve the economics of a CHP investment but are not necessarily tied to resource acquisition by utilities. Deployment incentives can encourage CHP at the state level in a variety of ways, and leading states have multiple types of incentive programs. To earn points in this subcategory, at least one available incentive must

- Apply to all CHP, regardless of fuel;
- Be an investment tax credit, a credit for installed capacity, a loan or loan guarantee, a project grant, or a net metering standard; and
- Apply to both the commercial and the industrial sectors.

Tax incentives for CHP can take many forms but are often credits taken against business or real estate taxes. The Bipartisan Budget Act of 2018 reinstated a federal business energy investment tax credit administered by the US Internal Revenue Service. The credit incentivizes CHP systems by offering a credit for 10% of CHP project costs (DSIRE 2019). Systems up to 50 MW placed in service between October 3, 2008, and December 31, 2021, are generally eligible for the full credit, subject to some limitations. Larger systems may be eligible for partial credit (DOE 2018a). Tax credits administered by a state can also provide support for CHP deployment.

State grants can further support CHP deployment by providing financing for capital and other costs. Some grant awards and other simple incentive programs offer rebates or payments linked to the installation of CHP capacity with amounts set in $/kW. Many of these programs are administered in conjunction with production incentives. Low-interest loan programs, loan guarantees, and bonding authorities are other strategies states can use to make CHP systems financially attractive and reduce the cost of financing. To earn points for these programs, a state must clearly identify CHP as an eligible project type and market it to CHP project developers who then take advantage of the financing opportunity.

Net metering regulations can also incentivize CHP deployment by allowing owners of small distributed generation systems to get credit for net excess electricity that they produce and export to the grid. We gave credit to states that explicitly list CHP as an eligible technology and offer at least wholesale net metering to all CHP systems, regardless of fuel, in all customer classes. Some states are transitioning away from net metering and are developing new methods for valuing and compensating distributed energy resources, including CHP. Future editions of the *Scorecard* may consider new mechanisms that replace net metering approaches.

Detailed information on incentives for CHP is available from the EPA's CHP Policies and Incentives Database (EPA 2019) and from the Database of State Incentives for Renewables and Efficiency (DSIRE 2019).[53]

Revenue streams. States that provide access to favorable revenue streams for CHP, including production incentives ($/kWh), feed-in tariffs, standard-offer programs, and other revenue streams linked to kWh production could earn credit in this category. These strategies encourage measurable energy savings from CHP. Production incentives are linked directly to a CHP system's production or to some calculated amount of energy savings relative to an established baseline. Feed-in tariffs usually specify $/kWh payments to CHP operators for exporting electricity to the grid. They provide price certainty and long-term contracts that can help finance CHP systems (EPA 2015). Standard offer programs offer a set price for qualifying CHP production and often have a program cap or point at which the standard offer is no longer available.

In general, we did not give credit for custom program offerings marketed to the commercial and industrial sectors that could only *potentially* be used for CHP, as the spending and savings for these programs are reflected in other parts of the *State Scorecard*. However we did give credit for programs that included a specific CHP-focused component, for example the identification of and outreach to potential sites for CHP installations.

Promotion of CHP in NWA or other market policies. States earned credit in this category for including CHP as an eligible measure in NWA programs or other market-based efforts to address targeted grid needs.[54] NWA approaches are emerging as a way to acquire cost-effective utility-owned and customer-sited distributed energy resources to meet targeted

[53] EPA's database is available at www.epa.gov/chp/dchpp-chp-policies-and-incentives-database. The DSIRE database is available at www.dsireusa.org.

[54] Sometimes also called nonwires solutions.

grid needs. They help defer or displace the need to upgrade or replace transmission and distribution equipment due to aging infrastructure or increasing load. To date, few states have enacted formal NWA policies, but there is evidence to suggest that such policies can be effective tools for utilities to acquire new cost-effective CHP resources. For states that are innovating new procurement mechanisms, other market approaches that similarly encourage cost-effective deployment of CHP resources for targeted grid needs could also earn credit in this category.

Additional Supportive Policies

A state could receive up to 1 point for additional activities or policies that support the deployment of CHP. States could earn 0.5 points for the presence of each of the following:

- Policies that encourage, in conjunction with CHP technologies, the use of opportunity fuels such as biomass, biogas, anaerobic digester gas, landfill gas, wood, and other waste (including waste heat); and
- Policies and programs that specifically encourage CHP for its resilience and reliability benefits.

States could earn points for renewable portfolio standards (RPSs) and other policies that encourage the use of renewable-fueled CHP as an additional supportive policy. Natural gas is available nearly everywhere in the United States and is the predominant fuel used by CHP systems. The availability of biomass and biogas resources is often local, and some states are better suited than others to use these resources. While natural gas CHP systems do not generally benefit from RPS treatment, biomass or biogas systems often do, and we recognize the use of these and other opportunity fuels in this category.

States could also earn points for programs that encourage consideration of CHP's resilience benefits during grid outages. Experts and key stakeholders working on CHP issues across the country have identified resilience as a major driver of CHP deployment. States experiencing an increasing number of extreme weather events are concerned about maintaining resilient energy resources, particularly at critical facilities like hospitals, wastewater treatment plants, and shelters.

Many attributes of CHP systems can offer resilience benefits. For example, onsite generation limits power outages due to tree limbs or debris falling on power lines. CHP systems are typically well maintained, ensuring that they will work when needed. They can meet changing energy demand by ramping production up and down quickly, by operating independently of the grid (called islanding), and by turning on without any outside power from the grid (called black starting).

States can make CHP eligible for grants, loans, or tax credits for critical infrastructure and facilities and for microgrids targeted for resilience. They can also require that public buildings and critical facilities consider CHP during upgrades or new construction. In addition, they can provide technical assistance, education, and resilience planning that includes CHP.

Other Considerations for CHP

Due to this year's reduction in points allocated to CHP, we did not score states on two other supportive policies that we included in previous editions of the *Scorecard.* First, states may offer technical assistance programs, education campaigns, and other special efforts that support CHP beyond the services provided by DOE's CHP Technical Assistance Partnerships. Second, they may offer streamlined air permitting, including permit-by-rule processes, to help reduce the time and cost involved in permitting eligible CHP units.[55] Both of these policies continue to be important to CHP deployment, and we are still providing state-by-state information on each of them in the ACEEE State and Local Policy Database's CHP section (ACEEE 2019).

Distributed generation systems such as CHP are charged standby rates when they must rely on power from the grid due to scheduled or emergency outages. These rates can be a barrier to CHP deployment. We do not score states on their standby rates because of challenges in availability and consistency of data, but we may consider them in future editions. Interest in addressing standby rates has been increasing across the United States. For example, at the national level, the National Association of Utility Regulatory Commissioners adopted a resolution in February encouraging regulators to ensure that standby rates are not harmful to CHP (NARUC 2019). Pennsylvania is also aiming to improve the transparency of rates applicable to CHP.

Various economic considerations determine how many CHP projects are installed, but the retail price of energy is a major factor in their economic attractiveness. Higher electricity prices may improve the case for CHP in some states by making self-generation more cost effective than purchasing electricity from the grid. In other states, lower and stable natural gas prices can help hasten investment in CHP systems, since many are fueled by natural gas. States cannot control the price of electricity or gas, but decision makers can implement policies that help overcome economic barriers posed by lower electricity prices or higher gas prices. Future editions of the *State Scorecard* may account for these factors by scoring states on their installed CHP capacity relative to some measure of technical or economic potential or by assessing the degree to which unfavorable economics are minimized by certain regulatory or policy treatments.

ADDITIONAL UNSCORED METRIC

Table 36 shows the number of new CHP systems and installed CHP capacity over the past two years.[56] We did not use these measures in our scoring. Although this information is useful for comparing CHP activity among states, it does not in itself indicate a state's CHP supportiveness.

[55] Additional information about approaches to streamlined air permitting for CHP is available in an EPA fact sheet (EPA 2014).

[56] Data were obtained from the US DOE CHP Installation Database maintained by ICF and reflect installations as of December 31, 2018 (DOE 2018b).

Table 36. Number of new CHP systems and installed CHP capacity by state, 2017–2018

State	Number of new CHP installations in 2017	New capacity installed in 2017 (MW)	Number of new CHP installations in 2018	New capacity installed in 2018 (MW)	Total number of new CHP installations	Total new capacity installed (MW)
Alabama	0	0.0	0	0.0	0	0.0
Alaska	2	7.2	1	17.0	3	24.2
Arizona	0	0.0	0	0.0	0	0.0
Arkansas	0	0.0	0	0.0	0	0.0
California	6	27.6	5	12.4	11	40.0
Colorado	2	0.6	0	0.0	2	0.6
Connecticut	4	4.9	2	1.1	6	5.9
District of Columbia	1	1.0	1	7.5	2	8.5
Delaware	0	0.0	0	0.0	0	0.0
Florida	0	0.0	1	7.4	1	7.4
Georgia	2	58.5	0	0.0	2	58.5
Hawaii	1	2.0	1	2.2	2	4.2
Idaho	0	0.0	0	0.0	0	0.0
Illinois	0	0.0	0	0.0	0	0.0
Indiana	1	86.0	3	4.8	4	90.8
Iowa	0	0.0	0	0.0	0	0.0
Kansas	0	0.0	0	0.0	0	0.0
Kentucky	0	0.0	0	0.0	0	0.0
Louisiana	1	0.1	0	0.0	1	0.1
Maine	0	0.0	0	0.0	0	0.0
Maryland	4	5.4	2	8.0	6	13.4
Massachusetts	10	31.0	5	6.7	15	37.7
Michigan	4	150.0	1	7.8	5	157.8
Minnesota	3	69.4	0	0.0	3	69.4
Mississippi	0	0.0	1	7.2	1	7.2
Missouri	1	0.3	0	0.0	1	0.3
Montana	0	0.0	1	0.2	1	0.2
Nebraska	0	0.0	0	0.0	0	0.0
Nevada	0	0.0	0	0.0	0	0.0
New Hampshire	1	0.2	0	0.0	1	0.2
New Jersey	26	10.9	17	8.6	43	19.6
New Mexico	1	0.7	1	0.3	2	1.0
New York	67	12.5	33	24.0	100	36.4
North Carolina	3	3.2	1	6.5	4	9.7
North Dakota	0	0.0	0	0.0	0	0.0
Ohio	1	1.0	1	7.5	2	8.5
Oklahoma	0	0.0	1	5.0	1	5.0

State	Number of new CHP installations in 2017	New capacity installed in 2017 (MW)	Number of new CHP installations in 2018	New capacity installed in 2018 (MW)	Total number of new CHP installations	Total new capacity installed (MW)
Oregon	0	0.0	1	1.8	1	1.8
Pennsylvania	6	7.3	1	0.2	7	7.4
Puerto Rico	3	6.3	1	1.2	4	7.5
Rhode Island	2	3.2	0	0.0	2	3.2
South Carolina	1	3.5	1	14.1	2	17.6
South Dakota	0	0.0	0	0.0	0	0.0
Tennessee	2	56.3	2	95.0	4	151.3
Texas	4	23.0	0	0.0	4	23.0
Utah	0	0.0	1	3.0	1	3.0
Vermont	1	1.0	0	0.0	1	1.0
Virgin Islands	0	0.0	1	0.3	1	0.3
Virginia	0	0.0	0	0.0	0	0.0
Washington	0	0.0	1	0.1	1	0.1
West Virginia	0	0.0	0	0.0	0	0.0
Wisconsin	0	0.0	0	0.0	0	0.0
Wyoming	0	0.0	1	1.1	1	1.1
Total	160	573.0	88	251.0	248	823.9

Totals may not be exact due to rounding. *Source:* DOE 2018b.

Some states' activities directly increased support for CHP in the past year; we describe some of these efforts in the text box below. On the basis of these and other initiatives, CHP experts expect more 2018 installations to come to light as new data become available. They also anticipate a strong market for CHP in the coming year.

Leading and Trending States: Policies to Encourage CHP Development

Pennsylvania. In 2018 the Pennsylvania Public Utility Commission (PUC) unanimously adopted a policy statement that encourages investment in CHP. The statement recommends CHP's deployment for its resilience benefits at critical infrastructure, reducing barriers to deployment through increased marketing efforts and promotion of funding opportunities, data disclosure, and implementation of favorable interconnection processes and rates (PA PUC 2018). A CHP working group has been meeting since the adoption of the policy statement. It has covered topics such as alternative ratemaking, interconnection jurisdiction and costs, and financing (Pennsylvania PUC 2019a). The group has also focused on clarifying utility standby rates and describing best practices for modifying them to reduce financial barriers to CHP deployment (Pennsylvania PUC 2019b).

Virginia. Updated in 2018, Virginia's energy plan recommends increased state sponsorship of investment in CHP projects, including support for its resilience benefits. Specifically, the plan calls on the commonwealth to establish a cumulative target of at least 750 MW of CHP by 2030. This builds on Senate Bill 966, which requires Dominion Energy to consider including 200 MW of CHP or waste-heat-to-power in its next integrated resource plan (DMME 2018). Strategies for achieving the target include utility investments, private market mobilization, and the deployment of CHP in public buildings.

Michigan. The Michigan Energy Office released a CHP road map in August 2018. The report makes a number of recommendations on ways the state can realize its 722–2,360 MW of cost-effective CHP potential and provides additional guidance on how utilities should consider CHP in their integrated resource plans. The road map suggests that utilities should be formally required to consider CHP for supply- and demand-side resources, including modeling its generating capacity and demand-side savings. To ensure that CHP is fully valued in cost-effectiveness screens, the report lays out costs and benefits that should be factored in, including resilience, reliability, and the value of the thermal load (MEO 2018). Following the report's release, the agency offered grants for CHP feasibility studies and for training and education at facilities that were good candidates for CHP (MEO 2019).

Chapter 6. State Government–Led Initiatives

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INTRODUCTION

State legislatures and governors can advance energy efficiency policies and programs that affect the utilities, transportation, buildings, and CHP sectors discussed in previous chapters. They can also do more. In this chapter, we focus on energy efficiency initiatives that are designed, funded, and implemented by state entities, including energy offices, public universities, economic development agencies, and general services agencies.

We focus on four initiatives commonly undertaken by state governments: financial incentive programs for consumers, businesses, and industry; lead-by-example policies and programs to improve the energy efficiency of public facilities and fleets; R&D for energy efficiency technologies and practices; and carbon pricing.

SCORING AND RESULTS

States could earn up to 6 points in this policy area for the following:

- Financial incentives offered by state agencies (2.5 points)
- Lead-by-example policies (2 points)
- Publicly funded R&D programs focused on energy efficiency (0.5 points)
- Carbon pricing policy (1 point)

The metric for carbon pricing is new this year, reflecting a mechanism that many states rely on to expand energy efficiency programs. Carbon pricing policies internalize the societal costs associated with carbon emissions, thus increasing the value of savings from energy efficiency investments. They also generate funds that can be invested in efficiency.

Table 37 presents the overall results of scoring on state initiatives.

Table 37. Summary of scores for government-led initiatives

State	Financial incentives (2.5 pts.)	Lead by example (2 pts.)	R&D (0.5 pts.)	Carbon pricing policy (1 pt.)	Total score (6 pts.)
California	2.5	2	0.5	1	6
Connecticut	2.5	2	0.5	1	6
Delaware	2.5	2	0.5	1	6
Massachusetts	2.5	2	0.5	1	6
Rhode Island	2.5	2	0.5	1	6
Vermont	2.5	2	0.5	1	6
Maryland	2.5	1.5	0.5	1	5.5
New York	2.5	1.5	0.5	1	5.5
Colorado	2.5	2	0.5	0	5

State	Financial incentives (2.5 pts.)	Lead by example (2 pts.)	R&D (0.5 pts.)	Carbon pricing policy (1 pt.)	Total score (6 pts.)
Maine	2	1.5	0.5	1	5
Minnesota	2.5	2	0.5	0	5
Oregon	2.5	2	0.5	0	5
Washington	2.5	2	0.5	0	5
Kentucky	2.5	1.5	0.5	0	4.5
Missouri	2.5	1.5	0.5	0	4.5
New Hampshire	1.5	2	0	1	4.5
Pennsylvania	2.5	1.5	0.5	0	4.5
Tennessee	2	2	0.5	0	4.5
Virginia	2.5	1.5	0.5	0	4.5
Alaska	2.5	1	0.5	0	4
Florida	2	1.5	0.5	0	4
Illinois	1.5	2	0.5	0	4
Michigan	2.5	1	0.5	0	4
Nevada	2.5	1	0.5	0	4
Ohio	2.5	1	0.5	0	4
South Carolina	2.5	1.5	0	0	4
Texas	1.5	2	0.5	0	4
Utah	1.5	2	0.5	0	4
Arkansas	2	1.5	0	0	3.5
District of Columbia	1.5	1.5	0.5	0	3.5
New Mexico	1.5	2	0	0	3.5
North Carolina	1	2	0.5	0	3.5
Wisconsin	1.5	1.5	0.5	0	3.5
Alabama	1	1.5	0.5	0	3
Mississippi	1.5	1	0.5	0	3
Montana	1.5	1.5	0	0	3
Oklahoma	1.5	1.5	0	0	3
Arizona	1	1	0.5	0	2.5
Hawaii	0.5	1.5	0.5	0	2.5
Idaho	1.5	0.5	0.5	0	2.5
Louisiana	1	1.5	0	0	2.5
Nebraska	1.5	0.5	0.5	0	2.5

State	Financial incentives (2.5 pts.)	Lead by example (2 pts.)	R&D (0.5 pts.)	Carbon pricing policy (1 pt.)	Total score (6 pts.)
New Jersey	0	1	0.5	1	2.5
Wyoming	2	0.5	0	0	2.5
Georgia	0	1.5	0.5	0	2
Indiana	1	0.5	0.5	0	2
West Virginia	1.5	0	0.5	0	2
Iowa	0.5	0.5	0.5	0	1.5
Kansas	0	1	0.5	0	1.5
North Dakota	0.5	0	0	0	0.5
South Dakota	0	0.5	0	0	0.5

DISCUSSION

Financial Incentives

While utilities offer ratepayer-funded energy efficiency programs, many states also provide financial incentives to spur the adoption of technologies and practices in homes and businesses. These incentives can be administered by various state agencies but are most often coordinated by state energy offices. Incentives can take many forms: rebates, loans, grants, or bonds for energy efficiency improvements; income tax credits and deductions for individuals or businesses; and sales tax exemptions or reductions for eligible products. Financial incentives can lower the up-front cost and shorten the payback period for energy efficiency upgrades, shrinking two barriers for consumers and businesses that hope to make cost-effective efficiency investments. Incentives also raise consumer awareness of eligible products, encouraging manufacturers and retailers to market these products more actively and to continue to innovate. As economies of scale improve, prices of energy-efficient products fall, enabling the products to eventually compete in the marketplace without the incentives.

SCORES FOR FINANCIAL INCENTIVES

Information regarding state incentives for energy efficiency improvements were gathered through our survey of state energy officials and our review of the Database of State Incentives for Renewables and Efficiency (DSIRE 2019), with additional support from program listing information provided by IncentiFind's online database (IncentiFind 2019).

We did not give points in this category for utilities' customer-funded financial incentive programs, which we covered in Chapter 2. Here we include state appropriations or bonds, oil overcharge revenues, auction proceeds from the RGGI or California's cap-and-trade program, other non-customer sources, and tax incentives. While state and customer funding sometimes overlap—for example, where state incentives are funded through a system benefits charge—we designed this category to capture energy efficiency initiatives not already covered in Chapter 2.

We recognize growing state efforts to leverage private dollars for energy efficiency programs by awarding points for loans offered by green banks with active energy efficiency programs and giving credit for the PACE financing programs enabled by state legislation. From 2010 to 2017, energy efficiency projects accounted for 48% of commercial and 58% of residential PACE funding (PACENation 2018b). State legislatures pass and amend legislation enabling residential and/or commercial PACE, and localities or private program administrators typically run the programs, depending on the jurisdiction.[57] Sometimes states play a more prominent role in PACE coordination by administering a statewide program or offering guidance to PACE providers (Fazeli 2016). Because programs are usually locally administered, we did not give extra credit for multiple active PACE programs; however we indicate in table 38 whether state PACE activity is in the residential or commercial market or both. We discuss other energy efficiency financing efforts in more detail at the end of this chapter.

States earned up to 2.5 points for major financial incentive programs that encourage the purchase of energy-efficient products.[58] We judged these programs on their relative strength, customer reach, and impact. Incentive programs generally received 0.5 points each, but several states have major incentive programs that we deemed worth 1 point each; these include Arizona, Connecticut, Idaho, Nebraska, Nevada, New York, Texas, Washington, and Wisconsin. States that have at least one active PACE program were awarded 0.5 points. Table 38 shows our scoring of state financial incentives.

It should be noted that the number of financial incentive programs a state implements may not fully reflect the robustness of its efforts. Accordingly, this year we attempted to collect additional information from state energy offices regarding state budgets for financial incentives, program participation rates, verified savings from incentives, and leveraging of private capital. These data are presented in Appendixes I and J.

[57] Currently, 36 states plus Washington, DC, authorize PACE (PACENation 2018a). While most states' PACE activity is in the commercial market, there have been several residential PACE programs over the past few years. In July 2016, the Federal Housing Administration, the DOE, and the Department of Veterans Affairs issued new guidance and best practices on residential PACE, and these are expected to lay the groundwork for future residential PACE programs. For more information on these announcements, part of the White House's Clean Energy Savings for All Americans initiative, visit www.whitehouse.gov/the-press-office/2016/07/19/fact-sheet-obama-administration-announces-clean-energy-savings-all.

[58] Energy-efficient products include any product or process that reduces energy consumption. While renewable energy technologies such as solar hot-water heating may reduce energy consumption, they are often rolled into larger programs that focus on renewable energy rather than energy efficiency. ACEEE would like to credit states for renewable energy technologies that reduce energy consumption, but they are often difficult to distinguish from broader renewable energy incentives that fall outside the scope of the *State Scorecard*. As a result, they are not credited at this time.

Table 38. State scores for major financial incentive programs

State	Major state financial incentives for energy efficiency	Score (2.5 pts.)
Alaska	Five loan programs; one grant program	2.5
California	California Infrastructure and Economic Development Bank–led bond program for public buildings; three grants; two revolving loans for public buildings; one loan loss reserve for small businesses; one rebate program; one tax incentive for advanced transportation technologies; commercial and residential PACE financing	2.5
Colorado	Loan loss reserve program; school loan program; Residential Energy Upgrade (RENU) Loan program; Agricultural Energy Efficiency Program; statewide commercial PACE financing	2.5
Connecticut	Connecticut Green Bank–led programs including three loans, three financing options for multifamily and low- to moderate-income residential projects, commercial PACE financing; one loan for multifamily housing properties; two loans for multifamily and low-income residential projects	2.5
Delaware	Home Energy Loan Program; Energy Efficiency Investment Fund rebates; Energize Delaware Farm Program; Energy Efficiency Industrial (E2I) program; State Revolving Loan Fund	2.5
Kentucky	Grants, loans, and bonds for farms, schools, and local governments; Kentucky Green Bank–funded loan for state government; sales tax exemption for energy-efficient products; commercial PACE financing	2.5
Maryland	Loans and grant programs for agricultural, residential, multifamily, commercial, and industrial sectors; Smart Energy Communities program; loans for state agencies; commercial PACE financing	2.5
Massachusetts	Community Clean Energy Resiliency Initiative grant; Alternative Energy and Energy Conservation Patent Exemption (personal and corporate); one bond; four other grants	2.5
Michigan	Three loans; five grants; commercial PACE financing	2.5
Minnesota	Five loans; two revolving loans; one loan loss reserve; commercial PACE financing	2.5
Missouri	One loan program; one loan loss reserve; one revolving loan; one personal tax deduction; commercial and residential PACE financing	2.5
Nevada	Property tax abatement for green buildings; Home Energy Retrofit Opportunities for Seniors (HEROS); loans for state employees; commercial PACE financing	2.5
New York	Green Jobs–Green NY Program; loan, grant, financing, rebate, and incentive programs; Energy Conservation Improvements Property Tax Exemption; NY Green Bank; commercial PACE financing	2.5
Ohio	Two loans and one grant program; property tax exemption for energy-efficient projects; commercial PACE financing	2.5
Oregon	Several residential and business energy tax credits; one grant program; commercial PACE financing	2.5
Pennsylvania	Alternative Energy Investment Fund; Sustainable Energy Finance Program; several grant and loan programs; commercial PACE financing	2.5

State	Major state financial incentives for energy efficiency	Score (2.5 pts.)
Rhode Island	Rhode Island Infrastructure Bank–led programs, including one revolving loan program and commercial PACE financing; two grants; two rebates	2.5
South Carolina	Tax credits and sales tax cap for new energy-efficient manufactured homes; two loan programs; mini-grants	2.5
Vermont	Three Sustainable Energy Loan Fund programs; Energy Loan Guarantee Program; Weatherization Trust Fund; Heat Saver Loan	2.5
Virginia	Energy Leasing Program for state-owned facilities; Clean Energy Manufacturing Incentive Grant Program; one loan program; personal tax incentive; financing for innovative energy technologies; commercial PACE financing	2.5
Washington	Major grant program for energy efficiency in public facilities and local communities; several loans and grants	2.5
Arkansas	Three loans; commercial PACE financing	2
Florida	Farm Renewable and Efficiency Demonstrations (FRED); Renewable Energy and Energy-Efficient Technologies (REET) Grant Matching Program; commercial and residential PACE financing	2
Maine	Residential rebate and incentive; consumer products incentive; commercial and industrial incentive	2
Tennessee	Energy Efficient Schools Initiative (loans and grants); one grant program; one loan program	2
Wyoming	Three grant programs; one loan program	2
District of Columbia	Green Light Grant Program; commercial PACE financing; DC Green Bank	1.5
Idaho	Income tax deduction for energy efficiency improvements; one major low-interest loan program; Government Leading by Example (GLBE) program for public buildings in rural cities and counties	1.5
Illinois	Renewable Energy and Energy Efficiency Project Financing; Green Energy Loan program; commercial PACE financing	1.5
Mississippi	One loan program; one public-sector lease program for energy-efficient equipment; one private-sector grant for industrial energy efficiency	1.5
Montana	Energy conservation installation tax credit; tax deduction for energy-conserving investment; Alternative Energy Revolving Loan Program	1.5
Nebraska	Major loan program (Dollar and Energy Saving Loans); commercial PACE financing	1.5
New Hampshire	Two revolving loan funds; commercial PACE financing	1.5
New Mexico	Sustainable Building Tax Credit (corporate and personal); bond program	1.5
Oklahoma	Three loan programs	1.5
Texas	Major loan program (Texas LoanSTAR); commercial PACE financing	1.5
Utah	Two loan programs for state-owned buildings and schools; commercial PACE financing	1.5

State	Major state financial incentives for energy efficiency	Score (2.5 pts.)
West Virginia	West Virginia Division of Energy and WVU College of Engineering partnership; EE West Virginia; one revolving loan fund	1.5
Wisconsin	Major loan program (Clean Energy Manufacturing Revolving Loan Fund); commercial PACE financing	1.5
Alabama	Alabama SAVES revolving loan program; AlabamaWISE Home Energy Program (loans)	1
Arizona	Property tax exemption for energy-efficient building components and CHP	1
Indiana	Tax credit for purchase and installation of residential insulation; Green Project Reserve revolving loan fund	1
Louisiana	Home Energy Loan Program (HELP); Energy Fund Loan Program	1
North Carolina	One rebate; one loan program	1
Hawaii	Green Energy Market Securitization (GEMS) financing program	0.5
Iowa	Energy Bank Revolving Loan Program	0.5
North Dakota	Energy Conservation Grant	0.5
Georgia	None	0
Kansas	None	0
New Jersey	None	0
South Dakota	None	0

GREEN BANKS

States are increasingly leveraging private capital alongside public dollars to incentivize energy efficiency. One way of doing this is through green banks, which can overcome barriers faced by consumers and lenders in financing energy efficiency and renewable energy projects. While we do not currently give credit solely for the establishment of a green bank, we recognize the important contribution they make to incentivizing energy efficiency.[59] These financing institutions offer public dollars and leverage private funds to unleash new investment, reduce costs, and increase consumer demand in the clean energy sector. In addition, green banks often provide technical assistance to clean energy projects across sectors to help consumers understand available funding streams and to simplify the process of purchasing efficiency technologies (CGC 2015).

Because most state green banks are in the early planning stages and have yet to reach full scale, there is a lack of data on their performance (Gilleo, Stickles, and Kramer 2016). To more accurately assess the impacts of financing programs offered by green banks, policymakers and program administrators should collect data—and standardize data collection efforts—on the following metrics:

[59] While we credit evaluated savings from financing programs (including on-bill financing programs) in the utilities chapter, in this chapter we recognize financing programs like green banks that leverage additional, non-ratepayer state resources.

- *Energy savings.* Independently evaluated energy savings achieved as a result of green bank investments
- *Leverage.* The ratio of private loan capital deployed and public or ratepayer funds used
- *Market penetration.* In particular, whether financing is available to low-income, multifamily, and other underserved markets
- *Coordination with utility programs.* The extent to which green banks and utilities coordinate program offerings

Leading and Trending States: Financial Incentives

Pennsylvania. In June 2018, Pennsylvania became the first northeastern state in six years to enable Commercial Property Assessed Clean Energy (C-PACE). To help local governments establish C-PACE programs, the state released model program guidelines and made them available online in March 2019. To date, three counties have passed resolutions authorizing C-PACE.

Hawaii. On April 8, 2019, Hawaii Governor David Ige formally announced the Green Energy Money $aver (GEM$) on-bill financing program, a statewide initiative to make clean energy more affordable for homes and small businesses. The culmination of more than seven years of work by Hawaiian authorities, the program provides easy-access financing for cost-effective rooftop solar panels and other renewable distributed energy systems, as well as energy efficiency upgrades. The GEM$ On-Bill Program is available to about 95% of Hawaii's population. In addition to rooftop solar, eligible projects include solar hot-water heaters, heat pump water heaters, and energy efficiency measures. Projects must be designed to reduce energy bills by at least 10% after accounting for repayment of the clean energy investment.

Colorado. In February 2018 the Colorado Energy Office (CEO) announced the launch of the Colorado Residential Energy Upgrade (RENU) Loan, a statewide program to finance energy efficiency and renewable energy projects in existing homes. The program is a partnership between the CEO and Boulder-based Elevations Credit Union, which will offer long-term, low-interest loans to homeowners seeking energy efficiency improvements such as air sealing, insulation, windows, lighting, and appliances. Loans range from $500 to $35,000 for 3- to 15-year terms and can be used to finance 100% of project costs. As program sponsor, the CEO authorizes contractors to participate in the program, and the contractors then work directly with the homeowner to install upgrades.

New York. The NY Green Bank (NYGB) was established in 2013 as a state-sponsored specialty financing entity housed within the New York State Energy and Development Authority (NYSERDA). NYGB combines funds from ratepayers and RGGI to leverage private clean energy capital. NYGB's recent energy efficiency projects include retrofits to the Northpoint School District and New York City Housing Authority developments, a CHP system installation at a Hebrew Home for the Aged, and funding for a residential energy software company. As of March 2018, NYGB had received more than $2.6 billion in investment proposals since inception, with an active pipeline of $704.2 million of potential investments proceeding toward close. NYGB's investments have driven between 6 million and 8 million metric tons of gross lifetime GHG reductions, equivalent to removing 60,000 to 80,000 cars from the road for the next 23 years.

Lead by Example

State governments can advance energy-efficient technologies and practices in the marketplace by adopting policies and programs to save energy in public-sector buildings and fleets, a practice commonly referred to as *lead by example*. In the current environment of fiscal austerity, lead-by-example policies and programs are a proven strategy for improving the operational efficiency and economic performance of states' assets. Lead-by-example initiatives also reduce the negative environmental and health impacts of high energy use and promote energy efficiency to the broader public.[60]

States can show leadership in energy efficiency policy through the development of state energy plans (and in fact most states have them). Governors can issue executive orders or form planning committees to evaluate state energy needs, goals, and opportunities. Sometimes legislatures initiate the process. These actions help establish a statewide vision for energy use. We do not award points solely for the existence of a state energy plan, but we do consider the formal executive orders and policies that execute energy efficiency initiatives included in such plans.

SCORES FOR LEAD BY EXAMPLE

States could earn up to 2 points in this category: 0.5 points each for energy savings targets in new and existing state buildings, benchmarking requirements for public facilities, energy savings performance contract (ESPC) activities, and fleet fuel efficiency mandates. We based our review of states' lead-by-example initiatives on our survey of state energy officials as well as independent research.

State building requirements. Many states have adopted policies and comprehensive programs to reduce energy use in state buildings. State governments operate numerous facilities, including office buildings, public schools, colleges, and universities, the energy costs of which can account for as much as 10% of a typical government's annual operating budget. In addition, the energy consumed by a state's facilities can account for as much as 90% of its GHG emissions (DOE 2008). Only a handful of states have not yet implemented an energy efficiency policy for public facilities. Mandatory energy savings targets for new and existing state government facilities are the most widely adopted state measures. These requirements encourage states to invest in the construction of new, efficient buildings and retrofit projects, lowering energy bills and promoting economic development in the energy services and construction sectors.

To earn credit, energy savings targets must commit state government facilities to a specific energy reduction goal over a distinct time period. We also gave 0.5 points to states that require state buildings to exceed the statewide energy code or meet a green building criterion like Leadership in Energy and Environmental Design (LEED) certification.

Benchmarking requirements for public buildings. Proper building energy management is a critical element of successful energy efficiency initiatives in the public sector. Benchmarking

[60] Energy efficiency limits harmful pollutants by reducing the need to burn fossil fuels to generate electricity. ACEEE and Physicians for Social Responsibility explore this connection in a joint fact sheet at aceee.org/fact-sheet/ee-and-health.

energy use in public-sector buildings through tailored tools or widely available tools such as ENERGY STAR Portfolio Manager ensures a comprehensive set of energy use data that can be used to drive cost-effective energy efficiency investments.[61] Comparing building energy performance across agencies can also help prioritize energy efficiency projects.

Through benchmarking policies, states and cities require all buildings of a certain size or type to undergo a regular energy audit or have their energy performance tracked. We awarded 0.5 points for energy benchmarking policies and large-scale benchmarking programs for public-sector facilities.

Energy savings performance contracting policies and programs. If state governments have the necessary support, leadership, and tools in place, they can help projects overcome information and cost barriers by financing energy improvements through ESPCs. The state may enter into an ESPC with an energy services company (ESCO), paying for these services with money saved on lower energy bills from energy conservation measures. A designated state agency may serve as the lead contact for implementing the contract.[62]

We based scores for ESPC activities on support, leadership, and tools. To promote performance contracting, states must provide an enabling framework (support) and guidance and resources (leadership and tools) to get projects underway. We awarded a state 0.5 points if it satisfied at least two of the three criteria. Table 39 describes qualifying actions.

Table 39. Scoring of ESPC policies and programs

Criterion	Qualifying action
Support	The state explicitly promotes the use of ESPCs to improve the energy efficiency of public buildings through statutory requirements, recommendations, or explicit preferences for ESPC use; executive orders that promote or require ESPCs; and/or financial incentives for agencies seeking to use ESPCs.
Leadership	A state program directly coordinates ESPCs, or a specific state agency serves as lead contact for implementing ESPCs.
Tools	The state offers documents that streamline and standardize the ESPC process, including a list of prequalified service companies, model contracts, and/or a manual that lays out the procedures required for state agencies to utilize ESPCs.

States must satisfy at least two of the three criteria above to receive credit.

Efficient fleets. In addition to lead-by-example initiatives in state government buildings, many states enact policies encouraging or requiring efficient vehicle fleets to reduce fleet fuel costs and hedge against rising fuel prices. Collectively, state governments own

[61] Some states have their own databases of public building energy use that integrate with the ENERGY STAR Portfolio Manager. For example, Maryland's EnergyCAP database compiles the energy use (based on utility bills) of all public buildings in the state and enables comparison of buildings occupied by various state agencies.

[62] For a full discussion of ESPCs, the ESCO market, and actual implementation trends, see Stuart et al. (2016). For additional best practices in state and local establishment and implementation of ESPC programs, see DOE's ESPC Toolkit (betterbuildingssolutioncenter.energy.gov/espc/home) and its guidelines for state ESPC program development (betterbuildingssolutioncenter.energy.gov/sites/default/files/attachments/ESPC-Program_Guidelines_Final.pdf).

approximately 500,000 vehicles, with a median fleet size of about 3,500. Operation and maintenance costs for these fleets every year exceed $2.5 billion nationwide, ranging from $7 million to $250 million per state (NCFSA 2007). In response to these costs, states may adopt an efficiency standard specifically for state vehicle fleets that reduces fuel consumption and GHG emissions.

For this category, states received credit only if the plan or policy for increasing the efficiency of the state's fleet contains a specific, mandatory requirement. For example, states could qualify for 0.5 points if fleet policies specify fuel economy improvements that exceed existing CAFE standards. Other policies that earned the half point include binding goals to reduce petroleum use by a certain amount over a given time frame, meaningful GHG reduction targets for fleets, and procurement requirements for hybrid-electric or all-electric vehicles. Because state adoption of such targets does not guarantee they will be achieved, we may need to revisit this metric in the future; meanwhile, we will continue to seek data on state progress toward meeting these goals. We did not credit requirements for procuring alternative-fuel vehicles because such vehicles may not result in improved fuel economy.

Table 40 presents states' overall scores for lead-by-example efforts.

Table 40. State scores for lead-by-example initiatives

State	New and existing state building requirements (0.5 pts.)	Benchmarking requirements for public buildings (0.5 pts.)	ESPC policy and programs (0.5 pts.)	Efficient fleets (0.5 pts.)	Total score (2 pts.)
California	•	•	•	•	2
Colorado	•	•	•	•	2
Connecticut	•	•	•	•	2
Delaware	•	•	•	•	2
Illinois	•	•	•	•	2
Massachusetts	•	•	•	•	2
Minnesota	•	•	•	•	2
New Hampshire	•	•	•	•	2
New Mexico	•	•	•	•	2
North Carolina	•	•	•	•	2
Oregon	•	•	•	•	2
Rhode Island	•	•	•	•	2
Tennessee	•	•	•	•	2
Texas	•	•	•	•	2
Utah	•	•	•	•	2
Vermont	•	•	•	•	2
Washington	•	•	•	•	2

State	New and existing state building requirements (0.5 pts.)	Benchmarking requirements for public buildings (0.5 pts.)	ESPC policy and programs (0.5 pts.)	Efficient fleets (0.5 pts.)	Total score (2 pts.)
Alabama		•	•	•	1.5
Arkansas	•	•	•		1.5
District of Columbia	•	•		•	1.5
Florida		•	•	•	1.5
Georgia	•	•	•		1.5
Hawaii		•	•	•	1.5
Kentucky	•	•	•		1.5
Louisiana	•		•	•	1.5
Maine	•		•	•	1.5
Maryland	•	•	•		1.5
Missouri	•		•	•	1.5
Montana	•	•	•		1.5
New York	•	•	•		1.5
Oklahoma	•	•	•		1.5
Pennsylvania	•	•		•	1.5
South Carolina	•	•	•		1.5
Virginia	•	•	•		1.5
Wisconsin	•		•	•	1.5
Alaska	•	•			1
Arizona	•		•		1
Kansas	•		•		1
Michigan		•	•		1
Mississippi		•		•	1
Nevada		•	•		1
New Jersey		•	•		1
Ohio		•	•		1
Idaho			•		0.5
Indiana	•				0.5
Iowa		•			0.5
Nebraska		•			0.5
South Dakota		•			0.5
Wyoming			•		0.5

State	New and existing state building requirements (0.5 pts.)	Benchmarking requirements for public buildings (0.5 pts.)	ESPC policy and programs (0.5 pts.)	Efficient fleets (0.5 pts.)	Total score (2 pts.)
North Dakota					0
West Virginia					0

Leading and Trending States: Lead-by-Example Initiatives

New Mexico. In 2019, Governor Lujan Grisham signed Executive Order 2019-003, which commits the state to the 2015 Paris Agreement goals and to the US Climate Alliance. The order also creates a New Mexico Climate Change Task Force that will work toward a statewide climate strategy. In particular, the task force will aim to reduce light-duty vehicle emissions, set emissions limits through a market-based program, adopt new building codes, identify transmission corridors to transport renewable energy, and strengthen the state's renewable portfolio and energy efficiency standards. Further, state agencies are now required to incorporate climate mitigation and adaptation strategies into their programs and implement policies to further reduce GHGs.

Connecticut. Signed by Governor Ned Lamont in 2019, Executive Order No. 1 calls for reducing energy consumption and GHG emissions from state government operations. Focusing on state buildings, a steering committee will work on onsite heating and cooling, electricity, clean energy, vehicles, waste management, water use, and product procurement to help the state achieve its GHG emissions, waste disposal, and water consumption goals. The committee will also consider how to meet a net-zero emissions target for 2050.

Oregon. Executive Order 17-20, signed by Governor Kate Brown in November 2017, establishes a plan to cut energy use and carbon emissions in state buildings and residential and commercial construction. It calls for updates to building energy codes to require electric vehicle–ready building construction and zero energy–ready homes. The order also directs all state agencies to adopt targets for remodels and directs the Oregon Department of Energy to track state-owned building energy use to guide energy conservation efforts. New state-owned office buildings permitted after January 1, 2022, must be designed to operate as carbon neutral and follow energy use and renewable energy requirements of ASHRAE Standard 189.1. The order also calls for a statewide plug-load management strategy and a variety of other measures to increase uptake of EVs, improve state standards for appliances and water efficiency, and enhance coordination of energy data across the region.

Washington. In 2018, Governor Jay Inslee signed Executive Order 18-01, establishing several new lead-by-example initiatives. This order includes a focus on zero-energy buildings and requires state agencies to prioritize the purchase or lease of battery electric vehicles (BEVs). It also sets goals for state agencies to purchase environmentally preferable products and establishes a Governing Council to oversee the goals of the executive order.

R&D

R&D programs drive advances in energy-efficient technologies, and states play a unique role in laying the foundation for such progress. By leveraging resources in the public and private sectors, state government programs can foster collaborative efforts and rapidly create, develop, and commercialize new energy-efficient technologies. These programs can also encourage cooperation among organizations from different sectors and backgrounds to further spur innovation.

In response to an increasing need for state initiatives in energy-related R&D, several state bodies established the Association of State Energy Research and Technology Transfer Institutions (ASERTTI) in 1990. ASERTTI members collaborate on applied R&D and share technical and operational information, emphasizing end-use efficiency and conservation.

Aside from those institutions affiliated with ASERTTI, numerous other state-level entities (including universities, state agencies, research centers, and utilities) fund and implement R&D programs to advance energy efficiency throughout the economy. Such programs include research on energy consumption patterns in local industries and the development of energy-saving technologies at state or university research centers and through public–private partnerships.

Individual state research institutions provide expertise and knowledge that policymakers can draw from to advance successful efficiency programs. And through information sharing—facilitated by ASERTTI membership—states can benefit from one another's research. States without R&D institutions can use this shared information as a road map to begin or advance their own efficiency programs. Even leading states can improve or add to their R&D efforts by drawing from other states' programs and best practices.

SCORES FOR R&D

We reviewed state energy efficiency R&D institutions using information collected from our survey of state energy officials and secondary research. This research complemented information we had previously collected from the *National Guide to State Energy Research Centers* (Wiegman 2012). We awarded 0.5 points to states that have at least one major state government–funded R&D program dedicated to energy efficiency. We included programs administered by state government agencies, public–private partnerships, and universities. Because R&D funding often fluctuates, and because it is difficult to determine the dollar amount that specifically supports energy efficiency research, we do not currently score R&D on the basis of program funding or staffing levels.[63] We recognize that the presence of an R&D institution does not guarantee the deployment of technologies being developed or the achievement of actual energy savings. For future *State Scorecards*, we will seek ways to refine this metric through additional quantitative data. For full descriptions of state energy efficiency R&D program activities, visit ACEEE's State and Local Policy Database (ACEEE 2019).

[63] Institutions that focus primarily on renewable energy technology or alternative-fuel R&D did not receive credit in the *Scorecard*. In addition, programs that serve primarily an educational or policy-development purpose also did not receive points.

Table 41 presents the scores.

Table 41. Scores for R&D institutions doing energy efficiency–focused research

State	R&D institutions	Score (0.5 pts.)
Alabama	University of Alabama's Center for Advanced Vehicle Technologies	0.5
Alaska	Cold Climate Housing Research Center	0.5
Arizona	Sustainable Energy Solutions Group of Northern Arizona University, Arizona State University's LightWorks Center	0.5
California	California Energy Commission's Electric Program Investment Charge (EPIC) Program and Natural Gas Research and Development Program, University of California–Davis's Center for Water-Energy Efficiency and the Energy and Efficiency Institute, University of California–Berkeley's Center for the Built Environment, University of California–Los Angeles's Center for Energy Science and Technology Advanced Research and Smart Grid Energy Research Center, University of California–Irvine Plug Load Research Center (CalPlug)	0.5
Colorado	Colorado State University's Engines and Energy Conversion Lab and Institute for the Built Environment; University of Colorado–Boulder's Renewable and Sustainable Energy Institute; Colorado School of Mines' Research in Delivery, Usage, and Control of Energy and Center for Renewable Energy Economic Development; Colorado Energy Research Collaboratory	0.5
Connecticut	University of Connecticut's Center for Clean Energy Engineering, DEEP's Energy Efficiency & Renewable Energy Test Bed Program, Connecticut Center for Advanced Technology	0.5
Delaware	University of Delaware's Center for Energy and Environmental Policy and Mid-Atlantic Industrial Assessment Center (IAC), Delaware Technical and Community College energy facilities	0.5
District of Columbia	Green Building Fund Grant Program	0.5
Florida	University of Central Florida's Florida Solar Energy Center; Florida State University's Energy and Sustainability Center; University of Florida's Florida Institute for Sustainable Energy and Florida Energy Systems Consortium; University of South Florida's Clean Energy Research Center; University of West Florida's Community Outreach, Research and Education	0.5
Georgia	Southface Energy Institute, Georgia Institute of Technology's Brook Byers Institute for Sustainable Systems	0.5
Hawaii	Hawaii Natural Energy Institute at the University of Hawaii	0.5
Idaho	Center for Advanced Energy Studies	0.5
Illinois	University of Illinois at Chicago's Energy Resources Center, Illinois Sustainable Technology Center, University of Illinois at Urbana–Champaign Department of Urban and Regional Planning and Smart Energy Design Assistance Center, Gas Technology Institute	0.5
Indiana	Purdue University Energy Efficiency and Reliability Center	0.5

State	R&D institutions	Score (0.5 pts.)
Iowa	Iowa Energy Center, research support through the Iowa Economic Development Authority, University of Northern Iowa Center for Energy and Environmental Education	0.5
Kansas	Studio 804, Inc.; Wichita State University's Center for Energy Studies	0.5
Kentucky	University of Louisville's Conn Center for Renewable Energy Research	0.5
Maine	Maine Technology Institute	0.5
Maryland	University of Maryland's Energy Research Center and Maryland Clean Energy Technology Incubator	0.5
Massachusetts	Massachusetts Energy Efficiency Partnership, University of Massachusetts–Amherst's Center for Energy Efficiency and Renewable Energy	0.5
Michigan	Michigan NextEnergy Center	0.5
Minnesota	Conservation Applied Research and Development Program, Center for Diesel Research at the University of Minnesota, Center for Sustainable Building Research, Center for Energy and Environment's Innovation Exchange	0.5
Mississippi	Mississippi State University's Energy Institute and Center for Advanced Vehicular Systems, Institute of Higher Learning	0.5
Missouri	Midwest Energy Efficiency Research Consortium, National Energy Retrofit Institute, Missouri University of Science and Technology's Energy Research and Development Center.	0.5
Nebraska	Nebraska Center for Energy Sciences Research, Energy Savings Potential program, University of Nebraska Utility Corporation	0.5
Nevada	Center for Energy Research at University of Nevada–Las Vegas	0.5
New Jersey	Rutgers Center for Green Building	0.5
New York	NYSERDA, State University of New York's Center for Sustainable & Renewable Energy at SUNY-ESF, Syracuse University's Building Energy and Environmental Systems Laboratory, City University of New York's Institute for Urban Systems, Albany State University's Energy and Environmental Technology Application Center (E2TAC)	0.5
North Carolina	North Carolina A&T State University's Center for Energy Research and Technology, Appalachian State University's Energy Center, NC Clean Energy Technology Center at NC State University	0.5
Ohio	Ohio State University's Center for Energy, Sustainability, and the Environment	0.5
Oregon	Oregon Built Environment and Sustainable Technologies Center, University of Oregon's Energy Studies in Building Laboratory and Baker Lighting Lab, Portland State University's Renewable Energy Research Lab, Energy Trust of Oregon, Oregon Transportation Research and Education Consortium	0.5
Pennsylvania	Leigh University's Energy Research Center, Penn State's Indoor Environment Center and Consortium for Building Energy Innovation, Penn State at the Navy Yard, Carnegie Mellon University Wilton E. Scott Institute for Energy Innovation	0.5
Rhode Island	University of Rhode Island Energy Fellows Program	0.5

State	R&D institutions	Score (0.5 pts.)
Tennessee	University of Tennessee partnership with Oak Ridge National Laboratory and the Electric Power Research Institute, CURENT	0.5
Texas	Texas A&M's Engineering Experiment Station, University of Texas–Austin's Center for Energy and Environmental Resources	0.5
Utah	Alliance for Computationally Guided Design of Energy Efficiency Electronic Materials (CDE3M), USTAR Energy Research Triangle Program	0.5
Vermont	University of Vermont Smart Grid Research Center	0.5
Virginia	Southern Virginia Product Advancement Center, R&D Center for Advanced Manufacturing and Energy Efficiency	0.5
Washington	Northwest Building Energy Technology Hub, Clean Energy Fund	0.5
West Virginia	West Virginia University Energy Institute	0.5
Wisconsin	Energy Center of Wisconsin, Wisconsin Focus on Energy, and University of Wisconsin's Solar Energy Lab	0.5

Leading and Trending States: R&D Initiatives

California. To date, the California Energy Commission (CEC) has awarded $760 million to 431 projects dedicated to clean energy research and development. In May 2019, the CEC approved $11 million for clean energy demonstration projects for biofuels, renewable gas, and microgrids. The Zero Net Energy Alliance was awarded $5 million for a project that demonstrates the economic benefits and energy security of advanced solar photovoltaic generation and battery storage technologies. A virtual power plant integrates and manages the project's DERs, making commercial deployment feasible.

Wisconsin. Through its new Energy Innovation Grant Program, the Wisconsin Public Service Commission's Office of Energy Innovation awarded $5 million in grants to projects that promote innovative energy solutions. They range from energy efficiency measures to bolstering resiliency in the energy system. The Darlington Community School District was awarded about $50,000 to investigate the feasibility of achieving the state's first zero net energy schools within the district. Another reward recipient proposes to use its $144,000 to improve efficiency in renewable energy production and building energy use.

Florida. Florida's universities have received more than $5 million for energy efficiency research. The University of Florida's Florida Institute for Sustainable Energy has more than 150 faculty members at 22 centers conducting research on efficient construction and lighting. The University of Central Florida's Florida Solar Energy Center focuses on energy-efficient buildings, schools, and standards and has a similarly large faculty. The state created the Florida Energy Systems Consortium to bring universities together to share their energy-related expertise. Twelve universities participate in the working group, conducting R&D on innovative energy systems that lead to improved energy efficiency and expanded economic development.

New York. NYSERDA supports a range of technology R&D and commercialization activities to improve the energy efficiency of the state's buildings and its industrial, transportation, power, and environmental sectors. NYSERDA invests in scientific research, market analysis, product development, and technology field validation. These investments focus on the environmental impacts of current and emerging energy options, support early-stage market analysis associated with new technologies, advance clean energy innovations toward market readiness, and stimulate innovation.

Carbon Pricing

Several states (including Nevada, New Mexico, Washington, New York, and Maine) have set and strengthened GHG and/or clean energy goals since last year's *State Scorecard*. Accordingly, we decided to implement a new metric on state carbon pricing policies. These policies aim to put a price on carbon, the idea being that if emitting GHGs increases costs, then the market will find a way to reduce emissions at the lowest possible cost (Nadel and Kubes 2019). Two main types of pricing are generally used: a carbon tax and cap-and-trade. A carbon tax charges a fee for each unit of CO_2 (typically a tonne) that is emitted. A cap-and-trade system sets a limit on the total amount of CO_2 that can be emitted and divides this total into emissions allowances. It then distributes these allowances among GHG-emitting companies, creating a market in which the certificates can be bought and sold.

Energy efficiency plays an important role in the successful implementation of carbon pricing policies. When the funds collected from these policies are invested in efficiency, they reduce energy use, energy bills, and energy-related emissions. That can help achieve net economic benefits and cushion the effect of a carbon pricing program on energy costs (Nadel and Kubes 2019). For example, the Regional Greenhouse Gas Initiative (RGGI) has dedicated to energy efficiency about 58% of the funds it has raised from cap-and-trade (RGGI 2018). That has resulted in decreased emissions, lower customer bills, lower wholesale power prices, new jobs, and a strengthened local economy (Hibbard et al. 2018).

SCORES FOR CARBON PRICING

States could earn 1 point for having either a carbon tax or a cap-and-trade policy in place. Table 42 highlights the states with carbon pricing policies. All of these states except California are signatories to the Transportation and Climate Initiative (TCI), although participation in the TCI does not contribute toward scores. The TCI is a regional collaboration facilitated by the Georgetown Climate Center comprising 12 Northeast and Mid-Atlantic states and the District of Columbia that seeks to improve transportation, develop the clean energy economy, and reduce carbon emissions from the transportation sector.

Table 42. States with carbon pricing policies

State	Carbon pricing policy	Score (1 pt.)
California	Cap-and-trade program created by AB 32 began in 2013 and covers CO_2 emissions from the power sector, transportation sector, and natural gas use	1
Connecticut	~70% of RGGI proceeds allocated to energy efficiency; has introduced several carbon pricing bills	1
Delaware	~65% of RGGI proceeds allocated to energy efficiency	1
Maine	Has introduced a carbon tax bill	1
Maryland	Has introduced a carbon tax bill	1
Massachusetts	~84% of RGGI proceeds dedicated to energy efficiency programs; has introduced several alternative carbon pricing bills	1
New Hampshire	Has introduced a carbon tax bill	1
New Jersey	TCI member; will join RGGI in January, 2020	1
New York	Has introduced several alternative carbon pricing bills	1
Rhode Island	Has introduced a carbon tax bill	1
Vermont	Has introduced a carbon tax bill	1

With the exception of California and New Jersey, all these states are currently RGGI and TCI members. *Sources:* 2019 ACEEE data request; Price on Carbon 2019.

Leading and Trending States: Carbon Pricing Policies

California. California's AB 32, adopted in 2006, authorized the California Air Resources Board (CARB) to establish a cap-and-trade program for GHG emissions. The program covers entities responsible for emissions of at least 25,000 tonnes per year. Most allowances are auctioned, but 15% are given freely to either utilities or the industrial sector. Those given to utilities must be put up for sale on consignment in auction, with proceeds used to benefit ratepayers. The program was officially implemented in 2013, initially covering only the power sector. However in 2017 the state extended the program to 2030 and added the transportation sector and users of natural gas outside the power sector. About 9% of collected funds were invested in energy efficiency in 2017. This did not include the substantial investments that also went toward low-carbon vehicles and public transportation. The state met its 2020 emissions target in 2016.

Regional Greenhouse Gas Initiative (RGGI). The RGGI is a mandatory cap-and-trade program for reducing GHG emissions in North America that began its compliance period in 2009. Nine northeastern and Mid-Atlantic states belong to the program (New Jersey will become the 10th in January 2020), with each state committed to spending 25% of allowance proceeds to benefit consumers. Capping CO_2 emissions from the power sector, the program aims to reduce emissions by 45% below 2005 levels by 2020 and by an additional 30% by 2030. Allowances are distributed through quarterly regional auctions open to all qualified participants. Allowances not purchased are generally used for state set-aside accounts. In 2016, 58% of collected funds were invested in energy efficiency, reaching a variety of customers including businesses, municipalities, residences, and under-resourced communities. These investments magnify the GHG reductions and economic benefits realized through the cap-and-trade program.

Energy Efficiency Programs for Low-income Households

As discussed in Chapter 2, low-income households often face a disproportionate energy burden that can be alleviated by energy efficiency (Drehobl and Ross 2016). Reducing energy burdens for low-income households not only keeps money in these families' pockets but also improves their quality of life by creating healthier homes and neighborhoods. These efforts can help states address other priorities such as reduced emissions, economic development, and improved public health.

Energy efficiency programs for low-income households are often supported by a diverse array of funding streams that may include federal, state, or ratepayer dollars. They can be administered by utilities, state government, community action agencies, or other organizations. In Chapter 2 we specifically highlighted utility- and ratepayer-funded income-qualified programs, although in practice these are often combined with other funding streams since nonutility weatherization funding can be used to leverage ratepayer funds, and vice versa. State energy offices, state housing agencies, and partner agencies also have many options for investing in energy efficiency in under-resourced communities. These options include

- Designing energy efficiency programs or incentives specifically for low-income households and investing state resources alongside federal and ratepayer dollars
- Leveraging existing Weatherization Assistance Program delivery channels to expand energy efficiency offerings to program participants

- Providing technical assistance and financial resources to public housing authorities as they work with ESCOs to improve their properties
- Encouraging agencies and organizations allocating federal grants to income-qualified recipients, such as the Low-Income Housing Tax Credit, to prioritize energy efficiency in their allocation process

Through ongoing research and outreach, ACEEE is working to help states and utilities identify the challenges and opportunities in delivering energy efficiency to this market. Below, we highlight several examples of states that have enacted policies or programs for under-resourced communities.

Leading and Trending States: Low-Income Energy Efficiency Policies and Programs

Maryland. The EmPOWER Clean Energy Communities Low-to-Moderate Income (LMI) Grant Program provides funding for energy efficiency measures that benefit low- to moderate-income Marylanders. The program targets existing residences, new residential construction, commercial buildings, and schools and community centers that serve the target population, as well as master-metered multifamily buildings. All forms of cost-effective energy-saving measures across multiple energy sources are eligible. In addition to covering the cost of approved efficiency measures, LMI supports health and safety upgrades, like mechanical ventilation, that enable implementation of energy efficiency measures. Where possible, utility programs add funds or additional measures, allowing more work to occur per building (Nowak, Kushler, and Witte 2019).

Washington. In 2015 the Washington State legislature passed HB 1720, expanding its investment in weatherization programs to include healthy housing improvements. The new program, Weatherization Plus Health (Wx+H), is administered by the state Department of Commerce and combines energy- and cost-saving weatherization services in low-income homes with measures that reduce health risks and health costs for vulnerable families. From 2015 to 2017 the state invested $15 million in weatherization, with $4.3 million in Matchmaker funds committed to the Wx+H initiative. The Matchmaker Program, created in 1987, helps leverage local matching dollars and resources from utilities, rental owners, and others while forming partnerships among weatherization stakeholders. In October 2018, the Washington State University Energy Program worked with the Department of Commerce to evaluate the initiative.

Tennessee. The Tennessee Department of Environment and Conservation's Office of Policy and Planning and Office of Energy Programs convene a working group of state and local agencies, utilities, and nongovernmental organizations to consider best practices in low-income single-family and multifamily energy efficiency program design and implementation. This group has developed a low-income energy efficiency program resource manual and toolkit. In another effort, the Tennessee Housing Development Agency prioritizes energy-efficient properties in its allocation of the Low-Income Housing Tax Credit, encouraging applicants to pursue certification by Enterprise Green Communities.

California. The state allocates Greenhouse Gas Reduction Funds to the Department of Community Services and Development (CSD) to help low-income residents in disadvantaged communities reduce their energy use through the Low-Income Weatherization Program (LIWP). CSD leverages funding from several sources including LIWP, ratepayer-funded weatherization programs, and the federally funded Weatherization Assistance Program. CSD collaborates with the California investor-owned utilities and the California Public Utility Commission to share information on residential energy usage and target and qualify households for efficiency and weatherization services.

Chapter 7. Appliance and Equipment Efficiency Standards

Author: Marianne DiMascio

INTRODUCTION

It was an especially important year for state appliance standards in 2019, with four states adopting new laws and an additional six states and the District of Columbia filing bills.

Every day we use appliances, equipment, and lighting in our homes, offices, and public buildings. Even when the energy consumption of a particular device seems small, the extra energy consumed by less-efficient products collectively adds up to a substantial amount. For example, a single computer might waste a small amount of electricity, but the energy wasted by millions of computers in the United States is considerable. Persistent market barriers inhibit sales of more-efficient models to consumers. Appliance efficiency standards overcome these barriers by initiating change at the manufacturer level, requiring appliance makers to meet minimum efficiency levels for all products and thereby removing the most inefficient products from the market.

States have historically led the way in establishing standards for appliances and other equipment. In 1976 California became the first state to introduce appliance standards. Many others, including New York and Massachusetts, soon followed. Congress established the first national standards, which were based on standards previously adopted by California and several other states, when it passed the National Appliance Energy Conservation Act in 1987. Congress enacted additional national standards in 1988, 1992, 2005, and 2007, generally basing them on existing state standards. The federal laws typically set initial standards for specific products and require DOE to periodically review and, if warranted, strengthen them. More than 60 products are now subject to national efficiency standards. Most directly relate to energy use, although several address water efficiency.

Existing national standards save the average US household about $500 a year on utility bills, or about 16% of average annual utility bill spending in 2015. Businesses saved a total of $23 billion in utility bills in that year, or about 8% of total business spending on electricity and natural gas. Total household and business utility bill savings reached $80 billion in 2015. Annual savings will increase to nearly $150 billion by 2030 as new national standards kick in and the effects of existing ones grow (deLaski and Mauer 2017).

Federal preemption prevents states from setting standards for federally regulated products. States that wish to implement their own standards after federal preemption generally must apply for a waiver; however states remain free to set standards for any products that are not subject to national standards. These can generate significant energy and water savings and set precedents for adopting new national standards.

Over the years there has been an inverse relationship between standards activity at the federal and state levels: When federal activity slows, the impetus for states to set standards increases, and vice versa. Progress on federal standards has stalled since 2017. On taking office, the Trump administration withheld four completed national standards from final publication. Altogether, DOE has missed legal deadlines for the review of 18 others. The administration is also trying to roll back light bulb standards and has proposed changes to the federal program that would make it harder to update any existing standard.

States have responded to the federal inaction and the attempts to weaken the standards program. In 2019 lawmakers in 10 states and the District of Columbia filed standards legislation based on recommendations from the ASAP and ACEEE report *States Go First* (Mauer, deLaski, and DiMascio 2017) and its 2019 update.[64] States also added legislative provisions to protect against the rollback of light bulb and other federal standards.

Legislators in Washington, Colorado, Hawaii, and Nevada also passed appliance standards bills in 2019. The efficiency levels are based on California standards, ENERGY STAR and WaterSense specifications, and completed but never published federal standards. The Washington and Colorado bills adopt new standards for more than 15 products including computers and monitors, faucets, showerheads, commercial dishwashers, and portable air conditioners. Hawaii meanwhile passed a bill establishing standards for five products. Legislators in Connecticut, Illinois, Maine, Massachusetts, Minnesota, Rhode Island, and the District of Columbia also filed standards bills in 2019.

Also in 2019, the California Energy Commission (CEC) adopted new standards for air compressors, portable electric spas, and portable air conditioners. CEC is currently conducting rulemakings for hearth products, certain linear fluorescent lamps, commercial and industrial fans, pool pump replacement motors, and spray sprinkler bodies.

Other state actions are similarly encouraging. Vermont adopted standards for 16 products in 2018 and adopted two provisions to protect against the rollback of light bulb standards and remaining federal standards in 2017. Nevada's new governor signed a bill to protect against the rollback of federal light bulb standards. The laws in Washington and Colorado include similar light bulb provisions and, like Hawaii's legislation, contain provisions to protect against a repeal of the remaining federal standards. Finally, Hawaii, Nevada, and Washington have joined a handful of drought-prone states (California, Colorado, Georgia, and Texas) that adopted standards for water-saving products such as faucets, showerheads, toilets, and urinals over the past decade. The faucet and showerhead standards will also save energy by reducing hot-water consumption.

SCORING AND RESULTS

States could earn up to 2.5 points for savings from state-specific appliance standards that are not currently preempted by federal standards; they could earn another 0.5 points for adopting existing federal standards, including those for light bulbs due to take effect in 2020. This scoring system credits states for adopting new standards that substitute for or expand on existing federal standards.

We credited standards only if the compliance date (not the adoption date) for at least one state with an equivalent standard was within the past five calendar years or is slated for the future. This acknowledges the important role early adopters play in paving the way for other states. For example, California adopted efficiency standards for televisions in 2009 (compliance required in 2011), followed by Connecticut in 2011 (compliance required in 2014) and Oregon in 2013 (compliance required in 2014). California, Connecticut, and

[64] The report recommends a package of standards that states can adopt and analyzes potential energy, water, and utility bill savings and emissions reductions.

Oregon get credit for television standards in 2019 because the most recent compliance date (2014) is within the past five years. If no additional states pass television standards, we will not count those savings in 2020, since no compliance dates will be within five calendar years.

We calculated scores for the adoption of state standards on the basis of cumulative per capita savings (measured in million Btus) through 2035.[65] We used a floating start date that aligns with each state's product compliance date. For example, standards for commercial dishwashers will take effect in Vermont in 2020. Our savings analysis for that product in Vermont covers the period from 2020 to 2035. Colorado and Washington adopted standards for commercial dishwashers that will take effect in 2021, and so for those states the analysis period begins in 2021.

Our savings estimates were based on the approach used by ASAP and ACEEE in previous analyses of savings from appliance standards (Mauer, deLaski, and DiMascio 2017). We used estimates of annual shipments, per-unit energy savings, and average product lifetime based on the best available data. To estimate state-by-state shipments, we allocated national shipments to individual states on the basis of population. We also accounted for the portion of sales that had already met the standard level at the time the first state standard was established for a given product.

We normalized the savings estimates using the population of each state in order to rank states based on per capita energy savings. We scored in 0.5-point increments up to a maximum of 2.5 points.

Table 43 shows the scoring breakdown for state standards.

Table 43. Scoring of savings from state appliance standards

Energy savings through 2035 (MMBtus/capita)	Score
35 or more	2.5
25–34.99	2
15–24.99	1.5
5–14.99	1
0.1–4.99	0.5
No energy savings	0

Other consideration	Score
Adoption of existing federal standards	+0.5

Table 44 shows the scoring results, with points allocated for the adoption of both state-specific and federal standards.

[65] For this edition of the *Scorecard*, we changed the end year for the cumulative savings calculation from 2030 to 2035. We had not adjusted the year since 2010.

Table 44. Scoring for appliance efficiency standards

State	Energy savings from state standards through 2035 (MMBtus/capita)	Year most recent state standards adopted	Score for adoption of state standards	Score for adoption of federal standards	Total score (3 pts.)
California	47.8	2019	2.5	0.5	3.0
Colorado	18.3	2019	1.5	0.5	2.0
Washington	18.3	2019	1.5	0.5	2.0
Vermont	16.5	2019	1.5	0.5	2.0
Hawaii	14.9	2019	1	0.5	1.5
Connecticut	11.2	2011	1	–	1.0
Oregon	11.2	2013	1	–	1.0
Nevada	–	2019	–	0.5	0.5

California scored the maximum of 2.5 points on savings from 11 products, including televisions and several types of lighting. Colorado earned credit for new products plus plumbing product standards adopted in 2014; Washington and Hawaii, for new products; and Connecticut and Oregon, for TV standards passed in 2011 and 2013, respectively. Vermont earned credit for a package of standards adopted in 2018. California, Colorado, Hawaii, Nevada, Vermont, and Washington earned 0.5 points for adopting a law to protect against rollback of light bulb efficiency and/or repeal of federal standards.

Leading and Trending States: Appliance and Equipment Efficiency Standards

Washington. On May 7, 2019, Governor Jay Inslee signed HB 1444, setting energy and water efficiency standards for 16 products and adopting 2020 federal light bulb standards and any remaining federal standards into state law to protect against rollbacks. Washington overcame lighting and computer industry objections, paving the way for other states to follow. For example, the lighting industry was opposed to standards for high-color-rendering-index (CRI) lighting but ultimately agreed to support the bill once the state changed the compliance date from 2021 to 2023.

Colorado. Representative Meg Froehlich, a freshman legislator, led a successful bipartisan effort to adopt Colorado's first comprehensive appliance standards bill for 15 products. Colorado had previously adopted standards for four water-saving products (faucets, showerheads, toilets, and urinals) in 2014. The new law also includes provisions to protect against the light bulb rollback and the repeal of federal standards. Advocates referred to the bill as "the best energy and water savings policy you've never heard of."

Hawaii. Legislators passed a bill to adopt standards for five products (computers and monitors, faucets, high-CRI fluorescent lamps, showerheads, and spray sprinkler bodies), most of them aligning with standards already adopted in California. The bill was held up by implementation issues in 2018, but in 2019 stakeholders worked together on a compromise plan. To improve compliance, the public benefits fee administrator is tasked with educating and training appliance manufacturers, distributors, and retailers about the standards.

Chapter 8. Conclusions

STATES LEAD ON CLEAN ENERGY AND THE EVOLVING ROLE OF EFFICIENCY

Determined to move issues like climate change and building a zero-carbon economy to center stage in 2019, a growing number of states looked to energy efficiency to help meet their objectives. We saw a string of 2019 bills setting 100% clean energy targets in states including Nevada, New Mexico, Washington, New York, and Maine, which joined California and Hawaii in adopting that target. These policies recognize energy efficiency as a core strategy to achieve state carbon goals. Many states have committed to efficiency for its broad range of additional benefits, including lowering energy bills, easing home energy burdens, improving air quality, and creating local jobs. The year also saw several states taking the lead in advancing efficiency in areas typically guided at the federal level, including policies to curb vehicle emissions and set efficiency standards for consumer appliances.

At the same time, diverging factors are influencing the uptake of some efficiency technologies. For example, federal lighting standards, approved in 2017 and expected to save consumers billions on energy bills upon implementation in 2020, faced a potential reversal under a proposal issued by the US Department of Energy. But while progress on lighting standards and those targeting vehicle emissions met resistance at the federal level, state-level conversations around efficiency continued to evolve. States are ushering in the next generation of efficiency by targeting home retrofits, net-zero homes and buildings, and ongoing efforts to strengthen and evolve programs to achieve deeper levels of savings (ACEEE 2019).

EXTENSION AND EXPANSION OF SAVINGS TARGETS

The year was one of the busiest in recent history for utility target-setting efforts, with more than half a dozen states approving new multiyear savings goals for utilities. These included Connecticut, Maine, Massachusetts, New Mexico, New York, Washington, and Wisconsin (see Chapter 2). Meanwhile, in New Jersey and Virginia—where some of the most exciting developments were highlighted in last year's *Scorecard*—utilities and regulators were hard at work designing new, expanded program portfolios to meet strengthened legislative efficiency requirements adopted in 2018. Twenty-six states (as of July 2019) are currently implementing EERS policies requiring specified levels of electricity savings. Of these states, 19 also have EERS policies in place for natural gas. Washington State recently passed HB 1257, which calls on utilities to establish gas targets to take effect in 2022.

Among the most active states were those where new governors brought a renewed focus on climate and conservation policies. New Mexico's HB-291, signed by the new governor in April, effectively required utilities to double existing efforts to achieve savings of 5% of 2020 sales by 2025, in addition to expanding a cap on program spending and enabling decoupling. In Nevada, NV Energy entered into a new phase of increased energy savings under strengthened targets established by the utility's Joint Integrated Resource Plan. And in Colorado, following last year's PUC decision to ramp up Xcel's savings targets, the governor signed a series of clean energy bills aimed at moving the state toward a 100% carbon-free future. The legislation established a goal of reducing economy-wide carbon emissions by 90%, set a price on carbon (at least $46 per ton of CO_2) for utilities to consider

in energy resource decision making, and strengthened building energy codes and appliance efficiency standards.

A growing number of states are also better aligning utility savings targets with evolving priorities such as decarbonization, cost, equity, and grid value. Massachusetts is embracing strategic electrification by adding resource targets matched with measures to reduce winter and summer peak demand and new incentives for homeowners to switch from oil and propane furnaces to electric heat pumps. Both New York and Massachusetts are pairing GHG reduction targets with fuel-neutral goals measured in Btus. Working alongside existing resource-specific goals for electricity and natural gas, fuel-neutral goals give states flexibility in addressing savings goals for multiple fuels while permitting efficiency measures that result in a net reduction of GHGs despite adding grid load.

APPLIANCE STANDARDS

State-level activity on appliance standards also made headlines this year with California, Washington, Colorado, Hawaii, and Nevada all stepping up to champion laws to promote efficient consumer products. Each of these states passed appliance standards this year expected to save consumers hundreds of millions of dollars on utility bills. These efforts come at an important time, as progress on federal standards, a primary driver of appliance savings for several decades, has stalled. The Trump administration has withheld several completed national standards from publication and seeks to roll back previously approved light bulb standards.

A total of 10 states and the District of Columbia filed standards legislation in 2019 based on recommendations from the ASAP and ACEEE report *States Go First* and its 2019 update (Mauer, deLaski, and DiMascio 2017; ASAP 2018) States also added legislative provisions to protect against the rollback of light bulb and other federal standards.

Bills in Washington State and Colorado adopt new standards for more than 15 products including computers and monitors, faucets, showerheads, commercial dishwashers, and portable air conditioners. Hawaii's governor signed a bill establishing standards for five products. Nevada passed legislation to protect against the light bulb standard rollback. The laws in Washington and Colorado include a similar light bulb provision and, like the Hawaii legislation, protect against a repeal of the remaining federal standards. California also adopted new standards this year for air compressors, portable electric spas, and portable air conditioners.

ELECTRIC VEHICLES

States and utilities continued to lead the way in transportation efficiency in 2019. The administration's efforts to undo previously established national vehicle efficiency standards for 2022–2025 continued this year with the EPA drafting proposed rules that would freeze standards at 2020 levels through 2026. Nevertheless, 14 states and the District of Columbia continue to embrace California's stringent standards while a coalition of 17 states have sued to block the attempted rollback. According to research from the International Council on

Clean Transportation (ICCT), states and cities committed to cleaner cars represent 60% of the US market (ICCT 2019).[66]

While a long-awaited electric vehicle revolution did not quite materialize in 2019, the year did see a surge in rulemaking proceedings as policymakers, utilities, and manufacturers continued to work together to refine rate designs, incentives, and interconnection practices for charging infrastructure. Signs that EVs may be quickly approaching their breakout year appeared everywhere. Since the 2018 *Scorecard*, Google Maps has added features enabling drivers to search for nearby charging stations and determine real-time availability of charging ports. Nearly all states undertook EV-related regulatory actions of some sort, and some, like Missouri and Wisconsin, opened new EV investigatory proceedings. Maryland's PSC approved an electric vehicle infrastructure program to roll out 5,000 chargers. Other states pushing to accelerate EV progress included Oregon and New Mexico, both of which moved to require public utilities to file plans to ramp up transportation electrification. Meanwhile, California, where roughly half of all electric vehicles are sold, continues to lead the way, approving major electrification plans for the state's electric IOUs in 2018 to help push the state toward its goal of 5 million ZEVs and 250,000 public chargers by 2030 (ICCT 2018).

BUILDINGS

The buildings sector also saw a flurry of important activity at the state and local levels, especially as interest grew in zero-energy codes as a complement to state decarbonization and electrification goals. Since the International Code Council's 2017 publication of the 2018 IECC, a number of states including Illinois, Maryland, Massachusetts, and Nevada have adopted this latest version. Colorado, a home rule state, passed HB 19-1260, requiring local jurisdictions to adopt one of the three most recent versions of the IECC. Nebraska, taking the lead in Midwest buildings efficiency with the passage of LB 405, upgraded the state code from the 2009 to the 2018 IECC. Meanwhile ASHRAE 90.1-2019, a national model energy code for commercial buildings, was released this year, and the development process was already underway for the 2021 IECC. States like California, Washington, Vermont, and New York implemented stretch codes, encouraging innovation to slash energy use beyond national model code levels.

DATA LIMITATIONS

The scoring framework used in this report is our best attempt to represent the myriad efficiency metrics as a quantitative score. Any effort to convert state spending data, energy savings data, and adoption of best-practice policies across six policy areas into one state energy efficiency score has obvious limitations. One of the most pronounced constraints is access to recent, reliable data on the results of energy efficiency. Because many states capture relatively little data on energy efficiency policy efforts, often under varying reporting protocols, we used a best-practices approach to score some policy areas. As an example, it is difficult to score states on building energy code compliance rates given that

[66] This count includes 14 states and the District of Columbia adopting California's clean car standards, nine states and DC adopting California's zero-emissions standard, 23 state governors joining the US Climate Alliance, and 425 municipal leaders belonging to the network of Climate Mayors.

many do not collect the relevant data, and also because of the variations in code stringency among states. In an effort to better quantify projected impacts of adopted codes, in 2018 the *Scorecard* began using modeled energy performance values based on analysis of state-specific code amendments by the New Buildings Institute. However the actual, measurable success of these codes in reducing energy consumption is unclear without a way to verify implementation. As data become more readily available, we will continue to explore ways to incorporate a more quantitative assessment of compliance in future *Scorecard*s.

As in the past, we faced a similar difficulty in scoring state-backed financing and incentive programs for energy efficiency investments. Though many states have seemingly robust programs aimed at residential and commercial consumers, few are able to relay information on program budgets or energy savings resulting from such initiatives. As a result, we can offer only a qualitative analysis of these programs. This lack of quantitative data is growing more pronounced as many states begin pouring financial resources into green banks. Without comparable results on dollars spent and rigorously evaluated energy savings, it is impossible to assess these programs with the same scrutiny that we bring to bear on utility programs.

POTENTIAL NEW METRICS

We have described relevant potential future metrics or revisions to existing metrics in several chapters of this year's *State Scorecard*. While we believe our data collection and scoring methodology are comprehensive, there is always room for modifications. As the energy efficiency market continues to evolve and data become more available, we will continue to adjust each chapter's scoring metrics. Here we present some additional metrics that currently fall outside the scope of our report but nonetheless indicate important efficiency pathways.

Interest in transportation electrification increased in 2019 as several states directed utilities to develop comprehensive plans to accelerate grid integration of EVs. While ACEEE's *Utility Energy Efficiency Scorecard*—a new edition of which will be released in early 2020—considers utility-specific electricity rate options for EV charging, our *State Scorecard* has yet to establish a scoring metric specifically addressing vehicle electrification. We intend to change this next year by considering the role of states in facilitating increased EV penetration. We plan to track the number of publicly available charging stations within each state and to take a closer look at the recent trend of state efforts to make up for lost gas tax revenues by applying additional registration fees to EV drivers. While it makes sense for EV owners to contribute to the maintenance of roads and infrastructure, these fees are based on questionable assumptions and may work at cross purposes to state goals to encourage EV deployment and address carbon pollution.

As discussed in Chapter 4, model energy codes are a critical driver for strengthening efficiency in the buildings sector. However many states do not directly contribute in the important multi-stakeholder process of code development, instead focusing on adoption and enforcement of the model codes after they have been established. In the *2020 State Scorecard*, we propose to score each state on the ratio of registered code development voters to total eligible voters in order to track levels of statewide commitment to code development.

LAST WORD

Ongoing state actions promoting efficiency demonstrate the value that saving energy brings across the economy by reducing energy demand and emissions while strengthening grid reliability and resilience. The impact on emissions is considerable. The US Energy Information Administration has found that half the carbon dioxide emissions reductions in the electric power sector since 2005 have been due to actions to reduce demand growth (EIA 2018a). Meanwhile ACEEE analyses have determined that the United States can slash its projected energy use approximately 50% by 2050 through a suite of energy efficiency measures including zero-energy homes, building retrofits, industrial energy efficiency, and vehicle fuel economy (Nadel 2016; Nadel and Unger 2019). ACEEE has also found that the average cost of efficiency to utilities is less than that of wind or utility-scale solar and that, overall, energy efficiency and clean energy continue to come in at a lower cost per kWh than traditional resources (Molina and Relf 2018).

Most of the states that have prioritized reducing their GHG footprint see efficiency as a vital strategy for getting there. Since the *2018 State Scorecard*, seven new states—Illinois, Maine, Michigan, New Mexico, Nevada, Pennsylvania, and Wisconsin—have signed on to the US Climate Alliance, a bipartisan coalition committed to reducing GHG emissions by at least 26% below 2005 levels by 2025.

Grid needs continue to evolve in response to rapid advances in technology, including smart meter proliferation, low-cost renewables, and rising sales of electric vehicles and energy storage. As they do, many states are revising utility planning processes and regulations to encourage the deployment of these technologies and remove barriers to their adoption. In the first quarter of 2019 alone, the NC Clean Energy Technology Center counted almost 400 grid modernization policy actions among 44 states, spanning utility business model reform, energy storage, microgrids, and demand response (Proudlove, Lips, and Sarkisian 2019).

With so many states advancing efficiency policies on multiple fronts, 2019 offered a wealth of examples of what is possible when policymakers unite around commitment to clean energy and climate issues. Continued progress on efficiency will face challenges like improving program participation in the industrial sector, assessing efficiency's time and locational value to the grid, and addressing equity concerns. The top states in this year's *Scorecard* are adopting new technologies and developing new policies and regulations to confront these issues as they lead the transition to a clean and efficient energy economy.

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Appendix A. Respondents to Utility and State Energy Office Data Requests

State	Primary state energy office data request respondent	Primary public utility commission data request respondent
Alabama	Maureen Neighbors, Director, Energy Division, Alabama Department of Economic and Community Affairs	—
Alaska	Jimmy Ord, Energy Program Information Manager, Alaska Housing Finance Corp.	—
Arizona	—	Laurie Woodall, Arizona Corporation Commission
Arkansas	Mitchell Simpson, Director, Arkansas Energy Office	Robert Booth, Rate Case Analyst, Arkansas Public Service Commission
California	Bill Pennington, Deputy Division Chief, Efficiency and Renewable Energy Division, California Energy Commission	Amanda Jordan Christenson, Energy Efficiency Analyst, California Public Utilities Commission
Colorado	Will Toor, Executive Director, and Andrew Sand, Deputy Director, Colorado Energy Office	Seina Soufiani, Engineer, Colorado Public Utilities Commission, Department of Regulatory Agencies
Connecticut	Michele Melley, Associate Research Analyst, Connecticut Department of Energy and Environmental Protection	Michele Melley, Associate Research Analyst, Connecticut Department of Energy and Environmental Protection
Delaware	Jessica Quinn, Renewable Energy Planner, Delaware Division of Energy & Climate	Jessica Quinn, Renewable Energy Planner, Delaware Division of Energy & Climate
District of Columbia	Marshall Duer-Balkind, Program Analyst, District Department of Energy & Environment	Ben Plotzker, Technical Energy Analyst, Vermont Energy Investment Corporation
Florida	Kelley Smith Burk, Director, Office of Energy, Florida Department of Agriculture and Consumer Services	Tripp Coston, Economic Supervisor, Conservation, Florida Public Service Commission
Georgia	—	Jamie Barber, Energy Efficiency and Renewable Energy Manager, Georgia Public Service Commission
Hawaii	—	Ashley Norman, Research Analyst, Hawaii Public Utilities Commission
Idaho	Katie Pegan, Policy Analyst, Idaho Governor's Office of Energy and Mineral Resources	Cassandra Koerner, Utility Analyst, Idaho Public Utilities Commission
Illinois	—	David Brightwell, Economist, Illinois Commerce Commission
Indiana	—	—
Iowa	Adrienne Ricehill, Program Manager, Iowa Economic Development Authority	Brenda Biddle, Utility Specialist, Iowa Utilities Board
Kansas	—	—

State	Primary state energy office data request respondent	Primary public utility commission data request respondent
Kentucky	Kenya Stump, Assistant Director, Kentucky Energy and Environment Cabinet – Office of Energy Policy	Greg Bone, Kentucky Energy and Environment Cabinet – Office of Energy Policy
Louisiana	—	—
Maine	Lisa Smith, Senior Planner, Governor's Energy Office	Jack Riordan, Strategic Initiatives, Efficiency Maine
Maryland	Jenn Gallicchio, Assistant Director of Energy Programs, Maryland Energy Administration	Dan Hurley, Director, Energy Analysis and Planning Division, Maryland Public Service Commission
Massachusetts	Lyn Huckabee, Residential Energy Efficiency Program Coordinator, Massachusetts Department of Energy Resources	Lyn Huckabee, Residential Energy Efficiency Program Coordinator, Massachusetts Department of Energy Resources
Michigan	Terri Novak, State Administrative Manager, Julie Staveland, SEP Specialist, Michigan Energy Office	Fawzon Tiwana, Economic Analyst, Michigan Public Service Commission
Minnesota	Anthony Fryer, Conservation Improvement Program Coordinator, Minnesota Department of Commerce	Anthony Fryer, Conservation Improvement Program Coordinator, Minnesota Department of Commerce
Mississippi	Sumesh Arora, Director of Energy & Natural Resources Division, Mississippi Development Authority	Vicki Munn, Electric, Gas & Communications Division, Mississippi Public Utilities Staff
Missouri	Cherylyn Kelley, Energy Policy Analyst, Missouri Department of Economic Development	Brad Fortson, Manager, Energy Resources Department, Missouri Public Service Commission
Montana	Garrett Martin, Senior Energy Analyst, Montana Energy Office	Robin Arnold, Policy Analyst, Montana Public Service Commission
Nebraska	—	Marc Shkolnick, Manager of Energy Services, Lincoln Electric System
Nevada	Robin Yochum, Energy Program Manager, Nevada Governor's Office of Energy	Darci Stewart, Nevada Public Utility Commission
New Hampshire	Alexis LaBrie, Energy Analyst, New Hampshire Office of Strategic Initiatives	Jim Cunningham, Utility Analyst, New Hampshire Public Utility Commission
New Jersey	Kelly Mooij, Deputy Director, New Jersey Board of Public Utilities	Kelly Mooij, Deputy Director, New Jersey Board of Public Utilities
New Mexico	Harold Trujillo, Bureau Chief, Energy Technology and Engineering, New Mexico Energy Office	John Reynolds, New Mexico Public Regulation Commission
New York	Robert Bergen, New York State Energy Research and Development Authority (NYSERDA)	Robert Bergen, New York State Energy Research and Development Authority (NYSERDA)

State	Primary state energy office data request respondent	Primary public utility commission data request respondent
North Carolina	Russell Duncan, Energy Assurance Manager, North Carolina Department of Environmental Quality	Jack Floyd, Engineer, Electric Division, Public Staff, North Carolina Utilities Commission
North Dakota	—	—
Ohio	Deborah Ohler, Staff Engineer, Division of Industrial Compliance, Ohio Department of Commerce	Gina Conigilo, Utility Analyst, Ohio Public Utility Commission
Oklahoma	—	Kathy Champion, Regulatory Analyst, Oklahoma Corporation Commission
Oregon	Warren Cook, Manager, Energy Efficiency and Conservation, Oregon Department of Energy; Erik Havig, Planning Section Manager, Oregon Department of Transportation	Warren Cook, Manager, Energy Efficiency and Conservation, Oregon Department of Energy; Anna Kim, Senior Utility Analyst, Energy Resources and Planning, Oregon Public Utility Commission; David Moody, Manager, Program Marketing, Bonneville Power Administration; Andrew Hudson, Planning Project Manager, Energy Trust of Oregon
Pennsylvania	Libby Dodson, Energy Program Specialist, Department of Environmental Protection	Joseph Sherrick, Supervisor, Policy and Planning, Pennsylvania Public Utility Commission
Rhode Island	Carrie Gill, Program Services Officer, Rhode Island Office of Energy Resources	—
South Carolina	—	Jocelyn Boyd, Chief Clerk, South Carolina Public Service Commission
South Dakota	Michele Farris, State Energy Manager	Darren Kearney, Utility Analyst, South Dakota Public Utilities Commission
Tennessee	Erik Franey, Specialist, Strategy, Marketing & Support, Tennessee Valley Authority	Jake Todd, Specialist, Strategy, Marketing, & Support, Tennessee Valley Authority
Texas	—	—
Utah	Shawna Cuan, Energy Efficiency and Programs Manager, Governor's Office of Energy Development	Carol Revelt, Executive Staff Director, Utah Public Service Commission
Vermont	Kelly Launder, Assistant Director, and Barry Murphy, Energy Efficiency Program Specialist, Vermont Public Service Department	Kelly Launder, Assistant Director, and Barry Murphy, Energy Efficiency Program Specialist, Vermont Public Service Department
Virginia	Barbara Simcoe, State Energy Program Manager, Virginia Division of Energy, Department of Mines, Minerals, and Energy	—
Washington	Chuck Murray, Washington Department of Commerce	Jennifer Snyder, Regulatory Analyst, Washington State Utilities & Transportation Commission

State	Primary state energy office data request respondent	Primary public utility commission data request respondent
West Virginia	Tiffany Bailey, Energy Development Specialist, West Virginia Division of Energy	Karen Hall, Public Information Specialist, Public Service Commission of West Virginia
Wisconsin	Maria Redmond, Director, Office of Energy Innovation, Public Service Commission of Wisconsin	Joe Fontaine, Focus on Energy Performance Manager, Public Service Commission of Wisconsin
Wyoming	Sherry Hughes, Energy Efficiency Program Manager, Wyoming State Energy Office	—

Appendix B. Electric Efficiency Program Spending per Capita

State	2018 electric efficiency spending ($ million)	$ per capita
Vermont	61.8	98.67
Massachusetts	577.1	83.61
Rhode Island	88.1	83.32
Oregon	156.6	37.37
Maryland	217.3	35.97
Washington	269.7	35.79
California	1,369.4	34.62
Connecticut	121.3	33.95
Idaho	59.0	33.64
Maine	44.3	33.07
Illinois	420.5	33.00
Iowa	104.1	32.98
New York	633.5	32.42
Minnesota	171.6	30.58
New Hampshire	35.2	25.94
Michigan	252.3	25.24
District of Columbia	15.8	22.49
Arkansas	67.3	22.33
Colorado	116.9	20.52
Wyoming	10.0	17.24
Oklahoma	65.2	16.54
Wisconsin	92.0	15.83
Ohio	183.9	15.74
New Mexico	32.8	15.65
Nevada	46.8	15.43
Indiana	101.8	15.21
Missouri	93.2	15.21
North Carolina	152.5	14.68
Hawaii	20.8	14.63
New Jersey	129.3	14.52
Pennsylvania	184.9	14.44
Utah	44.3	14.01
Montana	12.2	11.50
Arizona	82.4	11.49
Delaware	10.8	11.17
South Carolina	53.8	10.58
Florida	195.4	9.17
West Virginia	12.2	6.75
Texas	165.5	5.77
Georgia	60.5	5.76
Mississippi	16.5	5.51
Kentucky	24.3	5.43
Nebraska	9.7	5.03
South Dakota	4.3	4.87
Tennessee	24.3	3.59
Virginia	20.6	2.42
Louisiana	11.1	2.38
Alabama	5.4	1.11
North Dakota	0.2	0.24
Kansas	0.3	0.12
Alaska	0.0	0.00
US total	**6,648.7**	
Median	**61.8**	**15.21**

Appendix C. Large-Customer Self-Direct Programs by State

State	Availability	Description
Arizona	Customers of Arizona Public Service Company (APS), Tucson Electric Power Company (TEP), and Salt River Project (SRP)	APS: Large customers using at least 40 million kWh per calendar year can elect to self direct energy efficiency funds. Customers must notify APS each year if they wish to participate, after which 85% of the customer's demand-side management contribution will be reserved for future energy efficiency projects. Projects must be completed within two years. Self-direct funds are paid once per year, once the project is completed and verified by APS. TEP: To be eligible for self-direct, a customer must use a minimum of 35 million kWh per calendar year. SRP: SRP makes self-direct available only to very large customers using more than 240 million kWh per year. For all utilities, a portion of the funds they would have otherwise contributed to energy efficiency is retained to cover self-direct program administration, management, and evaluation costs.
Colorado	Customers of Xcel Energy and Black Hills	Xcel: The self-direct program is available to commercial and industrial (C&I) electric customers who have an aggregated peak load of at least 2 MW in any single month and an aggregated annual energy consumption of at least 10 GWh. Self-direct program customers cannot participate in other conservation products offered by the company. Rebates are paid based on actual savings from a project, up to $525 per customer kW or $0.10 per kWh. Rebates are given for either peak demand or energy savings, but not both and are limited to 50% of the incremental cost of the project. Xcel uses raw monitoring results and engineering calculations to demonstrate actual energy and demand savings. Black Hills: To participate in the C&I self-direct program, customers must have an aggregated peak load greater than 1 MW in any single month and aggregated annual energy usage of 5,000 MWh. Rebates and savings are calculated on a case-by-case basis, with rebate values calculated as either 50% of the incremental cost of the project or $0.30 per kWh savings, whichever is lower.
Idaho	Customers of Idaho Power	Idaho Power offers its largest customers an option to self direct the 4% energy efficiency rider that appears on all customers' bills. Customers have three years to complete projects, with 100% of the funds available to fund up to 100% of project costs. Self-direct projects are subject to the same criteria as projects in other efficiency programs.

State	Availability	Description
Illinois	Statewide for natural gas customers based on North American Industry Classification System (NAICS) code; pilot program for ComEd electric customers	Self-direct is generally applicable to customers of natural gas utilities subject to the Illinois Energy Efficiency Portfolio Standard. The North American Industry Classification System's (NAICS) threshold code number is 22111 or any such code number beginning with the digits 31, 32, or 33, and annual usage in the aggregate of 4 million therms or more in the affected gas utility's service territory or with aggregate usage of 8 million therms or more in the state. Customers must agree to set aside for their own use in implementing energy efficiency 2% of the customer's cost of natural gas, composed of the customer's commodity cost and the delivery service charges paid to the gas utility, or $150,000, whichever is less. For evaluation, the Illinois Department of Commerce and Economic Opportunity has the ability to audit compliance and take remedial action for noncompliance.
Michigan	Statewide	Self-direct is available statewide. Customers must have had an annual peak demand in the preceding year of at least 1 MW in the aggregate at all sites. Customers may use the funds that would otherwise have been paid to the utility provider for energy efficiency programs; however they must submit the portion of the energy efficiency funds that would have been collected and used for low-income programs to their utility provider. Customers then calculate the energy savings achieved and provide the funds to their utility provider. The percentage of eligible customers statewide is not calculated; however in 2009 there were 77 large customers who self directed. By 2014 that number had dropped to 24.
Minnesota	Statewide	Minnesota offers a self-direct option, with a full exemption from assigned cost-recovery mechanism (CRM) fees, to customers with 20 MW average electric demand or 500,000 MCF of gas consumption. Customers must also show that they are making "reasonable" efforts to identify or implement energy efficiency and that they are subject to competitive pressures that make it helpful for them to be exempted from the CRM fees. Participating customers must submit new reports every five years to maintain exempt status. The utility is not involved in self-direct program administration; the state Department of Commerce manages self-direct accounts and is the arbiter of whether a company qualifies for self-direct and is satisfying its obligations.
Montana	Statewide (all regulated public utilities)	Customers with average monthly demand of 1,000 kW can self direct universal systems benefits (USB) funds. Self-direct customers are reimbursed for their annual energy efficiency expenditures up to the amount of their annual total of USB rate payments to their utility. The transaction occurs directly between the customer and the utility, and the latter tabulates and summarizes self-directed funds annually. This does not include specifics or evaluation of efficiency projects. Evaluation of savings claims is not required.

State	Availability	Description
New Jersey	Statewide	Eligible customers must have contributed at least $300,000 in energy efficiency fee funds during the previous fiscal year. Customers can aggregate multiple buildings or sites together to meet the threshold. The facilities must also have a total annual billed peak demand of 400 kW or greater to ensure projects are large enough, since the program was designed for only the state's largest commercial and industrial customers. Participants submit a Draft Energy Efficiency Plan (DEEP), which gives the program an overview of the proposed project and serves as a basis for reserving incentives. The incentive structure returns 90% of a participant's New Jersey's Clean Energy Program (NJCEP) fund contribution from the previous fiscal year, unless that amount exceeds 75% of total project costs or $0.33 per projected kWh savings.
New Mexico	Statewide in the territories of three investor-owned utilities (IOUs)	Self-direct is available statewide. Customers who use more than 7,000 MWh annually may administer their own energy efficiency projects (Southwestern Public Service). They receive an exemption of, or a credit for, an amount equal to expenditures that they have made at their facilities on and after January 1, 2005. Evaluation is required. Public Service Company of New Mexico reported three self-direct programs in 2015. Southwestern Public Service (SPS) reported no participants in either 2014 or 2015 and did not foresee any 2016 participants. El Paso Electric reported no participants in 2014.
New York	Statewide (all six electric utilities)	To be eligible, individual customers must have a 36-month average demand of 2 MW or greater. Customers with an aggregated 36-month average demand of 4 MW or greater will also be eligible if one or more of the accounts aggregated has at least a 36-month average demand of 1 MW. Upon enrollment, participants are assigned an Energy Savings Account (ESA) to collect their fee contributions for efficiency assessed on their utility bills, which would otherwise be allocated to the general pool for utility-administered energy efficiency programs. The utility manages the ESA and may retain up to 15% for program administration and measurement and verification (M&V). The program runs on a three-year cycle, and participants will have access to at least 85% of their energy efficiency fee contributions to fund-eligible projects during that time. Before projects are implemented, participants provide a Project Plan—including details on expected costs, savings, baseline calculation, M&V plan, and schedule—for the utility to review and approve.

State	Availability	Description
Oregon	Customers of Portland General Electric, PacifiCorp, and select customers of Emerald People's Utility District (PUD)	The self-direct option for the Public Purpose Charge is available to sites that are served by two of the three investor-owned utilities and that meet the program requirements. One consumer-owned utility has chosen to participate in the self-direct program for select customers (those formerly served by an investor-owned utility). Programs cover approximately 80% of the electric customers in Oregon. Eligible sites must demonstrate usage of more than 8,760,000 kWh in the prior year to enter and remain in the program. Participants served by the three participating utilities have their proposed projects technically reviewed by the Oregon Department of Energy. In two programs, expenditures toward qualified projects are used as credit to offset future Public Purpose Charges. The credit is applied on-bill. In the third program, the utility has a set-aside program in combination with credit toward future Public Purpose Charges. These funds are provided by check and/or on-bill. The Oregon Department of Energy conducts a technical review of claimed savings before pre-certifying project eligibility and prior to project construction. It reviews a sampling of projects for actual performance. Of the estimated 230 sites eligible to self direct, around 80 are participating by self directing either their renewable and/or conservation portions of their public purpose charge obligation. Utilities do not publish the percentage of eligible load saved. Total savings for 2018 were 7,213,754 kWh.

State	Availability	Description
Vermont	Statewide for both electric and natural gas customers	For electric energy efficiency, three self-direct options are available statewide: the Self-Managed Energy Efficiency Program (SMEEP), the Customer Credit Program (CCP), and Energy Savings Accounts (ESA). SMEEP is also available for the state's eligible gas customers. The SMEEP option requires prospective participants or their predecessors to have contributed $1.5 million to the Vermont Energy Efficiency Utility Fund (VEEUF) in 2008 or 2017 through the Energy Efficiency Charge (EEC) adder on their electric costs. Two customers meet that standard. The ESA option allows Vermont businesses that pay an EEC in excess of $5,000 per year (or an average of $5,000 per year over three years) to use a portion of their EEC to support energy efficiency projects in their facilities. For CCP, eligible customers must be ISO 14001 certified and meet several conditions similar to ENERGY STAR® for industrial facilities. Natural gas energy efficiency is available only for transmission and industrial electric and natural gas ratepayers who have a minimum of $1.5 million in customer efficiency charges for electric use. In addition, the Vermont Public Service Board lets eligible Vermont business customers self-administer energy efficiency through an ESA or the CCP. Customers still pay these funds into the VEEUF; the customers recoup the funds upon completion of an eligible energy efficiency measure. For natural gas, ESA and CCP participants can access a percentage of the funds paid into the VEEUF to undertake approved energy efficiency measures. For the SMEEP electric program, eligible customers must demonstrate that they have a comprehensive energy management program with annual objectives, or that they have achieved ISO 14001 certification. These customers must report to the Public Service Board, detailing the measures undertaken, the estimated energy and cost savings, and any related costs. The Board then reviews and approves the reports. The ESA account operates through Efficiency Vermont; the related savings are reported and verified through the savings verification mechanism. For CCP, eligible customers must be ISO 14001 certified and meet several conditions similar to ENERGY STAR for industrial facilities. Savings are verified through existing mechanisms.
Washington	All utilities have the option to develop self-direct options for industrial and commercial customers, but of the IOUs, only Puget Sound Energy has developed a self-direct program	Puget Sound Energy's self-direct program is available only to industrial or commercial customers on electric rate-specific rate schedules. The self-direct program operates on a four-year cycle comprising two phases: noncompetitive and competitive. During the noncompetitive phase, customers have exclusive access to their energy efficiency funds, which are collected over the four-year period. When this phase ends, any unused funds are pooled together and competitively bid on by the members of the self-direct program. Customers receive payment in the form of a check once the project is complete and verified. Participating customers do not receive any rate relief when they complete energy efficiency investments. The utility pre- and post-verifies 100% of the projects, including a review and revision of savings calculations to determine incentive levels. The program is included in the third-party evaluation cycle like any other utility conservation program.

State	Availability	Description
Wisconsin	Statewide	A self-direct option is open to customers that meet the definition of a large energy customer according to the 2005 Wisconsin Act 141. Under the self-direct option, a true-up at the end of the year returns contributions to participating customers for use on energy efficiency projects. Evaluation is required under Public Service Commission Administrative Code 137, with evaluation plans reviewed by that commission. This option has been available since 2008, but no customers have participated to date.

Appendix D. State Energy Efficiency Resource Standards

State Year(s) enacted Authority Applicability (% sales affected)	Description	Avg. incremental electric savings target per year (2019 onward)	Stringency	Reference	Score
Arizona 2010 Regulatory Electric and nat. gas IOUs, co-ops (~56%)	Electric: Incremental savings targets began at 1.25% of sales in 2011, ramping up to 2.5% in 2016–20 for cumulative annual electricity savings of 22% of retail sales, 2% of which may come from peak demand reductions. Natural gas: ~0.6% annual savings (for cumulative savings of 6% by 2020). Co-ops must meet 75% of targets.	2.1%	Binding	Docket No. RE-00000C-09-0427, Decision 71436 Docket No. RE-00000C-09-0427, Decision 71819 Docket No. RG-00000B-09-0428, Decision 71855	2.5
Arkansas 2018 Regulatory Electric and nat. gas IOUs (~50%)	Electric: Incremental targets for PY 2020–22 of 1.2% of 2018 retail sales for electric IOUs. Natural gas: Annual incremental reduction target of 0.50% for 2020–22 for natural gas IOUs.	1.2%	Opt-out	Order No. 43, Docket No. 13-002-U Order No. 17, Docket No. 08-144-U Order No. 1, Docket No. 13-002-U Order No. 7, Docket No. 13-002-U Order No. 31, Docket No. 13-002-U Order No. 43, Docket No.13-002-U	1.5

State Year(s) enacted Authority Applicability (% sales affected)	Description	Avg. incremental electric savings target per year (2019 onward)	Stringency	Reference	Score
California 2004, 2009, and 2015 Legislative Electric and nat. gas IOUs (~73%)	While SB 350, signed in 2015, called on state agencies and utilities to double cumulative efficiency savings achieved by 2030, work to develop specific utility targets is ongoing. Electric: Average incremental savings targets of about 1.3% of retail sales electricity from 2020–25. Natural gas: Incremental savings targets average 0.87% from incentive and codes and standards programs for natural gas from 2020–25 Utilities must pursue all cost-effective efficiency resources.	1.3%	Binding	CPUC Decision 15-10-028 CPUC Decision 17-09-025 AB 995 SB 350 (10/7/15) AB 802 (10/8/15)	1.5
Colorado 2007 and 2017 Legislative Electric and nat. gas IOUs (~56%)	Electric: For 2015–18, PSCo had been required to achieve incremental savings of at least 400 GWh per year; starting in 2019, this was increased to 500 GWh, or roughly 1.7% of sales. HB 17-1227 extends programs and calls for 5% energy savings by 2028 compared to 2018. Natural gas: Savings targets commensurate with spending targets (at least 0.5% of prior year's revenue).	1.7%	Binding	Colorado Revised Statutes 40-3.2-101, et seq.; Docket No. 13A-0686EG Dec. C14-0731 HB17-1227 Proceeding no. 17A-04262EG: Settlement Agreement (2/26/18) Dec. C18-0417 approving settlement agreement in proceeding 17A-0462EG	2.0
Connecticut 2007 and 2013 Legislative Electric and nat. gas IOUs (~93%)	Electric: Average incremental savings of 1.11% of sales from 2019 through 2021. Natural gas: Average incremental savings of 0.59% per year from 2019 through 2021. Utilities must pursue all cost-effective efficiency resources.	1.1%	Binding	Public Act No. 07-242 Public Act No. 13-298 2019–21 Electric and Natural Gas Conservation and Load Management Plan	2.0

State Year(s) enacted Authority Applicability (% sales affected)	Description	Avg. incremental electric savings target per year (2019 onward)	Stringency	Reference	Score
Hawaii 2004 and 2009 Legislative Electric Statewide goal (100%)	In 2009, transitioned away from a combined RPS-EERS to a stand-alone EEPS goal to reduce electricity consumption by 4,300 GWh by 2030 (equal to ~30% of forecast electricity sales, or 1.4% annual savings).	1.4%	Binding	HRS §269-91, 92, 96 HI PUC Order, Docket No. 2010-0037	1.0
Illinois 2007 and 2016 Legislative Electric and nat. gas utilities with more than 100,000 customers, Illinois DCEO (~89%)	Electric: Incremental savings targets vary by utility, averaging 1.77% of sales from 2018 to 2021, 2.08% from 2022 to 2025, and 2.05% from 2026 to 2030. SB 2814 also sets a rate cap of 4%, allowing targets to be adjusted downward should utilities reach spending limits. Natural gas: 8.5% cumulative savings by 2020 (0.2% incremental savings in 2011, ramping up to 1.5% in 2019).	1.7%	Cost cap	S.B. 1918 (2009) Public Act 96-0033 § 220 ILCS 5/8-103 S.B. 2814 (2015) Public Act 99-0906 Illinois Energy Efficiency Stakeholder Advisory Group	2.0
Iowa 2009 and 2018 Legislative Electric and nat. gas IOUs (75%)	Requirements for utility submission of energy efficiency goals to the IUB are outlined in SB 2386 (2008). Incremental savings targets vary by utility and have been reduced significantly by a 2% cost cap for electric energy efficiency under SF 2311 (1.5% cap for natural gas). Current gross savings targets average 0.9% of electric sales and 0.2% for natural gas according to five-year utility plans (2019–23). SF 2386 requires municipal utilities and rural cooperatives to set energy efficiency savings goals, but their plans are not reviewed or approved by the IUB.	0.9%	Binding	Senate Bill 2386 Docket EEP-2012-0001 SF 2311 (2018) Iowa Code chapter 1135, § 476.6	1.0

State Year(s) enacted Authority Applicability (% sales affected)	Description	Avg. incremental electric savings target per year (2019 onward)	Stringency	Reference	Score
Maine 2009 Legislative Electric and nat. gas Efficiency Maine (100%)	Electric: Savings of 20% by 2020, with incremental savings targets of ~1.6% per year for 2014–16 and ~2.4% per year for 2017–19. Natural gas: Incremental savings of ~0.2% per year for 2017–19. Efficiency Maine operates under an all cost-effective mandate.	2.4%	Opt-out	Efficiency Maine Triennial Plan (2014–16) Efficiency Maine Triennial Plan (2017–19) HP 1128 – LD 1559	2.5
Maryland 2008 and 2015 Legislative Electric IOUs (97%)	Electricity use reduction goal of 15% per capita by 2015 (10% by utilities, 5% achieved independently); 15% reduction in per capita peak demand by 2015 compared to 2007. After 2015, targets vary by utility, ramping up by 0.2% per year to reach 2% incremental savings.	2.0%	Binding	Maryland Public Utility Companies Code § 7-211 Maryland PSC Docket Nos. 9153–9157 Order No. 87082	2.0
Massachusetts 2009 Legislative Electric and nat. gas IOUs, co-ops, munis, Cape Light Compact (85%)	Electric: Net annual savings of 3.45 million MWh (not including fuel switching) for 2019–21, equivalent to savings of about 2.7% of retail sales per year. Natural gas: Savings goals of 1.25% of retail sales. Net annual savings of 95.89 MMTherms for 2019–21. Additional goal of 261.9 million net lifetime MMBtu for 2019–21. All cost-effective efficiency requirement.	2.7%	Binding	M.G.L. ch. 25, § 21; D.P.U. 18-110 through D.P.U. 18-119 (MA Joint Statewide Three-Year Energy Efficiency Plan for 2019 through 2021.)	3.0
Michigan 2008 and 2016 Legislative Electric and nat. gas Statewide goal (100%)	Electric: 1.0% incremental savings. Natural gas: Incremental savings of 0.75%. Targets carry forward in perpetuity for most utilities, but end in 2021 for non-rate regulated utilities (approximately 10% of state electric load).	1.0%	Binding	Act 295 (2008) S.B. 438 (2016)	1.5

State Year(s) enacted Authority Applicability (% sales affected)	Description	Avg. incremental electric savings target per year (2019 onward)	Stringency	Reference	Score
Minnesota 2007 Legislative Electric and nat. gas IOUs, co-ops with more than 5,000 customers, and munis with more than 1,000 customers (~97%)	Electric: 1.5% incremental savings in 2010 and each year thereafter. Senate File 1456 signed in May 2017 exempts some rural utilities from meeting energy efficiency requirements through the Conservation Improvement Program (CIP). Natural gas: 0.75% incremental savings per year in 2010–12; 1% incremental savings in 2013 and each year thereafter.	1.5%	Binding	Minn. Stat. § 216B.241 SF 1456	2.0
Nevada 2005 and 2009 Legislative Electric IOUs (88%)	20% of retail electricity sales to be met by renewables and energy efficiency by 2015, and 25% by 2025. Energy efficiency may meet a quarter of the standard through 2014, but is phased out of the RPS by 2025. SB 150, signed June 2017, directed the Nevada Public Utilities Commission to set new savings goals for NV Energy. The utility's 2018 Joint IRP Demand Side Plan establishes statewide goals of 1.18% in 2019, 1.14% in 2020, and 1.14% in 2021.	1.1%	Binding	NRS 704.7801 et seq.; Docket: 17-08023 – Investigation and rulemaking to implement Senate Bill 150 (2017) Docket No. 18-06003	1
New Hampshire 2016 Regulatory Electric and nat. gas Statewide goal (100%)	Electric: 0.8% incremental savings in 2018, ramping up to 1% in 2019, and 1.3% in 2020. Natural gas: 0.7% in 2018, 0.75% in 2019, and 0.8% in 2020.	1.3%	Binding	NH PUC Order No. 25932, Docket DE 15-137	1.5
New Jersey 2018 Legislative Electric and nat. gas Statewide goal (100%)	Electric: Under 2018 legislation A3723/S2314, utilities must achieve 2% of electric savings (as a percent of average annual usage from the prior three years) within five years. Natural gas: Must achieve 0.75% of electric savings (as a percent of average annual usage from the prior three years) within five years.	1.5%	Binding	A3723/S2314 (2018)	2

State Year(s) enacted Authority Applicability (% sales affected)	Description	Avg. incremental electric savings target per year (2019 onward)	Stringency	Reference	Score
New Mexico 2008 and 2013 Legislative Electric IOUs (69%)	The state's three public utilities must achieve 5% savings of 2020 retail sales by 2025. HB 291 (2019) directs the Public Regulation Commission to set additional targets through 2030.	1.0%	Binding	NM Stat. § 62-17-1 et seq. HB 291	0.5
New York 2008, 2016, and 2018 Regulatory Electric and nat. gas Statewide goal (100%)	An April 2018 NYSERDA white paper called for 185 TBtu of cumulative annual site energy savings under the 2025 energy use forecast, as well as an electric site savings sub-target of 3% of IOU sales in 2025. A December 2018 PSC Order adopting the 3% electric goal calls for utilities to propose detailed targets, which the PSC assumes will account for 2% of savings, with the remainder contributed through NYSERDA, codes and standards, and other state activities. No specific natural gas goal has been established but savings will count toward the overall 185 TBtu goal.	2.0%	Binding	NY PSC Order Authorizing the Clean Energy Fund Framework Energy Efficiency Metrics and Target Options Report (November 2016) New Efficiency: New York (2018) NY PSC Case 18-M-0084	1.0
North Carolina 2007 Legislative Electric Statewide goal (100%)	Renewable Energy and Energy Efficiency Portfolio Standard (REPS) requires renewable generation and/or energy savings of 6% by 2015, 10% by 2018, and 12.5% by 2021 and thereafter. Energy efficiency is capped at 25% of target, increasing to 40% in 2021 and thereafter. REPS for electric cooperatives and munis requires renewable generation and/or energy savings of 3% by 2012, 6% by 2014, and 10% by 2018.	0.4%	Opt-out	NC Gen. Stat. § 62-133.8 04 NCAC 11 R08-64, et seq.	0

State Year(s) enacted Authority Applicability (% sales affected)	Description	Avg. incremental electric savings target per year (2019 onward)	Stringency	Reference	Score
Oregon 2010 Regulatory Electric and nat. gas Energy Trust of Oregon (~70%)	Electric: Incremental targets average ~1.3% of sales annually for the period 2015–19. Natural gas: 0.3% of sales annually for the period 2015–19	1.3%	Binding	Energy Trust of Oregon 2015–19 Strategic Plan Grant Agreement between Energy Trust of Oregon and OR PUC	1.5
Pennsylvania 2004 and 2008 Legislative Electric Utilities with more than 100,000 customers (96%)	Varying targets have been set for IOUs amounting to yearly statewide incremental savings of 0.8% for 2016–20. EERS includes peak demand targets. Energy efficiency measures may not exceed an established cost cap.	0.8%	Cost cap	66 Pa. C.S. § 2806.1 PUC Order Docket No. M-2008-2069887 PUC Implementation Order Docket M-2012-2289411 PUC Final Implementation Order Docket M-2014-2424864	0.5
Rhode Island 2006 Legislative Electric and nat. gas IOUs, munis (~99%)	Electric: Average incremental savings of 2.5% for 2018–20. EERS includes demand response targets. Natural gas: Incremental savings of 0.97% for 2018–20. Utilities must acquire all cost-effective energy efficiency.	2.5%	Binding	RIGL § 39-1-27.7 Docket No. 4443 National Grid's 2018–20 Energy Efficiency and System Reliability Procurement Plan	3.0
Texas 1999 and 2007 Legislative Electric IOUs (74%)	20% incremental load growth in 2011 (equivalent to ~0.10% annual savings); 25% in 2012, and 30% in 2013 and onward. Peak demand reduction targets of 0.4% compared to previous year. Energy efficiency measures may not exceed an established cost cap.	0.2%	Cost cap, opt-out	SB 7 HB 3693 Substantive Rule § 25.181 SB 1125	0

State Year(s) enacted Authority Applicability (% sales affected)	Description	Avg. incremental electric savings target per year (2019 onward)	Stringency	Reference	Score
Vermont 2000 Legislative Electric Efficiency Vermont, Burlington Electric (98%)	Electric: Annual incremental savings totaling 357,400 MWh over 2018–20, or approximately 2.4% of annual sales. EERS includes demand response targets. Natural gas: Three-year annual incremental savings of 192,599 Mcf spanning 2018–20 or 0.5% of sales. Energy efficiency utilities must set budgets at a level that would realize all cost-effective energy efficiency.	2.4%	Binding	30 V.S.A. § 209; Efficiency Vermont Triennial Plan 2018–20 Order Re: Quantifiable Performance indicator Targets for Vermont Gas Systems (12/23/15) EEU-2016-03: PUC Order on 10/12/17 re: Performance Targets	2.5
Washington 2006 Legislative Electric IOUs, co-ops, munis (83%)	Biennial and 10-year goals vary by utility. Law requires savings targets to be based on the Northwest Power Plan, which targets acquiring 1,400 average MW by 2021, 3,000 aMW by 2026, and 4,300 aMW by 2035. Electric: Targets average ~0.94% incremental electricity savings per year. Natural gas: HB 1257 (2019) establishes a natural gas conservation standard requiring each gas company to acquire all conservation measures that are available and cost effective. Each company must establish an acquisition target every two years, with initial targets taking effect by 2022. All cost-effective conservation requirement.	0.9%	Binding	Ballot Initiative I-937 Energy Independence Act, ch. 19.285.040 WAC 480-109-100 WAC 194-37 Seventh Northwest Power Plan (adopted 2/10/16) Washington Department of Commerce 2019 Biennial Report	1.0

State Year(s) enacted Authority Applicability (% sales affected)	Description	Avg. incremental electric savings target per year (2019 onward)	Stringency	Reference	Score
Wisconsin 2011 Legislative Electric and nat. gas Statewide goal (100%)	Four-year goal for 2019–22 of 224,666,366 total net life cycle MMBtus (combined electric and natural gas). Energy efficiency measures may not exceed an established cost cap. Electric: Minimum electric net life cycle savings target of 22,832 GWh for 2019–22 or 1,840 GWh first-year savings across 2019–22. This translate to roughly ~0.6–0.7% of sales per year in 2019–22. Natural gas: Focus on Energy targets minimum net life cycle natural gas savings goal of 1,243 MMTherms for measures implemented in 2019–22, or 95.9 MMTherms of first-year savings, equating to approximately 0.6% savings as a percentage of sales on a net basis.	0.7%	Cost cap	2005 Wisconsin Act 141 Order, Docket 5-FE-100: Focus on Energy Revised Goals and Renewable Loan Fund (10/15) PSCW Memorandum, Docket 5-FE-101 (5/18) PSCW Decision, Docket 5-FE-101 (6/18)	1.0

Appendix E. Tax Incentives for High-Efficiency Vehicles

State	Tax incentive
Arizona	Electric vehicle (EV) owners in Arizona pay a significantly reduced vehicle license tax—$4 for every $100 in assessed value—as part of the state's Reduced Alternative Fuel Vehicle License Tax program.
California	AB 118 targets medium- and heavy-duty trucks in a voucher program that has as its goal to reduce the up-front incremental cost of purchasing a hybrid vehicle. Vouchers for up to $117,000 are available, depending on vehicle specifications, and are paid directly to fleets that purchase hybrid trucks for use within the state. California also offers rebates of up to $5,000 for light-duty zero-emission EVs and plug-in hybrid EVs on a first-come, first-served basis.
Colorado	On May 4, the Colorado legislature approved HB 1332, a bill that dramatically improves the state's alternative fuel vehicle tax credits. It sets a flat $5,000 credit for the purchase of a light-duty electric vehicle and makes the credits assignable to a car dealer or finance company effectively turning the credit into a point-of-sale incentive.
Connecticut	Connecticut's Hydrogen and Electric Automobile Purchase Rebate Program provides as much as $3,000 for the incremental cost of the purchase of a hydrogen fuel cell electric vehicle (FCEV), an all-electric vehicle, or a plug-in hybrid EV. Rebates are calculated on the basis of battery capacity. Vehicles with a battery capacity of 18 kWh or more earn $3,000, while those with capacities between 7 kWh and 18 kWh earn $1,500. Vehicles with batteries smaller than 7 kWh are eligible for a rebate of $750.
Delaware	As part of the Delaware Clean Transportation Incentive Program, the following rebates are available: • $3,500 for battery EVs under $60,000 MSRP • $1,500 for plug-in hybrid EVs and EVs with gasoline range extenders under $60,000 MSRP • $1,000 for battery and plug-in hybrid EVs over $60,000 MSRP
District of Columbia	The District of Columbia offers a reduced registration fee and a vehicle excise tax exemption for owners of all vehicles with an EPA-estimated city fuel economy of at least 40 miles per gallon.
Georgia	An annual tax credit is available for up to five years to businesses that manufacture alternative energy products used in battery, biofuel, and electric vehicle enterprises. The amount of the tax credit is based on the number of eligible new full-time jobs.
Guam	A rebate of up to 10% of the base price of a plug-in vehicle is available to residents and businesses.
Louisiana	Louisiana offers an income tax credit equivalent to 50% of the incremental cost of purchasing an EV under the state's alternative-fuel vehicle tax credit program. Alternatively, taxpayers may claim the lesser of 10% of the total cost of the vehicle or $3,000.
Maine	Maine is preparing to offer a $2,000 rebate for qualified electric vehicles, a $1,000 rebate for plug-in hybrids, and an enhanced rebate for low-income individuals, using funds from the Volkswagen Settlement Fund.
Maryland	Purchasers of qualifying all-electric and plug-in hybrid-electric light-duty vehicles may claim up to $3,000 against the vehicle excise tax in Maryland, depending on the vehicle's battery weight.

State	Tax incentive
Massachusetts	The Massachusetts Offers Rebates for EVs (MOR-EV) program offers rebates of up to $2,500 to customers purchasing plug-in EVs.
New Jersey	All zero-emission vehicles (ZEVs) in New Jersey are exempt from state sales and use taxes. In addition, vehicles that have an EPA fuel economy rating of less than 19 mpg or cost $45,000 or more in sales or lease price are subject to a fuel inefficient vehicle fee.
New York	Pursuant to legislation passed in April 2016, NYSERDA developed a rebate program for zero-emission vehicles that launched in March 2017. Rebates of up to $2,000 per vehicle are available for battery EVs, plug-in hybrid EVs, and fuel cell vehicles. New York also started the New York Truck Voucher Incentive Program in 2014. Vouchers of up to $60,000 are available for the purchase of hybrid and all-electric class 3–8 trucks.
Oregon	The Oregon Clean Vehicle Rebate Program offers rebates of $1,500–2,500 toward the purchase of a new hybrid or battery electric vehicle, depending on battery capacity. Rebates of $2,500 are available to low- and moderate-income households for the purchase of new and used EVs. All eligible vehicles must have a base MSRP of less than $50,000.
Pennsylvania	The Alternative Fuels Incentive Grant Program offers rebates to assist eligible residents in purchasing new alternate fuel vehicles (AFV). Qualified electric vehicles earn a rebate amount of $1,750.
Puerto Rico	In 2012, Puerto Rico amended the Internal Revenue Code to allow an excise tax reimbursement of up to 65% for buyers of hybrid and plug-in hybrid vehicles. The reimbursement ranges from $2,000 to $8,000 and is available through 2016. The excise tax is waived altogether for buyers of all-electric vehicles.
Texas	Electric vehicles weighing 8,500 pounds or less and purchased after September 1, 2013, are eligible for a $2,500 rebate.
Utah	Until December 2020, taxpayers are eligible for tax credits for the purchase of qualifying electric heavy-duty vehicles. Vehicles purchased in 2019 are eligible for an $18,000 tax credit. The tax credit amount is being gradually reduced from $25,000 in 2017 to $15,000 by 2020.
Washington	Tax credits are available to businesses that purchase new alternative fuel commercial vehicles. Businesses may claim up to $250,000 or credits for 25 vehicles per year, through January 1, 2021. HB 2042, passed in March 2019, also extends tax credits for light-duty passenger vehicles.

Source: DOE 2019b.

Appendix F. State Transit Funding

State	FY 2017 funding	2017 population*	Per capita transit expenditure
Massachusetts	$2,005,445,417	6,547,629	$306.29
New York	$5,243,292,300	19,378,102	$270.58
Alaska	$164,539,596	710,231	$231.67
Illinois	$2,437,784,995	12,830,632	$190.00
Connecticut	$632,110,145	3,574,097	$176.86
Pennsylvania	$1,647,371,630	12,702,379	$129.69
Delaware	$105,119,785	897,934	$117.07
District of Columbia	$554,712,567	5,000,000	$110.94
Minnesota	$448,811,000	5,303,925	$84.62
California	$2,301,559,553	37,253,956	$61.78
Virginia	$466,923,450	8,001,024	$58.36
Rhode Island	$57,309,695	1,052,567	$54.45
New Jersey	$364,546,485	8,791,894	$41.46
Maryland	$128,252,712	5,773,552	$22.21
Wisconsin	$113,487,500	5,686,986	$19.96
Florida	$353,244,238	18,801,310	$18.79
Washington	$105,996,000	6,724,540	$15.76
Vermont	$7,928,915	625,741	$12.67
Indiana	$64,334,148	6,483,802	$9.92
Wyoming	$2,562,304	563,626	$4.55
Kansas	$11,000,000	2,853,118	$3.86
Nebraska	$6,297,705	1,826,341	$3.45
Michigan	$28,943,956	9,883,640	$2.93
New Mexico	$5,700,000	2,059,179	$2.77
Arizona	$11,725,113	6,392,017	$1.83
Oklahoma	$5,750,000	3,751,351	$1.53
South Carolina	$6,500,000	4,625,364	$1.41
New Hampshire	$1,846,351	1,316,470	$1.40
South Dakota	$1,000,000	814,180	$1.23
West Virginia	$2,268,134	1,852,994	$1.22
Arkansas	$3,532,228	2,915,918	$1.21
Texas	$30,341,068	25,145,561	$1.21
Louisiana	$4,955,000	4,533,372	$1.09
Maine	$1,263,595	1,328,361	$0.95
Montana	$825,000	989,415	$0.83
Ohio	$7,300,000	11,536,504	$0.63
Mississippi	$1,600,000	2,967,297	$0.54
Kentucky	$1,702,686	4,339,367	$0.39

State	FY 2017 funding	2017 population*	Per capita transit expenditure
North Carolina	$93,943,490	9,535,483	$9.85
Georgia	$90,989,316	9,687,653	$9.39
Oregon	$32,033,345	3,831,074	$8.36
North Dakota	$4,116,486	672,591	$6.12
Tennessee	$37,281,916	6,346,105	$5.87
Iowa	$15,842,891	3,046,355	$5.20
Colorado	$25,000,000	5,029,196	$4.97
Missouri	$2,074,625	5,988,927	$0.35
Idaho	$312,000	1,567,582	$0.20
Alabama	$0	4,779,736	$0.00
Hawaii	$0	1,360,301	$0.00
Nevada	$0	2,700,551	$0.00
Utah	$0	2,763,885	$0.00

* Population figures represent total area served by transit system. *Source:* AASHTO 2017.

Appendix G. State Transit Legislation

State	Description	Source
Alabama	Alabama Act 2018-161 requires the Alabama Department of Economic and Community Affairs to create, oversee, and administer the Alabama Public Transportation Trust Fund, establishing a path to increase public transportation options in the state.	legiscan.com/AL/bill/SB85/2018
Arkansas	Passed in 2001, Arkansas Act 949 established the Arkansas Public Transit Fund, which directs monies from rental vehicle taxes toward public transit expenditures.	www.arkleg.state.ar.us/assembly/2001/R/Acts/Act949.pdf
California	California's Transportation Development Act provides two sources of funding for public transit: the Location Transportation Fund (LTF) and the State Transit Assistance (STA) Fund. The general sales tax collected in each county is used to fund each county's LTF. STA funds are appropriated by the legislature to the state controller's office. The statute requires that 50% of STA funds be allocated according to population and 50% be allocated according to operator revenues from the prior fiscal year.	www.dot.ca.gov/hq/MassTrans/State-TDA.html
Colorado	Colorado adopted SB1 in 2018, which significantly expands state funding for transit. SB1 creates a new multimodal options fund dedicated to public transit and bicycle and pedestrian infrastructure and operations.	leg.colorado.gov/bills/sb18-001
Florida	House Bill 1271 allows municipalities in Florida with a regional transportation system to levy a tax, subject to voter approval, that can be used as a funding stream for transit development and maintenance.	www.myfloridahouse.gov/sections/Bills/billsdetail.aspx?BillId=44036
Georgia	The Transportation Investment Act, enacted in 2010, allows municipalities to pass a sales tax for the express purpose of financing transit development and expansion.	gsfic.georgia.gov/transportation-investment-act
Hawaii	Section HRS 46-16.8 of the Hawaii Revised Statutes allows municipalities to add a county surcharge to state tax; the surcharge is then funneled toward mass transit projects.	www.capitol.hawaii.gov/hrscurrent/Vol02_Ch0046-0115/HRS0046/HRS_0046-0016_0008.htm
Illinois	House Bill 289 allocates $2.5 billion for the creation and maintenance of mass transit facilities from the issuance of state bonds.	legiscan.com/gaits/text/70761

State	Description	Source
Indiana	House Bill 1011 specifies that a county or city council may elect to provide revenue to a public transportation corporation from the distributive share of county adjusted gross income taxes, county option income taxes, or county economic development income taxes. An additional county economic development income tax no higher than 0.3% may also be imposed to pay the county's contribution to the funding of the metropolitan transit district. Only six counties within the state may take advantage of this legislation.	legiscan.com/IN/text/HB1011/id/673339
Iowa	The Iowa State Transit Assistance Program devotes 4% of the fees for new registration collected on sales of motor vehicle and accessory equipment to support public transportation.	www.iowadot.gov/transit/funding.html
Kansas	The Transportation Works for Kansas legislation was adopted in 2010 and provides financing for a multimodal development program in communities with immediate transportation needs.	votesmart.org/bill/11412/30514/transportation-works-for-kansas-program%20%28T-Works%20for%20Kansas%20Program%29
Maine	The Maine Legislature created a dedicated revenue stream for multimodal transportation in 2012. Through sales tax revenues derived from taxes on vehicle rentals, Maine's Multimodal Transportation Fund must be used for the purposes of purchasing, operating, maintaining, improving, repairing, constructing, and managing the assets of nonroad forms of transportation.	www.mainelegislature.org/legis/statutes/23/title23sec4210-B.html
Maryland	In 2018, Maryland passed the Maryland Metro/Transit Funding Act. Maryland's Transportation Trust Fund must provide at least $167 million in revenues to the Washington Suburban Transit District through an annual grant which will be used to pay capital costs of the Washington Metropolitan Area Transit Authority. In addition, the legislation requires at least $29.1 million of the revenue from the Transportation Trust Fund be provided for capital needs of the Maryland Transit Administration in fiscal years 2020, 2021, and 2022. The legislation further requires the appropriation for the operation of the Maryland Transit Administration in fiscal years 2020, 2021, and 2022 to be increased by at least 4.4% over the previous year, starting with the fiscal year 2019 budget.	mgaleg.maryland.gov/2018RS/chapters_noln/Ch_352_hb0372E.pdf, see Transportation Article §3–216.and §7–205
Massachusetts	Section 35T of Massachusetts general law establishes the Massachusetts Bay Transportation Authority State and Local Contribution Fund. This account is funded by revenues from a 1% sales tax.	malegislature.gov/Laws/GeneralLaws/PartI/TitleII/Chapter10/Section35t
Michigan	The Michigan Comprehensive Transportation Fund funnels both vehicle registration revenues and auto-related sales tax revenues toward public transportation and targeted transit demand management programs.	www.legislature.mi.gov/(S(hlkm5k45i240utf2mb0odtzt))/mileg.aspx?page=getObject&objectName=mcl-247-660b

State	Description	Source
Minnesota	House File 2700, adopted in 2010, is an omnibus bonding and capital improvement bill that provides $43.5 million for transit maintenance and construction. The bill also prioritized bonding authorization so that appropriations for transit construction for fiscal years 2011 and 2012 would amount to $200 million.	wdoc.house.leg.state.mn.us/leg/LS86/CEH2700.1.pdf
New York	In 2010, New York adopted Assembly Bill 8180, which increased certain registration and renewal fees to fund public transit. It also created the Metropolitan Transit Authority financial assistance fund to support subway, bus, and rail.	www.ncsl.org/issues-research/transport/major-state-transportation-legislation-2010.aspx#N
North Carolina	In 2009, North Carolina passed House Bill 148, which called for the establishment of a congestion relief and intermodal transportation fund.	www.ncleg.net/sessions/2009/bills/house/pdf/h148v2.pdf
Oregon	Oregon has a Lieu of State Payroll Tax Program that provides a direct ongoing revenue stream for transit districts that can demonstrate equal local matching revenues from state agency employers in their service areas.	www.oregonlegislature.gov/citizen_engagement/Reports/2008PublicTransit.pdf
Pennsylvania	Act 44 of House Bill 1590, passed in 2007, allows counties to impose a sales tax on liquor or an excise tax on rental vehicles to fund the development of county transit systems.	www.legis.state.pa.us/WU01/LI/LI/US/HTM/2007/0/0044..HTM
Tennessee	Senate Bill 1471, passed in 2009, calls for the creation of a regional transportation authority in major municipalities. It allows these authorities to set up dedicated funding streams for mass transit either by law or through voter referendum.	state.tn.us/sos/acts/106/pub/pc0362.pdf
Utah	Utah's comprehensive transportation funding bill, passed in 2015, allows counties to implement a 0.25% local sales tax to fund locally identified transportation needs. 40% of all revenues collected using this mechanism must be awarded to the county transit agency.	le.utah.gov/~2015/bills/static/HB0362.html
Virginia	House Bill 2313, adopted in 2013, created the Commonwealth Mass Transit Fund, which will receive approximately 15% of revenues collected from the implementation of a 1.5% sales and use tax for transportation expenditures.	lis.virginia.gov/cgi-bin/legp604.exe?131+ful+CHAP0766
Washington	In 2012, Washington adopted House Bill 2660, which created an account to provide grants to public transit agencies to preserve transit service.	apps.leg.wa.gov/documents/billdocs/2011-12/Pdf/Bills/Session%20Laws/House/2660.SL.pdf

State	Description	Source
West Virginia	In 2013, the West Virginia Commuter Rail Access Act (Senate Bill 03) established a special fund in the state treasury to pay track access fees accrued by commuter rail services operating within West Virginia borders. The funds have the ability to roll over from year to year and are administered by the West Virginia State Rail Authority.	www.legis.state.wv.us/Bill_Status/bills_text.cfm?billdoc=SB103%20SUB1%20ENR.htm&yr=2013&sesstype=RS&i=103

Appendix H. State Progress toward Public Building Energy Benchmarking

State	Percentage benchmarked/Progress status
California	100% of state-owned, executive branch facilities, benchmarked since 2013
Connecticut	42% of state buildings, 100% of the Connecticut Technical High School system, 100% of several K–12 school districts, 100% of Connecticut Community Colleges
Delaware	80%
District of Columbia	Nearly 99% of government-owned floor area
Florida	20% of state-owned or leased facilities with more than 5,000 square feet of air-conditioned space
Hawaii	Over 29 million square feet of public facilities
Iowa	80,191,001 square feet benchmarked. 1,572 sites and 2,148 buildings benchmarked in the Iowa B3 Benchmarking Program
Kentucky	801 buildings, representing over 16 million square feet of facilities
Maryland	100% of state facilities
Massachusetts	100% of about 80 million square feet of state-owned facilities
Michigan	88% of state-owned facilities
Mississippi	95% of agencies covered by the energy and cost data reporting requirements under the Mississippi Energy Sustainability and Development Act of 2013
Missouri	Approximately 50% of square footage managed by the Office of Administration and the Department of Corrections
Nevada	86% of total state building square footage
New Hampshire	95% of state-owned building square footage
New Mexico	Approximately 20%
North Carolina	100% of state-owned buildings and community college buildings
Oregon	100% of state-owned and occupied buildings greater than 5,000 square feet
Rhode Island	100% of all state, municipal, and public-school square footage
South Carolina	100% of state-owned buildings are benchmarked
Tennessee	100% of state-owned and managed facilities
Utah	60% of DFCM-managed buildings
Vermont	70% of the state-owned and operated building space that the ENERGY STAR® Portfolio Manager is capable of benchmarking
Washington	55% of state agency square footage, 30% of college square footage, 17% of university square footage

Not all states with benchmarking requirements provided the percentage of buildings benchmarked. All states listed above, except Missouri, require benchmarking in public facilities. Missouri has a voluntary benchmarking program.

Appendix I. State Energy Savings Performance Contracting: Investments and Savings

State	2018 investments ($ million)	2018 incremental electricity savings for all active ESCO projects	2018 annual savings from active projects
California	$12	3.5 million kWh	51 million kWh
Colorado	$28		$34.2 million annual utility cost savings
Delaware	$4.5	2,613,935 kWh (net annual)	
Kentucky	$29		
Maryland			Approximately $24.8 million in savings annually
Massachusetts	Over $5	$208,000 in energy cost savings	Over $21 million in annual cost savings
Nevada	$1	12,427,674 kWh	54,850,434 kWh
New Mexico	$12	2,866,617 kWh	97,444,041 kWh from energy efficiency measures
North Carolina	$13		
Pennsylvania	$18.5 (estimated)	5.2 million kWh	
Rhode Island	$5.2 (one entity)	2,280,000 kWh (one entity)	
Utah	$6.19	955,794 kWh	At least 955,794 kWh
Virginia	$12.4	322,000 kWh	17.4 million kWh
Washington	$48	9,336,931 kWh	366,144,300 kWh

We excluded ESPC program budgets and projected energy and cost savings from states in order to focus on investments and cost and energy savings already achieved. This table only includes data provided by states in response to our data request.

Appendix J. Total Energy and Cost Savings from State Financial Incentives

State	Title	Low income targeted	Program administrator	Program-level energy savings	Program-level monetary savings
Alabama	AlabamaSAVES Revolving Loan Program	No	Alabama Department of Economic and Community Affairs	3,312,403 kWh	$232,700
California	Bright Schools Program	No	California Energy Commission	444,872 kWh and 51,592 therms potential savings	$64,007 potential savings
California	California Clean Energy Jobs Act Program (Proposition 39 K-12 Program)	Yes	California Energy Commission	561,757,246 kWh estimated savings	$108 million (this includes kWh, therm, propane, and fuel oil savings)
California	California Clean Energy Jobs Act Program (Proposition 39 Community College Program)		California Community Colleges Chancellor's Office	50,209,162 kWh estimated savings	$8.5 million estimated savings
California	Energy Partnership Program	No	California Energy Commission	2,602,184 kWh and 529 therms	$304,972 (this includes kWh and therm savings)
California	Property Assessed Clean Energy (PACE) Loss Reserve Program	Yes	California Alternative Energy and Advanced Transportation Financing Authority (CAEATFA)	353.9 million kWh estimated annual savings	
California	Energy Conservation Assistance Act	No	California Energy Commission	8,885,818 kWh and 18,399 therms	
California	Energy Conservation Assistance Act – Education Subaccount	No	California Energy Commission	1,933,024 kWh	
California	Sales and Use Tax Exclusion for Advanced Transportation and Alternative Energy Manufacturing Program	Yes	CAEATFA		$927.02 million

State	Title	Low income targeted	Program administrator	Program-level energy savings	Program-level monetary savings
California	California Hub for Energy Efficiency Financing (CHEEF)	Yes	CAEATFA		$5.8 million in private capital (seven active lenders)
Colorado	Agricultural Energy Efficiency Program	No	Colorado Energy Office	2.6 million kWh estimated savings to date	
Colorado	Energy Savings for Schools	No	Colorado Energy Office	3.5 million kWh estimated savings to date	
Colorado	C-PACE: Colorado Commercial Property Assessed Clean Energy	No	Sustainable Real Estate Solutions (SRS)	54.5 million kBtu annually projected	$29.5 million projected to date
Delaware	Home Energy Loan Program (Part of Home Performance with ENERGY STAR®)	No	Delaware Sustainable Energy Utility (DESEU)	2,194,344 kWh (net annual)	
Delaware	Energy Efficiency Investment Fund Rebates	No	Department of Natural Resources and Environmental Control	7,603,223 kWh (net annual)	
Delaware	Energize Delaware Farm Program	No	DESEU	11,685 kWh (net annual)	
Maine	Efficiency Maine Custom Program	No	Efficiency Maine Trust	469,862 MMBtu	$5,709,087
Maine	Efficiency Maine C&I Prescriptive Incentive Program	No	Efficiency Maine Trust	763,584 MMBtu	$6,034,120
Maine	Efficiency Maine Consumer Products Program	No	Efficiency Maine Trust	61,574 MMBtu	$703,350
Maine	Efficiency Maine Home Energy Savings Program	No	Efficiency Maine Trust	1,601,155 MMBtu	$12,938,643
Maine	Efficiency Maine Low Income Initiatives	Yes	Efficiency Maine Trust	754,258 MMBtu	$8,939,063

State	Title	Low income targeted	Program administrator	Program-level energy savings	Program-level monetary savings
Maryland	Maryland Smart Energy Communities (MSEC) Grant	No	Maryland Energy Administration (MEA)	880,900 kWh, not including savings from new MSEC communities (anticipated savings)	
Maryland	Commercial and Industrial Grant Program	No	MEA	3.609 million kWh annual estimated savings	$418,340 annual estimated savings
Maryland	Mathias Agricultural Energy Efficiency Grant Program	No	MEA	59,185 kWh, 3346 MBMTU annual estimated savings	$52,000 annual savings
Maryland	Be SMART Home Efficiency Loan Program	No	Maryland Department of Housing and Community Development (DHCD)	BeSMART requires every borrower to submit an energy audit that shows at least 15% in energy savings opportunities. The average applicant's audit identified 4,000 kWh in potential savings.	
Maryland	Be SMART Multifamily Efficiency Loan Program	No	DHCD	325,000 kWh estimated savings	
Maryland	Jane E. Lawton Conservation Loan Program	No	MEA	1.9 million kWh, 1,501 MMBTU annual estimated savings	$197,700 annual estimated savings
Maryland	State Agency Loan Program		MEA	1,898,393 kWh annual estimated savings	$728,841 annual estimated savings
Maryland	Local Option – Clean Energy Loan Program	No	Maryland-PACE is administered by the Maryland Clean Energy Center (MCEC)	8,222 MMBTU annual estimated savings	
Maryland	Data Centers	No	MEA	3.037 million kWh annual estimated savings	
Maryland	Combined Heat and Power	No	MEA	Over 541,000 MMBTU annual estimated savings	

State	Title	Low income targeted	Program administrator	Program-level energy savings	Program-level monetary savings
Maryland	Energy-Water Infrastructure Program	No	Maryland Department of the Environment (MDE)	157,908 kWh annual estimated savings	
Maryland	Clean Energy Grant Program – New ground source heat pumps	No	MEA	558,000 kWh, 1,423 MMBTU annual savings	
Massachusetts	Green Communities Grant Program	No	Department of Energy Resources (DOER)	26,020,314 kWh	
Missouri	Energy Loan Program		State Energy Office	2,441,718 kWh	$174,674
Nevada	Home Energy Retrofit Opportunities for Seniors	Yes	Nevada Housing Division & State Energy Office	870,742 kWh	$160,711
Nevada	Property Tax Abatement for Green Buildings	No	State Energy Office	288,606,078 kWh	
Nevada	Direct Energy Assistance Loan Program	No	State Energy Office	52,590 kWh	
Nevada	Performance Contracting Audit Assistance Program (PCAAP)	No	State Energy Office	54,850,434 kWh	$6,643,675
New Jersey	Non-IOU HVAC	No	State Energy Office	258.8 kWh	
New Jersey	Non-IOU HPwES	No	State Energy Office	122.9 kWh	
New Jersey	Non-IOU Direct Install	No	State Energy Office	10,009 kWh	
New Mexico	Sustainable Building Tax Credit (corporate)	No	State Energy Office	6,988,155 kBtu program life savings	$204,691 annual savings
New Mexico	Energy Efficiency & Renewable Energy Bond Program/Clean Energy Revenue Bond Program	No	State Energy Office	1,862,283 kWh	$193,810 guaranteed annual savings
New Mexico	Sustainable Building Tax Credit (personal)	No	State Energy Office	67,931,953 kBtu program life savings	$5,837,571 program life savings

State	Title	Low income targeted	Program administrator	Program-level energy savings	Program-level monetary savings
New York	NY Power Authority (NYPA) – Energy Services Programs for Public Entities	No	NYPA	99,379,240 kWh	$13,950,217
Oregon	Energy Conservation Tax Credits – Competitively Selected Projects (personal)	No	Oregon Department of Energy	22,713,671 kWh, 495,714 therms	$2,307,851
Oregon	Energy Conservation Tax Credits – Competitively-Selected Projects (corporate)	No	Oregon Department of Energy	4,382,537 kWh, 73,055 therms	$422,927
Oregon	Energy Conservation Tax Credits – Small Premium Projects (corporate)	No	Oregon Department of Energy	3,179,585 kWh, 8,094 therms	$262,380
Oregon	Industrial Self Direct of Public Purpose Funds	No	Oregon Department of Energy	7,213,754 kWh	$436,795
Pennsylvania	Alternative and Clean Energy Program	No	Commonwealth Financing Authority/Department of Community and Economic Development	111,067 MMBTU annual savings	
Pennsylvania	Alternative Fuels Incentive Grant	Yes	Department of Environmental Protection (DEP) administers this grant program under the Alternative Fuels Incentive Act (Nov. 29, 2004; P.L. 1376; No. 178).	1.5 million gasoline gallons equivalent in savings	
Pennsylvania	Small Business Advantage Grant Program		DEP	3,672,427 kWh	$584,789

State	Title	Low income targeted	Program administrator	Program-level energy savings	Program-level monetary savings
Pennsylvania	Green Energy Loan Fund	No	Revolving Fund initially created during ARRA and supplemented with State Energy Program Funds. The Reinvestment Fund administers the program with support of the Pennsylvania DEP and US DOE.	23,423,017 kWh, 79,919 MMBTU annual energy savings	$3,513,453
Rhode Island	Efficient Buildings Fund	No	Rhode Island Infrastructure Bank, Office of Energy Resources	778,425 kWh, 44, 825.18 therms annual estimated savings	$473,447 annual estimated savings
Rhode Island	LED Streetlight Program	No	Office of Energy Resources	3,720,516 kWh annual savings	$1,126,210 annual savings
Rhode Island	Pascoag Utility District Energy Efficiency Program	No	Office of Energy Resources, Pascoag Utility District	50,596 kWh saved in 2018	$7,184 saved in 2018
South Carolina	Energy Efficient Manufactured Homes Incentive Tax Credit	Yes	State Energy Office, Department of Revenue	769,027.3 kWh	$21,625
South Carolina	ConserFund Loan Program	No	State Energy Office	173,749.94 kWh	$9,402
South Carolina	ConserFund Plus Loan Program	No	State Energy Office	53,926,944 kWh	$301,015
South Carolina	Mini-grants	No	State Energy Office	248,777 kWh	$1,742
Tennessee	EmPower TN	No	Tennessee Department of Environment and Conservation, Office of Energy Programs	40.6 million kWh	$4.5 million annual estimated savings
Tennessee	Energy Efficient Schools Initiative – Grants	No	Energy Efficient Schools Initiative	41 million kWh annual savings	$4.1 million annual electricity savings; $24.6 million cumulative savings (2012–18)
Tennessee	Energy Efficient Schools Initiative – Loans	No	Energy Efficient Schools Initiative	17,651,302 kWh annual savings	$7,200,000 annual estimated savings

State	Title	Low income targeted	Program administrator	Program-level energy savings	Program-level monetary savings
Tennessee	Pathway Energy Efficiency and Renewable Energy Loan Program	No	Pathway Lending	12,857,062 kWh annual savings	$1,403,107 annual savings
Utah	U-Save Revolving Loan Fund/Revolving Loan Fund for Energy Efficiency Projects in School Districts and Political Subdivisions	No	Governor's Office of Energy Development	839,489 kWh	$198,302
Utah	State Building Energy Efficiency Fund	No	Division of Facilities and Construction Management	2,146,493 kWh	$152,401
Utah	Guaranteed Energy Savings Performance Contracting	No	Governor's Office of Energy Development and Division of Facilities Construction and Management	955,794 kWh	$6,938,877

We excluded individual program budgets from the table because this metric did not allow for a state-by-state comparison of financial incentives. We attempted to collect incentive participation data, but most state respondents were unable to quantify the total number of eligible participants for each program. As a result, we could not express participation as a percentage, and we excluded these data from the table. We also excluded any programs already listed on the DSIRE website www.dsireusa.org.

Appendix K. State Efficiency Spending and Savings Targets for Low-Income Customers

State	Spending/savings requirements for low-income energy efficiency programs
California	CA Public Utilities Code Section 382(e) sets a goal to provide low-income energy efficiency measures to 100% of eligible and willing customers by 2020. A. 14-11-007 (2016) strengthened the goal and updates interpretation of the "willing and feasible to participate (WFTP)" factor.
Connecticut	Utilities are required to allocate the limited income budgets in parity with the revenues that are expected to be collected from that sector. Per Public Act 11-80, Section 33, Connecticut establishes a goal of weatherizing 80% of homes. This goal is not specific to low-income customers, but activity in the low-income program helps the companies achieve this goal. Also, as part of the performance management incentive (PMI) calculation, the utilities are required to spend at least 95% of the low-income budget. Electric, natural gas, oil, and propane savings metrics also fall under the low-income program attached to the PMI calculation. Utilities are required to allocate budgets to low-income programs in parity with revenues expected to be collected from that sector.
Delaware	Delaware established legislative energy savings targets in 2009 with the adoption of SB 106, although these have yet to be implemented. The legislation sets up a Sustainable Energy Trust Fund to collect charges assessed by energy providers in service of energy savings goals. SB 106 specifies that 20% of assessment be provided to the Weatherization Assistance Program. Electric utility restructuring legislation passed in 1999 specifies that Delmarva Power and Light collect 0.095 mills per kWh (approximately $800,000 annually) from customers to be forwarded to the Department of Health and Social Services, Division of State Service Centers to be used to fund low-income fuel assistance and weatherization programs. To make low-income energy efficiency programs more accessible, a Guidance Document was drafted in 2016 as part of the merger settlements approved by the PSC between Exelon and Delmarva Power and Light to allocate $4 million of the funds toward low-income customer energy efficiency programs. This Guidance Document applies to DPL customers and funds are available to support organizations delivering energy efficiency programs to low-income ratepayers. Organizations that receive grants to run low-income energy efficiency programs will increase energy efficiency measures for low-income Delaware households, increase statewide electric and gas savings, engage and inform low-income households about the benefits of energy efficiency, develop a community-based approach to address energy efficiency issues in low-income housing by mobilizing public and private sector resources, and ensure to the greatest extent feasible that job training, employment, and contracting generated by this grant will be directed to low-income persons. All settlement-funded low-income programs must be officially recommended by the EEAC and approved by the PSC.
District of Columbia	The Clean and Affordable Energy Act (CAEA) of 2008 established a separate Energy Assistance Trust Fund (EATF) to fund: "(1) the existing low-income programs in the amount of $3.3 million annually; and (2) the Residential Aid Discount subsidy in the amount of $3 million annually." For the 2017–21 program cycle the low-income spending requirement was adjusted to 20% of expenditures.

State	Spending/savings requirements for low-income energy efficiency programs
Illinois	In December 2016, the Illinois State Legislature passed the Future Energy Jobs Bill (SB 2814). The legislation directs utilities to implement low-income energy efficiency measures of no less than $25 million per year for electric utilities that serve more than 3 million retail customers in the state (ComEd), and no less than $8.35 million per year for electric utilities that serve less than 3 million but more than 500,000 retail customers in the state (Ameren).
Maine	LD-1559, passed in June 2013, states that Efficiency Maine Trust shall "target at least 10% of funds for electricity conservation collected under subsection 4 or 4-A or $2,600,000, whichever is greater, to programs for low-income residential consumers, as defined by the board by rule."
Massachusetts	In the late 1990s, Massachusetts restructuring law established a low-income conservation fund through a 0.25 mills per kWh charge on every electric customer's bill, while a conservation charge on natural gas customers' bills has funded natural gas low-income energy efficiency programs. In 2010, the program received additional funding through the 2008 Green Communities Act, which required that 10% of electric utility program funds and 20% of gas program funds be spent on comprehensive low-income energy efficiency and education programs. The legislation further directed that these programs be implemented through the low-income weatherization assistance program (WAP) and fuel assistance program network with the objective of standardizing implementation among all utilities. In addition to the WAP-coordinated programs that directly serve low-income clients, the utilities fund the Low-Income Multifamily Retrofit Program, which provides cost-effective energy efficiency improvements to multifamily buildings, including nonprofit and public housing authorities. The program is targeted at one- to four-unit residential buildings where at least 50% of the units are occupied by low-income residents earning at or below 60% of area median income. Eligible projects involve efficiency upgrades for buildings with currently high energy consumption, specifically for space heating, hot water, air sealing, and insulation of building envelopes, lighting, and appliances.
Michigan	SB 438, approved in December 2016, extended the state's 1% annual energy savings requirement for utilities through 2021. The bill does not specify a minimum required level of spending or savings for low-income energy efficiency programs, other than to direct that distribution customers' funding responsibilities for low-income residential programs be proportionate to the distribution customers' funding of the total energy optimization (EO) program: "The established funding level for low-income residential programs shall be provided from each customer rate class in proportion to that customer rate class's funding of the provider's total energy optimization programs."
Minnesota	Municipal gas and all electric utilities must spend at least 0.2% of their gross operating revenue from residential customers on low-income programs. Legislation in 2013 raised the minimum low-income spending requirement for gas IOUs from 0.2% to 0.4% of their most recent three-year average gross operating revenue from residential customers.

State	Spending/savings requirements for low-income energy efficiency programs
Montana	SB 150, passed in 2015, made changes to the state's system benefit fund, increasing a public utility's minimum funding level for low-income energy and weatherization assistance and clarifying that eligible projects can be located on tribal reservations. SB 150 increases a public utility's minimum annual funding requirement for low-income energy and weatherization assistance from 17% to 50% of the public utility's annual electric universal systems benefits (USB) level. A cooperative utility's minimum annual funding requirement for low-income energy assistance remains at 17% of its annual USB funding level.
Nevada	In July 2001, Nevada passed AB 661, which created the Nevada Fund for Energy Assistance and Conservation (FEAC) through a universal energy charge (UEC) assessed on retail customers of the state's regulated electric and gas utilities. Nevada's Energy Assistance Code specifies the UEC is 3.30 mills per therm of natural gas and 0.39 mills per kWh of electricity purchased by these customers. NRS 702.270 requires that 25% of the money in the FEAC must be distributed to the Nevada Housing Division for programs of energy conservation, weatherization, and energy efficiency for eligible households. In June 2017, SB 150 was signed into law, which, in addition to directing the Public Utilities Commission to establish annual energy savings goals for NV Energy, also requires utilities to set aside 5% of efficiency program budgets for low-income customers.
New Hampshire	In August 2016, the New Hampshire Public Utilities Commission approved a settlement agreement establishing a statewide energy efficiency resource standard (EERS). The agreement provides for an increase in the minimum low-income share of the overall energy efficiency budget from 15.5% to 17%.
New Mexico	The state's energy efficiency targets, first established in 2005 within the Efficient Use of Energy Act, were amended in 2013 with the passage of HB 267. The legislation calls for an 8% reduction of energy consumption as a percentage of sales by 2020 and also directs that no less than 5% of the amount received by the public utility for program costs shall be specifically directed to energy efficiency programs for low-income customers.
New York	The January 2016 PSC Order authorizing the Clean Energy Fund Framework requires that NYSERDA must invest at least $234.5 million of Market Development funds in low- to moderate-income (LMI) initiatives over the initial three-year period. The new policy is intended to limit energy costs for low-income residents to no more than 6% of household income.
Oklahoma	Under OAC 165:35-41-4, all electric utilities under rate regulation of the Oklahoma Corporation Commission (OCC) must propose, at least once every three years, and be responsible for the administration and implementation of a demand portfolio of energy efficiency and demand response programs within their service territories. The regulations specify that demand portfolios address programs for low-income and hard-to-reach customers "to assure proportionate Demand Programs are deployed in these customer groups despite higher barriers to energy efficiency investments."

State	Spending/savings requirements for low-income energy efficiency programs
Oregon	Legislation (Senate Bill 1149) requiring electric industry restructuring for the state's largest investor-owned utilities was signed into law in July 1999. The law established an annual expenditure by the utilities of 3% of their revenues to fund "Public Purposes," including energy efficiency, development of new renewable energy, and low-income weatherization. Per the legislation, 13% of the public purpose charge would be allocated to low-income weatherization through the Energy Conservation Helping Oregonians (ECHO) program.
Pennsylvania	In June 2015, the Pennsylvania Public Utility Commission (PUC) issued an implementation order for Phase III of the Energy Efficiency and Conservation (EE&C) Program, setting five-year cumulative targets of 5.1 million MWh, equivalent to about 0.77% incremental savings per year through 2020. The order also requires each utility to obtain a minimum of 5.5% of their total consumption reduction target from the low-income sector.
Texas	As amended by SB 1434 in June 2011, Substantive Rule § 25.181 states "…each utility shall ensure that annual expenditures for the targeted low-income energy efficiency program are not less than 10% of the utility's energy efficiency budget for the program year."
Vermont	Efficiency Vermont (EVT), the state's energy efficiency utility established in 1999, is funded through a systems benefits charge on all utility customers' bills. Most of the costs of the electric efficiency measures implemented by EVT and the community-based weatherization agencies are paid for by EVT, with any remaining balances covered by the federal Weatherization Assistance Program (WAP). Other funding for WAP comes from the state's Weatherization Trust Fund, which was created in 1990 through legislative enactment of a gross-receipts tax of 0.5% on all non-transportation fuels sold in the state. As specified by Vermont Law, 50% of the net proceeds from the sale of carbon credits through the Regional Greenhouse Gas Initiative (RGGI) are deposited into a fuel efficiency fund to provide energy efficiency services to residential consumers who have incomes up to and including 80% of the state median income.
Virginia	The 2018 Grid Modernization and Security Act (SB966) requires that at least 5% of energy efficiency programs benefit low-income, elderly, and disabled individuals.
Wisconsin	The Reliability 2000 Law, passed in 1999, created a program for awarding grants to provide assistance to low-income households for weatherization and other energy conservation services, payment of energy bills, and the early identification and prevention of energy crises. The law specifies that 47% of total low-income funds must be dedicated to weatherization. The legislation required the Department of Administration to collect $24 million for low-income public benefits services the first year and to calculate a low-income need target in subsequent years. This low-income need target is calculated based on the estimated number of low-income families (households at or below 150% of the poverty level) multiplied by the estimated need per eligible household.

Appendix L. Cost-Effectiveness Rules for Utility Low-Income Efficiency Programs

State	Special cost-effectiveness provisions for low-income energy efficiency programs
Arizona	Since 2011 Arizona Administrative Code Title 14, Chapter 2, Article 24 (R14-2-2412) has directed that "an affected utility's low-income customer program portfolio shall be cost effective, but costs attributable to necessary health and safety measures shall not be used in the calculation."
Arkansas	Arkansas does not require program-level cost effectiveness for low-income programs.
California	California applies the Energy Savings Assistance Program Cost Effectiveness test (ESACET) and the Total Resource Cost (TRC) test to the low-income program. These tests incorporate nonenergy benefits and are used for informational purposes only, with no set minimum threshold for cost effectiveness.
Colorado	Decision No. C08-0560 directs the Colorado Public Service Commission to pursue all cost-effective low-income demand-side management (DSM) programs, "but to not forego DSM programs simply because they do not pass a 1.0 TRC test." It also directs that, in applying the TRC to low-income DSM programs, "the benefits included in the calculation shall be increased by 20%, to reflect the higher level of non-energy benefits that are likely to accrue from DSM services to low-income customers." This was increased further to 50% for low-income measures and products in April 2018 under Decision No. C18-0417. To avoid unintended impacts to calculations of benefits pursuant to performance incentives, the decision also allows utilities to exclude these costs in these determinations: "To address this concern we find that the costs and benefits associated with any low-income DSM program that is approved and has a TRC below 1.0 may be excluded from the calculation of net economic benefits. Further, the energy and demand savings may be applied toward the calculation of overall energy and demand savings, for purposes of determining progress toward annual goals."
Connecticut	Connecticut has established formal rules and procedures for evaluation, which are stated in Public Act 11-80 and Evaluation Rules and Roadmap. The Program Administrator test has been the primary cost-effectiveness test in Connecticut. However the TRC test is the primary test only for the Home Energy Solutions Limited-Income program. Connecticut regulators have repeatedly approved non-cost-effective low-income programs.
Delaware	The Evaluation, Measurement, and Verification (EM&V) Committee in 2016 recommended specific net-energy impacts, or net-energy benefits for low-income programs. These net-energy benefits include weatherization-reduced arrearages and participant health and safety benefits. Specific values were also applied to the net-energy benefits and are locked in for three years. These net-energy benefits were unanimously recognized and approved by the Energy Efficiency Advisory Council (EEAC).

State	Special cost-effectiveness provisions for low-income energy efficiency programs
District of Columbia	While no specific rules are in place for low-income programs per se, programs that are not cost effective may be included in the DC Sustainable Energy Utility's (DCSEU) portfolio as long as the overall portfolio is cost effective based on the Societal Cost test. A 10% adder is applied to program benefits to account for additional nonenergy benefits including comfort, noise reduction, aesthetics, health and safety, ease of selling/leasing home or building, improved occupant productivity, reduced work absences due to reduced illnesses, ability to stay in home/avoid moves, and macroeconomic benefits.
Florida	Program-level cost effectiveness is not required by Statute. However, in 2014, the Commission ordered FEECA utilities to evaluate and develop measures that will assist and educate low-income customers. (Order PSC-14-0696-FOF-EU)
Idaho	In April 2013, the PUC largely adopted its staff's recommendations from an October 2012 report regarding methodology for evaluating low-income weatherization assistance programs (LIWAP) and the criteria for increased funding (Order No. 32788, Case No. GNR-E-12-01). In this order, the PUC determined that a utility "may, but need not, include a 10% conservation preference adder for their low-income weatherization programs," but that if the utility believes the adder would make its cost-effectiveness calculations inconsistent, then the company need not use the adder. The PUC encouraged the utilities to include nonenergy benefits of LIWAPs when calculating cost effectiveness, but declined to construct a "specific cost-effectiveness test for low-income programs at this time." Instead, the PUC vowed to continue reviewing LIWAPs on a case-by-case basis.
Illinois	Section 8-103B (Energy Efficiency and Demand-Response Measures) of SB 2814 excludes low-income energy efficiency measures from the need to satisfy the TRC test: "The low-income measures described in subsection (c) of this Section shall not be required to meet the total resource cost test."
Indiana	Under Senate Bill 412 and Indiana Code 8-1-8.5-10(h) an electricity supplier may submit its energy efficiency plan to the commission for a determination of the overall reasonableness of the plan either as part of a general basic rate proceeding or as an independent proceeding. A petition submitted may include a home energy efficiency assistance program for qualified customers of the electricity supplier whether or not the program is cost effective.
Iowa	According to IAC 199 – 35.8(2), "Low-income and tree-planting programs shall not be tested for cost effectiveness, unless the utility wishes to present the results of cost-effectiveness tests for informational purposes."
Kansas	Low-income programs are not required to pass strict benefit–cost analysis so long as they are found to be in the public interest and supported by a reasonable budget.
Kentucky	Requirements for low-income programming are similar to those governing other programmatic offerings, and these were established by precedent in a 1997 proceeding surrounding the approval of LG&E's DSM program portfolio. The rules for benefit–cost tests are stated in Case No. 1997-083. These benefit–cost tests are required for total program-level screening, with exceptions for low-income programs, pilots, and new technologies. The commission also found in Case No. 97-083 that "If [a] filing fails any of the traditional [cost-effectiveness] tests, LG&E and its Collaborative may submit additional documentation to justify the need for the program."

State	Special cost-effectiveness provisions for low-income energy efficiency programs
Maine	Maine has not had specific cost-effectiveness guidelines in place for low-income programs. However the cost-effectiveness test for all programs provides for consideration of nonenergy benefits including "reduced operations and maintenance costs, job training opportunities and workforce development, general economic development and environmental benefits, to the extent that such benefits can be accurately and reasonably quantified and attributed to the program or project."
Maryland	In Order No. 87082 the PUC requires cost-effectiveness screening for limited-income programs, but indicated the programs may still be implemented without satisfying the test, stating: "We accept the recommendation of the Coalition that, while cost-effectiveness screening of the limited income sub-portfolio shall be required in the same manner as with respect to the other EmPower sub-portfolios, the results of the limited-income sub-portfolio screening shall serve as a point of comparison to other jurisdictions and past programmatic performance rather than as the basis for precluding certain limited-income program offerings."
Massachusetts	Massachusetts relies on the TRC test as its primary test for DSM programs, but specifically calculates additional benefits from low-income programs in its benefit–cost ratio. DPU 08-50-B specifies that an Energy Efficiency Plan must include calculations of non-electric benefits, specifically those related to: "(A) reduced costs for operation and maintenance associated with efficient equipment or practices; (B) the value of longer equipment replacement cycles and/or productivity improvements— associated with efficient equipment; (C) reduced environmental and safety costs, such as those for changes in a waste stream or disposal of lamp ballasts or ozone-depleting chemicals; and (D) all benefits associated with providing energy efficiency services to Low-Income Customers." In 2010, in its 2010–12 Three-Year Plan Order, the Massachusetts Department of Public Utilities (DPU) ordered the program administrators to conduct a more thorough analysis of nonenergy impacts through evaluation studies. The DPU, with few exceptions, approved these studies. A study for the Massachusetts Program Administrators, conducted by NMR Group, incorporates findings from a review of the Non-Energy Impacts (NEI) literature to quantify nonenergy benefits (NEB), including NEBs for low-income programs.
Michigan	Sec. 71 (4)(g) of SB 438 appears to exempt low-income programs from demonstrating cost effectiveness. To demonstrate that the provider's energy waste reduction programs, excluding program offerings to low-income residential customers, will collectively be cost effective, SB 438 states: "An energy waste reduction plan shall…demonstrate that the provider's energy waste reduction programs, excluding program offerings to low-income residential customers, will collectively be cost effective."

State	Special cost-effectiveness provisions for low-income energy efficiency programs
Minnesota	The rules for benefit–cost tests are stated in MN Statutes 261B.241 and Rule 7690.0550. The benefit–cost tests are required for portfolio, total program, and customer project-level screening with exceptions for low-income programs. Subd 7(e) of 216B.241 directs that "costs and benefits associated with any approved low-income gas or electric conservation improvement program that is not cost effective when considering the costs and benefits to the utility may, at the discretion of the utility, be excluded from the calculation of net economic benefits for purposes of calculating the financial incentive to the utility. The energy and demand savings may, at the discretion of the utility, be applied toward the calculation of overall portfolio energy and demand savings for purposes of determining progress toward annual goals and in the financial incentive mechanism."
Mississippi	Mississippi does not require program-level cost effectiveness for low-income programs.
Montana	Montana specifies the TRC as its primary test for decision making. The benefit–cost tests are required for the individual measure level for program screening, but there are exceptions for low-income programs, pilots, and new technologies.
Nevada	Nevada Housing Division for programs of energy conservation, weatherization, and energy efficiency for eligible households do not require a cost–benefit analysis. 2017 legislation established that low-income programs do not have to pass cost effectiveness screening as long as the portfolio of all DSM programs passes.
New Hampshire	With respect to nonenergy benefits for low-income programs, as noted in Order No. 23,574, both low-income programs and educational programs could still be approved by the Commission even if they do not surpass a 1.0 benefit–cost ratio given their additional hard-to quantify benefits."
New Jersey	Implementation of a low-income energy efficiency program is required by New Jersey statute N.J.S.A. 48:3-61. The New Jersey Board of Public Utilities does not require Comfort Partners Program to meet any cost-effectiveness tests.
New Mexico	The Utility Cost test (UCT) is conducted in New Mexico and is considered to be the primary test for decision making and evaluating program cost effectiveness. HB 267 directs that "…In developing this test for energy efficiency and load management programs directed to low-income customers, the commission shall either quantify or assign a reasonable value to reductions in working capital, reduced collection costs, lower bad-debt expense, improved customer service effectiveness and other appropriate factors as utility system economic benefits." It was later codified in New Mexico Administrative Code that: "In developing the utility cost test for energy efficiency and load management measures and programs directed to low-income customers, unless otherwise quantified in a commission proceeding, the public utility shall assume that 20% of the calculated energy savings is the reasonable value of reductions in working capital, reduced collection costs, lower bad-debt expense, improved customer service, effectiveness, and other appropriate factors qualifying as utility system economic benefits" [17.7.2.9 NMAC – Rp. 17.7.2.9 NMAC, 1-1-15].

State	Special cost-effectiveness provisions for low-income energy efficiency programs
New York	New York screens programs at the measure level and requires each to have a TRC score of at least 1.0 with some exceptions. It appears that New York's TRC test does not explicitly address nonenergy benefits of low-income programs. However the New York Public Service Commission (PSC) has generally recognized and considered low-income specific benefits in deciding on funding for utility low-income programs. For example, in a 2010 Order, the commission approved a low-income program with a TRC ratio of 0.91, finding that "As a general principle, all customers should have reasonable opportunities to participate in and benefit from Energy Efficiency Portfolio Standard (EEPS) programs. It is also important that supplemental funding be provided to address gas efficiency measures in this program."
North Carolina	North Carolina low-income programs are generally not required to meet cost-effectiveness thresholds in order that utilities would provide energy efficiency programs to a sector of the population that would likely not otherwise participate in energy efficiency.
Oklahoma	Oklahoma Administrative Code (OAC) 165:35-41-4 directs that demand programs targeted to low-income or hard-to-reach customers may have lower threshold cost-effectiveness results than other efficiency programs.
Oregon	The rules for benefit–cost tests are stated in Docket UM 551, Order 94-590, which lays out a number of situations where the PUC may make exceptions to the standard societal test calculation. Order 15-200, signed June 23, 2015, concerns Idaho Power Company's request for cost-effective exceptions to its DSM programs. The commission adopted the recommendation of staff that cost-effectiveness requirements in Order 95-590 do not apply to low-income weatherization programs, such as the Weatherization Assistance for Qualified Customers Program (WAQC).
Pennsylvania	In Order M-2015-2468992, the PUC specifies 2016 Total Resource Cost test requirements. Pennsylvania relies on the TRC test and considers it to be its primary cost-effectiveness test. A benefit–cost test is required for portfolio-level screening. The commission requires that the electric distribution companies provide benefit and cost data for both low-income and estimated non-low-income residential program savings in their annual reports and that TRC tests be calculated for all low-income programs and all residential programs. However the commission does not require a separate PA TRC test calculation for the low-income sector.
South Carolina	South Carolina does not require program-level cost effectiveness for low-income programs.
Texas	In an order adopted September 28, 2012, the commission directed that low-income programs would not be required to meet the cost-effectiveness standard in Substantive Rule § 25.181, but rather would only need to meet standards required by the Savings-to-Investment ratio (SIR) methodology. All measures with an SIR of 1.0 or greater qualify for installation. The SIR is the ratio of the present value of a customer's estimated lifetime electricity cost savings from energy efficiency measures to the present value of the installation costs, inclusive of any incidental repairs, of those energy efficiency measures.

State	Special cost-effectiveness provisions for low-income energy efficiency programs
Utah	The rules for benefit–cost tests are stated in Docket No. 09-035-27. Utah uses the TRC test, Utility Cost test (UCT), Participant Cost test (PCT), and Ratepayer Impact Measure (RIM). Approval of individual DSM programs or portfolios of programs should be based on an overall determination that the program or portfolio is in the public interest after consideration of all five tests and the passage of the threshold test, the UCT. In addition, Utah also utilizes the PacifiCorp TRC (PTRC) test, which follows the Northwest convention of adding 10% to the avoided costs to account for unquantified environmental and transmission and distribution impacts.
Vermont	Vermont specifies the Societal Cost test to be its primary test for decision making. A 15% adjustment is applied to the cost-effectiveness screening tool for low-income customer programs.
Virginia	Virginia does not require program-level cost effectiveness for low-income programs.
Washington	Per WAC 480-109-100, low-income weatherization is not included in the portfolio or sector-level cost-effectiveness analysis. Companies may implement low-income programs that have a TRC ratio of 0.67 or above. The rules for benefit–cost tests are directed by the Energy Independence Act of 2006, codified in Chapter 194-37 WAC, which specifies that the TRC test include all nonenergy impacts that a resource or measure may provide that can be quantified and monetized. Washington also applies an additional 10% benefit to account for non-quantifiable externalities, consistent with the Northwest Power Act. In Docket UE-131723, signed March 12, 2015, the commission revised the rule language to allow, rather than require, utilities to pursue low-income conservation that is cost effective consistent with the procedures of the Weatherization Manual finding that “in recognition that low-income conservation programs have significant nonenergy benefits, we find it appropriate for utilities to maintain robust low-income conservation offerings despite the unique barriers these programs face.”
Wisconsin	Administrative code requires programs for residential and nonresidential program portfolios to each pass portfolio-level cost-effectiveness. One of the established reasons for setting portfolio-level testing rather than program- or measure-level testing is to provide more flexibility for low-income programs.