Next-Generation Energy Efficiency Resource Standards

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August 2019
Report U1905

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Acknowledgments

This report was made possible through the generous support of foundations, CenterPoint Energy, Eversource, and IESO. The authors gratefully acknowledge external reviewers, internal reviewers, colleagues, and sponsors who supported this report. External review and support do not imply affiliation or endorsement. External expert reviewers included Jessica Shipley and David Farnsworth from the Regulatory Assistance Project, Mike Henchen from Rocky Mountain Institute, Brian Kealoha from Hawaii Energy, Karen Palmer from Resources for the Future, Lara Ettenson from Natural Resources Defense Council, Nick Mark and Carter Dedolph Jr. from CenterPoint Energy, Miles Ingram from Eversource, Aaron Tinjum from Xcel Energy, Ashley Norman and Commissioner Jenny Potter from the Hawaii Public Utilities Commission, Emily Levin from the Vermont Energy Investment Corporation, Vanessa Ulmer from the New York State Energy Research and Development Authority, Bill Pennington from the California Energy Commission, Anthony Fryer from the Minnesota Department of Commerce, Maggie McCarey from the Massachusetts Department of Energy Resources, Mike Bull from the Center for Energy and Environment, and Jeorge Tagnipes from the California Public Utilities Commission. Internal reviewers included Neal Elliott, Martin Kushler, Therese Langer, Steven Nadel, and Maggie Molina. Last, we would like to thank Fred Grossberg for developmental editing and managing the editing process; Elise Marton, Sean O'Brien, and Roxanna Usher for copy editing; Eric Schwass for graphics support; and Wendy Koch, Casey Skeens, Kate Doughty, and Maxine Chikumbo for their help in launching this report.

Executive Summary

KEY TAKEAWAYS

- Energy efficiency resource standards (EERS), adopted by 27 states over the past 20 years, are a key tool for driving energy and cost savings, propelling more than 80% of utility-sector electricity savings in 2017. In that year, states with an EERS in effect achieved incremental electricity savings of 1.2% of retail sales, on average, compared with average savings of 0.3% in states without an EERS.
- Increased focus on emissions reductions, least-cost resource planning, and equity have caused states to look for new frameworks for setting energy savings goals. Of the states we reviewed in this report, most cited decarbonization as the most pressing policy goal and are using EERS policies to help reduce emissions.
- States have taken three main approaches as they revise EERS policies: adopting resource-specific targets, fuel-neutral targets, and multiple-goal approaches that may combine these two strategies.
- States have also chosen to work within existing EERS frameworks and steer efficiency investments using seven additional tools: carve-outs, tracking, performance incentives, cost-effectiveness rules, program design, spending, and separate portfolios.
- Frameworks with multiple goals, especially where they include both fuel-neutral and resource-specific targets, are best positioned to meet long-term aims, including climate and clean energy objectives.
- Regardless of the EERS policy design, states should set goals based on high-quality potential studies. These studies should fairly value the costs, benefits, and potential for all the resources included in goal setting and cost-effectiveness testing.

Energy efficiency resource standards have been a key tool for delivering energy savings in states across the country. The 27 states that have adopted these policies delivered the lion's share of energy savings in recent years. 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. In that year, 19 of the top 20 electricity-saving states had an EERS in place, as did 6 of the top 7 natural gas–saving states (Berg et al. 2018). There is clear evidence that energy savings goals are achievable and effective, and with 23 states not yet adopting these standards there are significant opportunities for energy savings still on the table.

Traditionally, EERS policies have been designed to encourage energy savings for specific energy resources. All of the 27 states with energy savings goals have targets for electricity; 19 also have targets for natural gas. Most of these targets are set in terms of savings as a percentage of retail sales. While there are variations in the mechanisms and details, EERS policies have on the whole been designed around similar goals: encouraging electricity and natural gas savings.

Now states are looking to their energy efficiency policies to do more than deliver energy savings. Such policies can also help states meet aggressive climate goals, lower costs, give utilities the flexibility they need to meet demand, and deliver benefits like bill savings and healthier homes to those with the highest need. While some states are working to maximize these benefits within their existing frameworks, others are restructuring their energy savings goals.

NEW GOAL STRUCTURES AND OTHER POLICY TOOLS

To meet emerging policy goals including significant emissions reductions, lowered system costs, increased grid flexibility, and equitable access to the benefits of clean energy investments, states are considering a variety of models for EERS policies. Our research finds that states are taking three main approaches to goal-setting as they revise EERS policies: adopting resource-specific targets, fuel-neutral goals, or multiple-goal approaches that often incorporate both resource-specific and fuel-neutral goals. In practice, the boundaries separating these categories can blur. Resource-specific goals, which most current EERS structures follow, set savings targets by fuel type (e.g., electricity and natural gas). Some states, like New York and Massachusetts, have established fuel-neutral goals, but even these states pair this approach with additional targets under a multiple-goal framework that directs investments toward specific resources or strategies, like electricity savings, demand reduction, and heat pump deployment.

Beyond goal setting, policymakers and program administrators are using other tools to help steer energy efficiency programs toward reduced cost and emissions, improved equity, and strategies that maximize grid value. Our review of five states exploring new approaches to EERS policies and the literature on energy efficiency goal setting identified seven additional tools for ensuring EERS policies achieve the desired outcomes: carve-outs, which set subgoals underneath a larger goal; tracking metrics to establish a performance baseline; separate portfolios for particular resources or populations; spending guidance; performance incentives; cost-effectiveness rules; and program design guidance.

OTHER CONSIDERATIONS

Other issues may also affect the design and implementation of EERS policies in the future. States are increasingly seeing benefits of utility involvement in areas beyond resource acquisition, for example in promoting additional savings through building codes and appliance standards that transform markets. A number of states are redesigning energy efficiency targets to encourage deeper savings, and others are working to value efficiency investments by rate-basing these expenditures, an approach similar to the way other infrastructure investments are valued. Efforts to electrify both buildings and transportation will have an impact on overall load, which will in turn influence how energy savings goals are calculated.

The role of natural gas is also an important consideration. Studies have shown that natural gas usage could decline significantly but will likely continue to play a major role in providing energy to homes and businesses in many states. To address emerging climate goals, targets should encourage natural gas efficiency programs that provide the biggest customer savings, prioritize gas efficiency in markets where electrification may not deliver net benefits, and consider the effective useful life of new investments relative to policy goals.

RECOMMENDATIONS AND CONCLUSIONS

A state's energy efficiency and clean energy goals, rules, and program designs should align with its policy goals. States should identify their policy drivers for energy efficiency and align energy efficiency policies with those drivers. EERS policies can effectively help states accomplish a range of goals, including reducing emissions, lowering costs, improving grid flexibility, and delivering benefits to those with the greatest need. As states adjust their targets to reflect these emerging policy drivers, we recommend a multiple-goals approach, including both fuel-neutral targets and resource-specific targets where appropriate for a state's priorities.

Regardless of the approach taken, states should consider that the lens through which they view eligible energy efficiency measures will impact the magnitude and design of the targets they set. States should conduct high-quality resource planning and energy efficiency potential studies that are well aligned with their definitions of energy efficiency and their policy drivers.

EERS policies have been critical for delivering large-scale energy savings to businesses and families, and they will remain key tools for achieving a wide range of policy goals going forward.

Introduction

Nearly every state in the country delivers energy efficiency programs to businesses and residents, but the deepest savings come in states with energy efficiency resource standards (EERS) (Berg et al. 2018). Since 1999, 27 states have adopted an EERS, setting long-term, binding targets for energy savings for utilities.

Traditionally, EERS policies have been designed to encourage energy savings for specific energy resources. All of the 27 states with energy savings goals have targets for electricity, and 19 also have targets for natural gas. Most of these targets are set in terms of savings as a percentage of retail sales, although Texas, which in 1999 was the first state to adopt an EERS, designed its target around load growth. Several other states have demand goals in addition to energy savings goals, and some have carve-outs to encourage a certain level of investment in specific programs or sectors. While EERS policies vary in mechanisms and details, on the whole they have been designed to meet similar goals: encouraging electricity (and sometimes natural gas) savings as a utility resource.

After being structured very similarly for 20 years, EERS policies in some states have begun to evolve to meet new market and policy needs. Changing grid needs require that efficiency be a nimbler resource in utility system planning, driving an increased focus on its time and locational value. State policymakers are increasingly emphasizing climate goals and, often simultaneously, promoting beneficial electrification (see text box below: "What Is Beneficial Electrification?"). Energy efficiency is a critical tool for meeting these ambitious goals, and it can and should complement beneficial electrification strategies. At the same time, policymakers are shining a light on the equity implications of various energy investment choices. Low-income households' energy bills consume a larger proportion of their incomes than do those of higher-income households. Compared to white households, Hispanic households spend roughly one-third more of their income on energy bills, and black households pay roughly two-thirds more of their income. Energy efficiency can help reduce these costs by as much as 25%, but ensuring that the benefits of efficiency programs are fairly distributed across all customer segments requires care in program delivery and a policy design that prioritizes those with the greatest need (Drehobl and Ross 2016).

As policymakers take into account the broader benefits of energy efficiency, including improved air quality, reduced greenhouse gas (GHG) emissions, and improved health and safety in homes and businesses, they are increasingly asking how EERS policies can do more. Many are creating, expanding, and modifying efficiency targets to support their evolving priorities, and other states may be poised to follow suit.

Next-generation energy efficiency resource standards should continue to deliver the large societal and utility system benefits of well-established resource-specific energy savings goals but also meet evolving state policy needs. In this report, we seek to understand how EERS policies have performed to date and the ways that states are adapting these policies to meet new priorities. We outline key drivers of change and profile several states that have begun the process of updating their EERS policies. Using lessons learned from these states, we provide recommendations and key considerations for energy efficiency stakeholders seeking to update EERS policies to help achieve additional goals.

Methodology

We designed our study with these goals in mind:

- Understand how EERS policies have performed in recent years
- Outline major factors driving new policy design
- Analyze how various policy designs might serve changing policy goals

To assess how EERS policies have performed to date, we collected information on energy savings goals and utility performance for the 25 states with EERS policies in effect in 2016 and 2017. We updated the data set from a 2014 assessment of EERS policies (Downs and Cui 2014) to reflect goals and savings achievements during 2016 and 2017 using state legislation, regulatory orders, and utility-specific targets identified in annual and multiyear demand-side management reports and plans. In cases where regulatory outcomes differed from legislative guidance, we relied on regulatory language. We collected savings information from the annual reports of affected utilities or program administrators and supplemented these data with statewide savings figures provided by state utility commissions as part of ACEEE's annual *State Energy Efficiency Scorecard*.

To examine how energy savings goals are changing and can evolve, we designed a two-stage interview process. In the first stage, we spoke with five national experts in order to understand common policy goals and how EERS policies might need to change to meet these goals. We also asked these experts to help identify states that had undergone changes to EERS policy design or that were grappling with these questions. We sought to identify states at various stages of the EERS redesign process, and states in which stakeholders were considering a range of policy options. To keep the scope narrow, we focused interviews and research on energy efficiency targets. However we cataloged other methods for realigning energy efficiency policies, like using performance incentives, cost-effectiveness rules, and other policy tools.

We identified five states tackling the opportunities and challenges of EERS policy redesign: California, Hawaii, Massachusetts, Minnesota, and New York. These states represent a range of approaches, regions, and maturity of efforts. In each of these states, we conducted the second stage of our interview process, speaking with a variety of stakeholders including regulators or regulatory staff, energy efficiency advocates, and utilities. We asked our interviewees to identify the top two policy drivers for EERS change, outline the process by which changes were made, and reflect on lessons learned. These interviews inform the case studies of the five illustrative states in Appendix A. In the sections that follow, we summarize our key findings.

History of EERS Policies

Energy efficiency programs for utility customers emerged in the 1970s in the wake of the 1973 oil embargo and enjoyed their first wave of popularity through the 1980s and early 1990s as the concept of utility integrated resource planning (IRP) emerged. These efforts also introduced the principle of demand-side management (DSM), which utilities continue to incorporate within their IRPs to varying degrees (Duncan and Burtraw 2018).[1] During the mid-1990s the utility restructuring movement, along with corresponding economic pressures and limits to regulation, led to a mass reduction in efficiency programs for several years. In response, many states created public benefits funding mechanisms in an effort to sustain energy efficiency programs amid the new, restructured regulatory environment.

With these new supportive policies, the late 1990s and early 2000s saw a gradual reemergence of utility energy efficiency programs, though challenges persisted. These included the western US energy crisis of 2000 and 2001, which served to highlight the important value of energy efficiency in managing demand (Kushler, Vine, and York 2002). Meanwhile, legislatures in several states responded to the 2001 recession by raiding public benefits funds intended for energy efficiency, prompting a desire among many to shift energy efficiency back within utility regulation and out of the unpredictable state government budget process (Kushler et al. 2006).

Around this time the concept of the energy efficiency resource standard began to take root, pushing states to transition beyond a policy mind-set that was focused on funding levels to one that sought to achieve specific measurable levels of energy efficiency savings. States developed efficiency goals that were similar to renewable portfolio standards, which require utilities to include a specified proportion of renewable energy in their portfolios of resources. By setting long-term targets, an EERS offers regulatory certainty, helping utilities incorporate energy efficiency into their long-range IRPs and consider efficiency as a resource equivalent to supply-side assets in meeting customer energy needs (Downs and Cui 2014). Unlike the IRPs of the past, which may have had limited stringency, an EERS sets specific requirements and mandates clearer proof of compliance from utilities.

In 1999 Texas passed Senate Bill 7, restructuring the state's electricity market and establishing the first-ever state EERS, which required electric utilities to offset 10% of load growth through end-use energy efficiency.[2] By 2006 eight states had established EERS policies, and by 2011 the number had grown to 26. As of 2019, 27 states have implemented some form of EERS covering electricity. Of these states, 19 also have an EERS policy in place for natural gas.[3] Figure 1 gives a chronology of state EERS adoption, and figure 2 shows the states with electricity savings targets currently in place.

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[1] Demand-side management (DSM) programs are the planning, implementing, and monitoring activities of utilities to encourage consumers to modify their level and pattern of electricity usage. The term is often used interchangeably with energy efficiency but can also include demand response and flexibility activities.

[2] In the years since, the state incrementally increased this target to 30% of load growth, and in 2011 it transitioned to a savings target set to 0.4% of a company's peak demand.

[3] In Washington State, HB 1257 passed in 2019, establishing an all-cost-effective natural gas conservation standard under which utilities must set a savings target every two years. Initial targets will take effect in 2022.

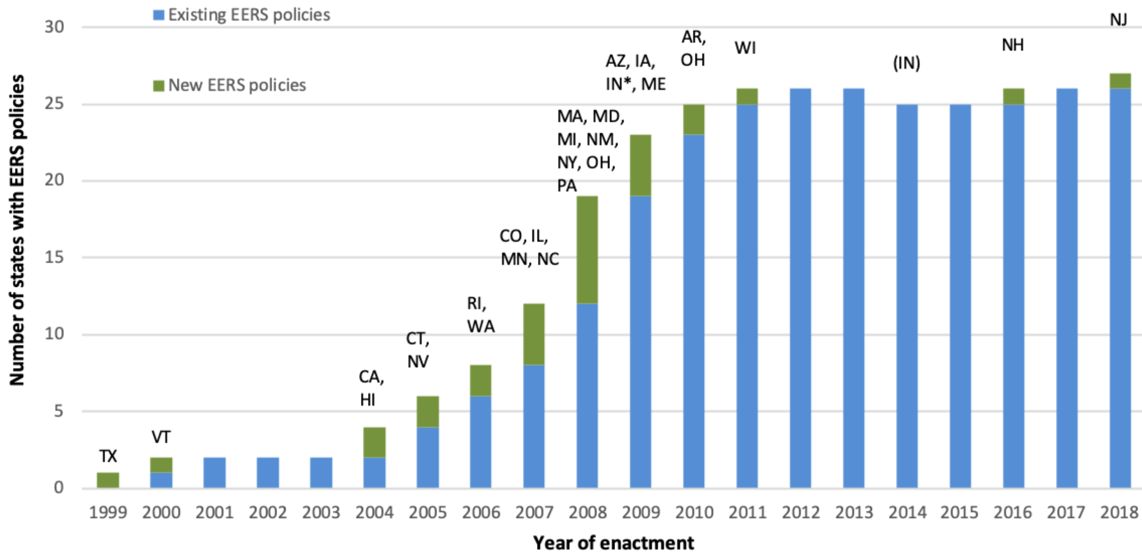

Figure 1. States with an EERS by year of adoption. *Indiana's EERS was rolled back in 2014.

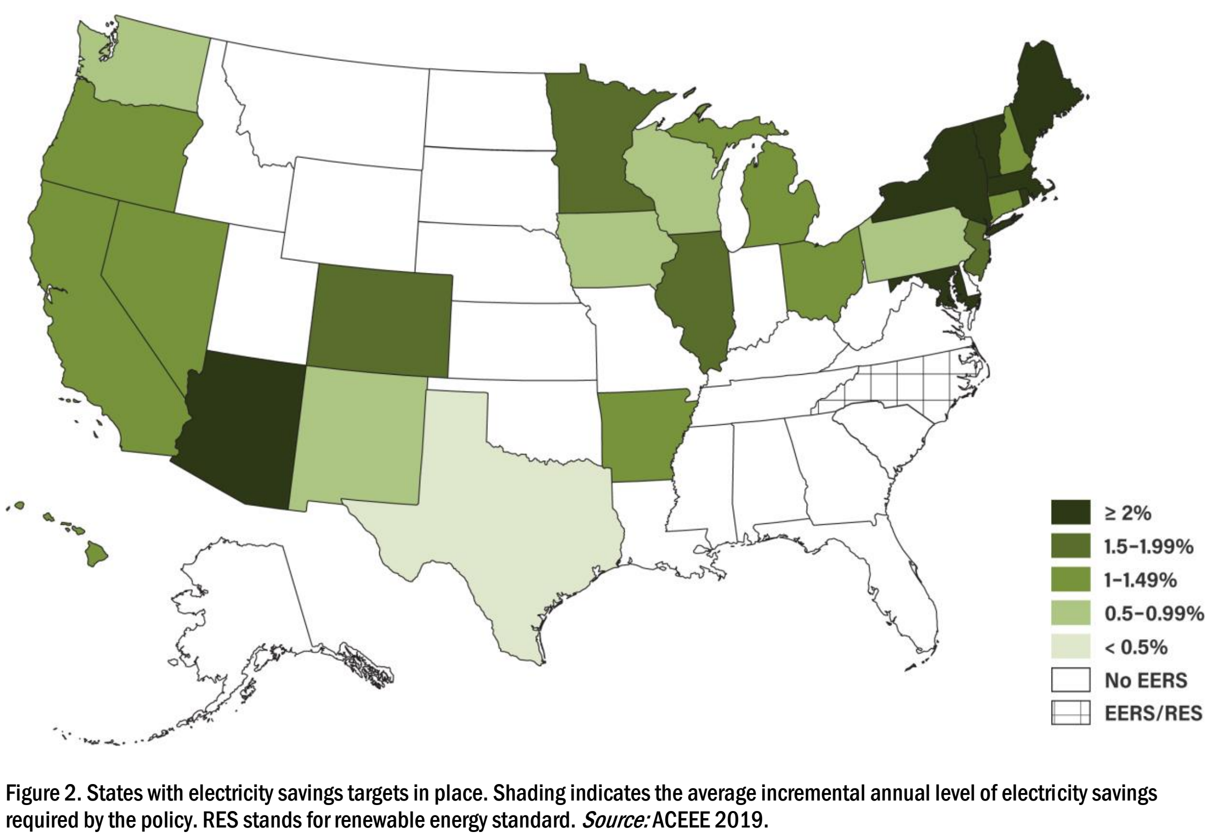

Figure 2. States with electricity savings targets in place. Shading indicates the average incremental annual level of electricity savings required by the policy. RES stands for renewable energy standard. *Source:* ACEEE 2019.

EERS Achievements

Over time, as states have strengthened targets and as funding and administration of programs have grown stronger, EERS policies have proved themselves the most effective way for a state to guarantee long-term energy savings. In 2017, states with an EERS in effect achieved incremental electricity savings of 1.2% of retail sales on average, compared with average savings of 0.3% in states without an EERS (ACEEE 2019).

In 2017, 19 of the top 20 electricity-saving states had an EERS in place, as did 6 of the top 7 natural gas–saving states (Berg et al. 2018). EERS policies covered approximately 49% of national electric sales while accounting for approximately 80% of reported nationwide utility savings in 2016 and 2017. Taken together, the utilities with these policies reported roughly 18.9 million MWh of savings in 2016 and almost 20.6 million MWh of savings in 2017. Furthermore, the utilities were able to over-deliver. Combined, they achieved 114% and 124% of aggregate savings targets across all states with an EERS in 2016 and 2017, respectively.

Our analysis of reported levels of electricity and natural gas savings in 2016 and 2017 shows that utilities in states with an EERS have generally been successful in meeting established savings targets and have been instrumental in driving nationwide energy efficiency. Figure 3 shows levels of electricity savings achieved by these states relative to their efficiency targets in recent years.

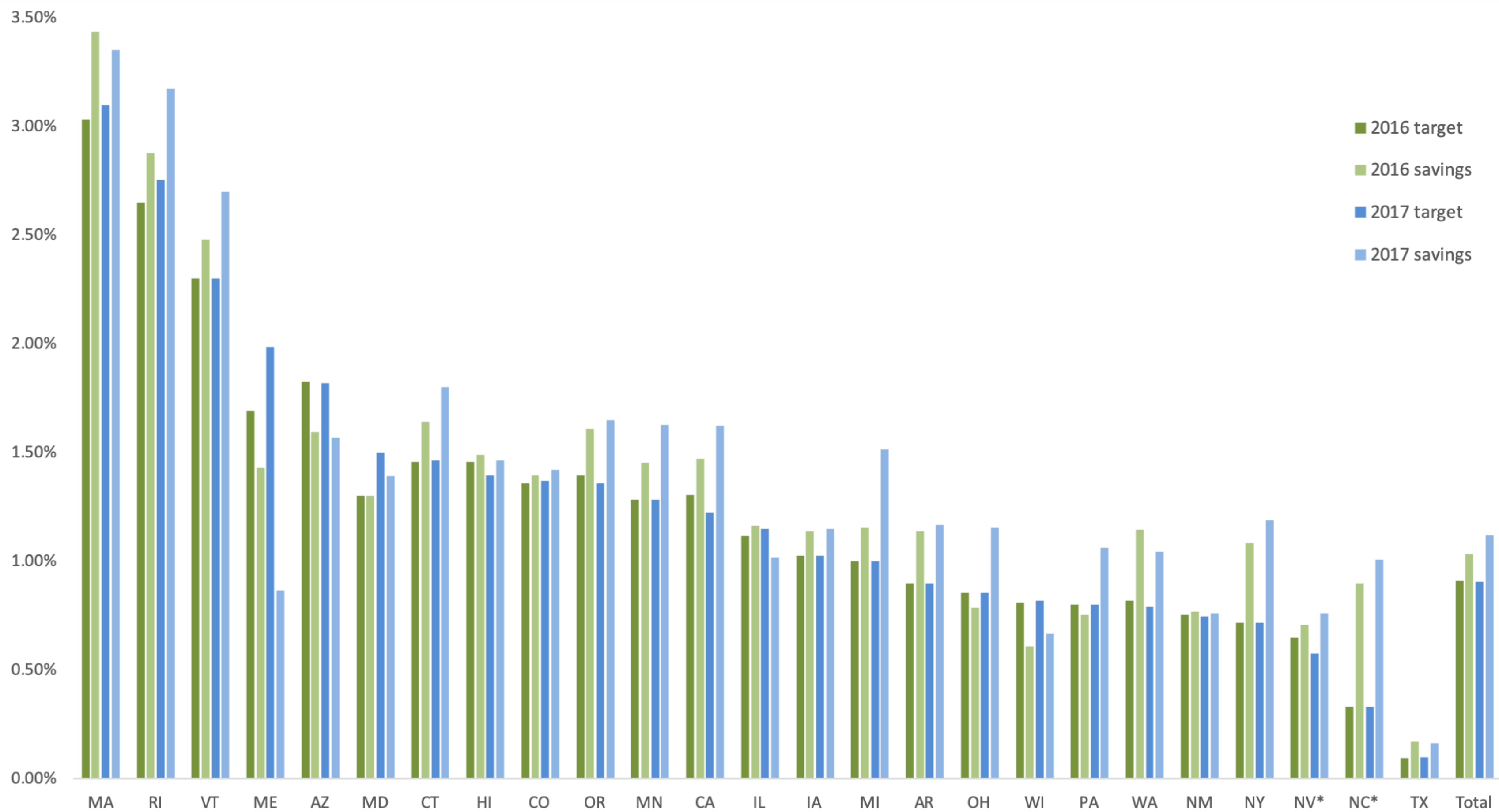

Figure 3. Electric utility progress toward energy efficiency savings targets (2016–2017). All data are presented on an incremental annual basis. See Appendix D for additional information regarding data sources, assumptions, and net-to-gross adjustments.

Of the 25 states with an EERS policy in effect in 2017, 20 met or exceeded their targets for that year, and all but one exceeded 80% of their savings goals.[4] The two states that were the least successful at meeting their goals, Maine and Wisconsin, both experienced significant cuts to efficiency budgets affecting these program years. Maine, for example, had annual energy efficiency funds reduced from $60 million to $22 million in 2015 by the Maine Public Utilities Commission, impeding Efficiency Maine Trust's ability to meet previously adopted savings goals (Maine PUC 2015). Wisconsin's Focus on Energy, the state administrator of efficiency programs, suffered a less severe cut of $7 million, roughly 7% of program funding, under 2016 state legislation (Wisconsin Legislature 2016). Highest-achieving states included Massachusetts, reporting utility savings above 3% under all-cost-effective savings targets established by the state's Green Communities Act. Rhode Island followed closely behind, also reporting savings exceeding 3% in 2017.[5] The state's Comprehensive Energy Conservation, Efficiency and Affordability Act of 2006 established a least-cost procurement mandate, also requiring utilities to acquire all cost-effective energy efficiency savings. In the years since, targets have risen from 1.7% to more than 2.5%.

It should be noted that targets vary significantly. Massachusetts, Rhode Island, and Vermont set relatively ambitious targets based on calculated net savings and covering virtually 100% of statewide sales; other states have lower targets requiring less stringent evaluation of savings. While more than half of states with an EERS have targets equivalent to 1% of electric sales or higher, most of those that do not—such as Washington, Arkansas, Pennsylvania, New York, and North Carolina—nevertheless exceeded 1% savings for covered utilities. The coverage of these policies also varies from state to state, as do regulatory guidelines on how utilities meet targets. Arizona's EERS, for example, covers only roughly 56% of the state's electricity sales, with utilities instead reporting gross savings and claiming up to 10% of their annual goal savings from demand response programs.[6]

We also examined the progress of the 16 states with natural gas targets established under an EERS in 2016 and 2017, illustrated in figure 4. As with electricity targets, we found that states have generally been successful in achieving natural gas savings goals, with about two-thirds of states reporting savings that met or exceeded their respective targets. Altogether, utilities subject to these targets accounted for just 34% of total national natural gas volumes distributed in the years studied but produced about 85% of total natural gas savings reported nationally. Utilities under these policies collectively reported roughly 291 MMTherms of savings in 2016 and 307 MMTherms in 2017, or roughly 108% and 112% of aggregate savings targets across all states with a natural gas EERS for each year. Targets for natural gas savings tend to be lower. Taken in aggregate, they called for savings

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[4] While 27 states had adopted an EERS as of May 2019, New Hampshire and New Jersey were not included in this analysis as neither had savings targets in effect for the 2016–2017 period analyzed. New Hampshire adopted targets in 2016 that took effect during the 2018 program year, and New Jersey did not adopt an EERS until 2018. It should also be noted that since 2017 several states have strengthened utility savings targets beyond what is presented in figure 4. These include Arkansas, Colorado, Illinois, Nevada, New York, and Vermont.

[5] See Appendix D for details on how we calculated progress toward energy savings goals.

[6] In Arizona, peak demand reduction capability from utility demand response is converted to an annual energy savings equivalent based on an assumed 50% annual load factor (DOE 2019).

equivalent to 0.5%–0.6% of natural gas sales volumes, roughly half the aggregate percentage of savings achieved by electric EERS policies. This disparity reflects the relatively lower potential gas savings and avoided costs due to fewer natural gas end uses, as well as recent low gas prices.

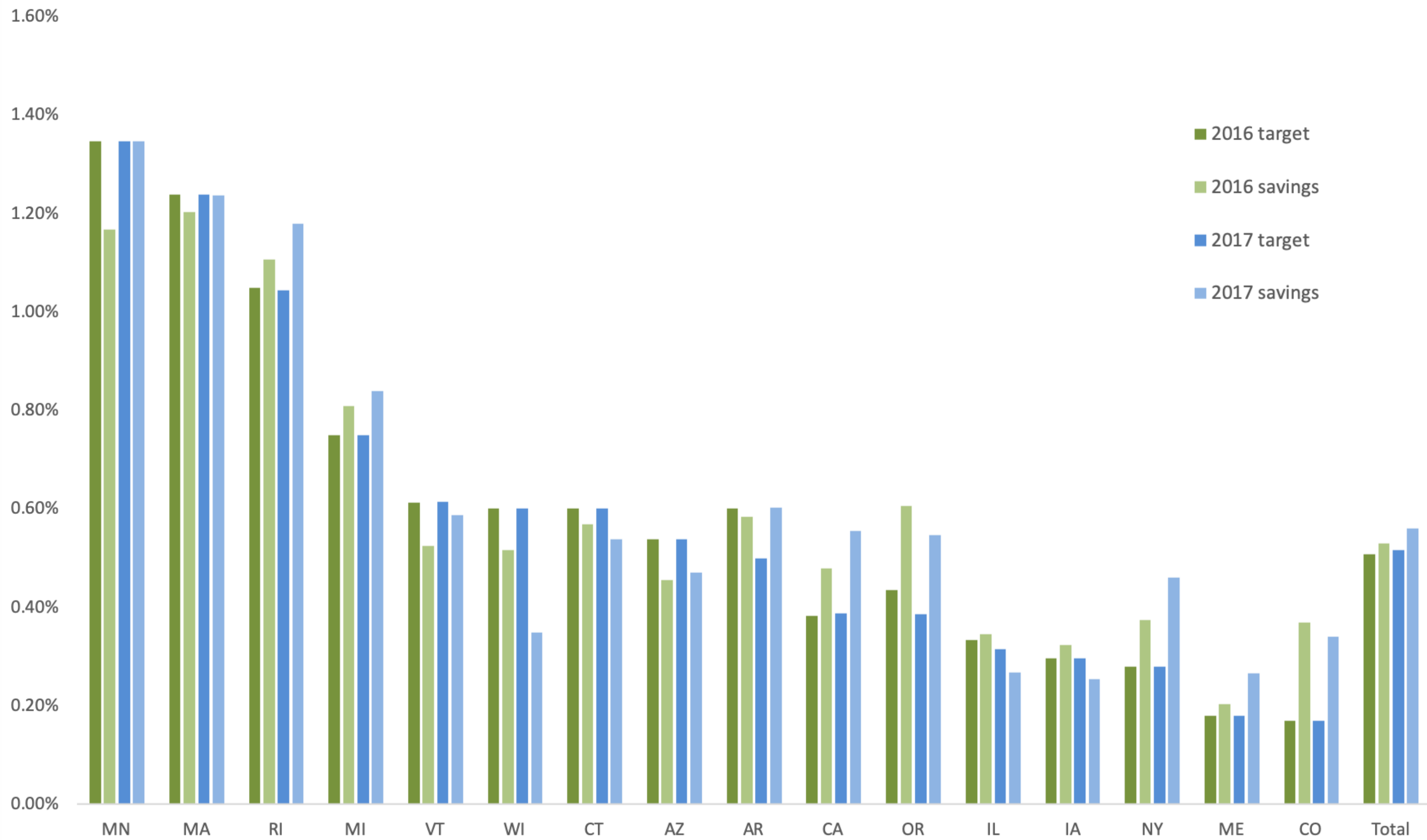

Figure 4. Utility progress toward EERS natural gas savings targets (2016–2017). All data are presented on an incremental annual basis. See Appendix D for additional information regarding data sources, assumptions, and net-to-gross adjustments applied.

EERS policies have done more than generate energy savings. They have also been an important economic development driver. More than 2.25 million Americans worked in energy efficiency in 2018, and 9 of the top 10 states for energy efficiency jobs had energy savings goals in place (E2 and E4TheFuture 2018). Efficiency has also had a major impact on total emissions from the power sector, with US electric power sector carbon emissions declining 28% since 2005 due in large part to slowed growth in demand, as shown in figure 5 (EIA 2018a).

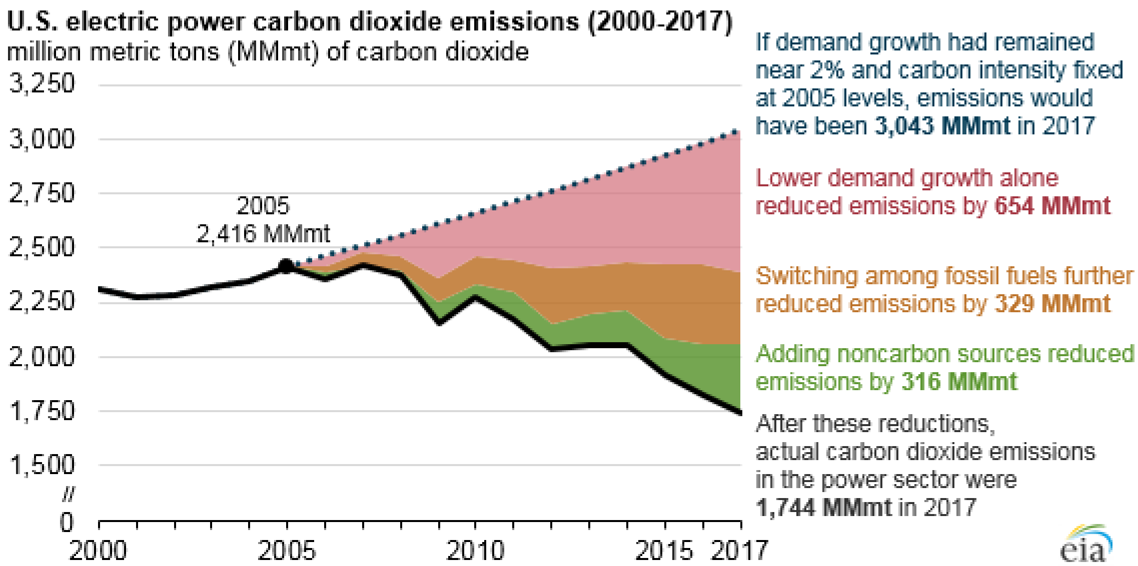

Figure 5. Changes in carbon dioxide emissions over time and the impact of contributing factors. *Source:* EIA 2018a.

Establishing EERS Baselines and Targets

EERS policies are designed to allow for load growth while maintaining clear and measurable savings targets. Historically, these targets have been broadly designed to accomplish the same goals, but policy details have differed. States have taken a variety of approaches to determining baselines, target levels, the duration of savings considered, and the scope of sales covered. Targets may be structured in absolute terms (e.g., as a specified annual number of MWh saved) or in relative terms (e.g., as an established percentage of electricity consumption). For those states expressing targets in relative terms, regulators specify either a fixed basis (total retail sales from a specific year) or a rolling basis (a moving year or average among years that changes with each compliance year) for determining savings levels. Figure 6 illustrates these options.

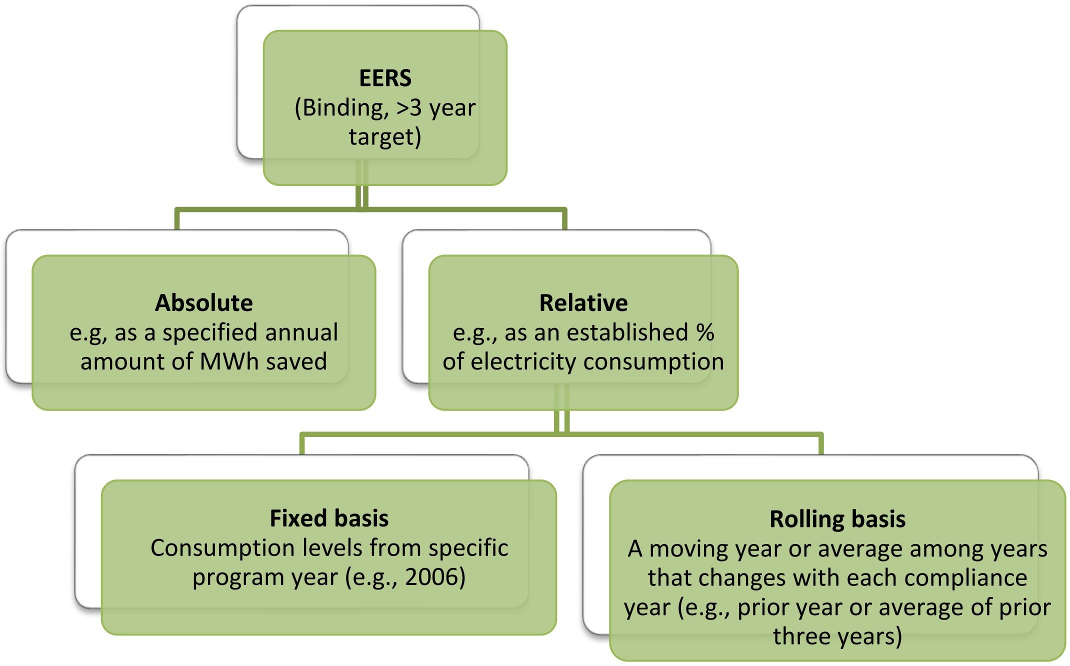

Figure 6. Baseline options for assessing EERS targets.

States have chosen each of these approaches, as figure 7 illustrates.

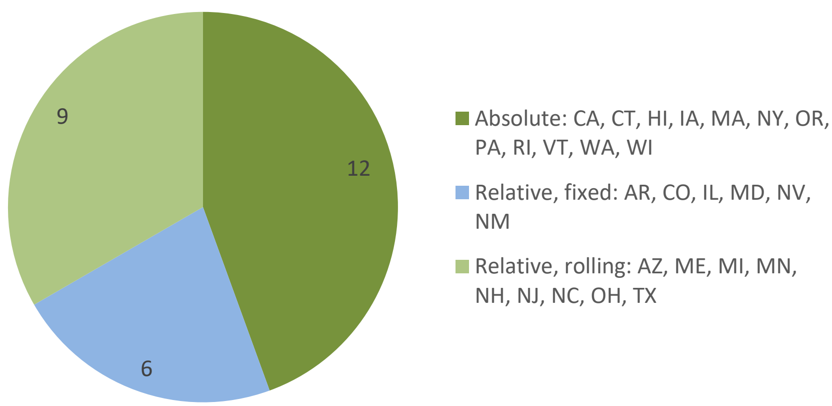

Figure 7. Number of states with EERS by basis type

Several states set targets based on potential studies guided by "all cost-effective" mandates or cost limitations. We consider those to be absolute targets, since the ultimate result is an absolute kWh target over the planning period rather than a goal that is associated with sales in a particular year.[7]

Perhaps most important for achieving energy savings are the target levels. These vary widely, ranging from the equivalent of 0.2% of retail sales per year (Texas) to 2.5% or more per year (Vermont, Rhode Island, and Massachusetts). Gas utilities are required to save the equivalent of 0.2% of retail sales per year (Maine) to 1.25% or more per year (Minnesota and Massachusetts).

Some states set the magnitude of targets according to the achievements of neighboring states, designing a ramp-up schedule for energy savings based on what has proved achievable elsewhere. In many states, however, energy savings goals are informed by potential studies. The parameters of these studies vary. They make various assumptions about methodological features like participation rates and incentive levels, and they incorporate diverse policy-based determinants, e.g., the primary cost-effectiveness test and eligible measures (Neubauer 2014). For example, utilities in California engage heavily in work to strengthen and implement building codes and appliance standards, and they count savings from these measures toward their goals. Some states include combined heat and power as an eligible efficiency measure and have increased goals accordingly. Others allow some amount of distribution system efficiency, such as conservation voltage reduction, to count toward energy savings goals.

It is also important to note that EERS policies do not cover every utility in every state. Some states, especially those with statewide efficiency administrators, offer programs to all customers. But many limit energy savings goals to investor-owned utilities that are under the purview of utility regulatory bodies. The percentage of sales covered by these policies ranges from 50% (Arkansas) to 100% or nearly 100% of sales (Hawaii, Maine, Michigan, Minnesota, New Hampshire, New York, Rhode Island, Vermont, and Wisconsin).[8]

Appendix B includes more details on current EERS policies by state.

Reexamination of EERS Policies

Although EERS policies have a long history of successfully delivering energy savings, emerging market and policy trends are forcing a reexamination of these policy tools. Below, we highlight market trends impacting energy efficiency as well as key considerations—like climate change, least-cost resource planning, and equity goals—that are shifting the lens through which policymakers view EERS policies.[9]

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[7] Even states that set targets in "absolute" terms often communicate the magnitude of these targets using relative terms (i.e., percentage of sales).

[8] Some states also have policies that allow large customers to opt out of efficiency programs, further limiting the portion of sales impacted by energy efficiency programs.

[9] Trends derived from expert interviews and literature review.

UNDERLYING MARKET AND POLICY TRENDS

Reduced Savings from Lighting

The most successful program administrators have energy efficiency targets, and to date, many have relied on significant contributions from lighting programs (Baatz, Gilleo, and Barigye 2016). The 2020 general service lighting standard from the Energy Independence and Security Act of 2007 will set a new baseline for this common program type, decreasing potential program administrator savings (EISA 2007). Some major opportunities for lighting savings remain, particularly commercial and industrial lighting with controls (Yamada et al. 2018). However, because lighting programs have represented the largest single source of savings, interviewees from multiple states expressed concern about their ability to continue meeting high savings goals going forward.

Increasing Availability of Controllable Intelligent Efficiency

Energy efficiency programs and measures increasingly include connected and controllable features, enhancing their ability to deliver kilowatts at particular times of day as well as total savings in kilowatt-hours. These include smart heating, ventilation, and cooling (HVAC); water heating; lighting; advanced power strips to manage plug loads; and energy management and information systems (Perry 2017). With these capabilities, energy efficiency products can also serve as demand response or flexibility resources, helping to reduce peak demand, integrate variable renewables, and balance power flows. These time- and location-specific values are monetizable in some market environments and can help integrate energy efficiency as a key distributed energy resource (DER) (Frick et al. 2017). Program administrators will have to break through traditional dividing lines between demand response and energy efficiency and may need to measure success differently to capture this opportunity. For example, program administrators are beginning to offer integrated programs that offer customers smart thermostats and other energy efficiency services in exchange for participation in demand response events (Nowak et al. 2019).

Decreasing Avoided Costs

The avoided cost of energy and capacity is decreasing as renewables decline in cost and represent a growing portion of supply, and as natural gas prices continue to be low, as shown in figure 8 (Synapse 2018). Energy efficiency cost-effectiveness calculations often include a range of benefits beyond avoided energy and capacity, but these factors make up a large portion of the overall value stack and as a result these tests may show decreasing benefits where avoided costs are low. In turn, program administrators may face pressure to cut program costs. Long-range planning processes informed by energy efficiency potential studies may also be impacted, as some traditional energy efficiency programs are screened out by cost-effectiveness tests.

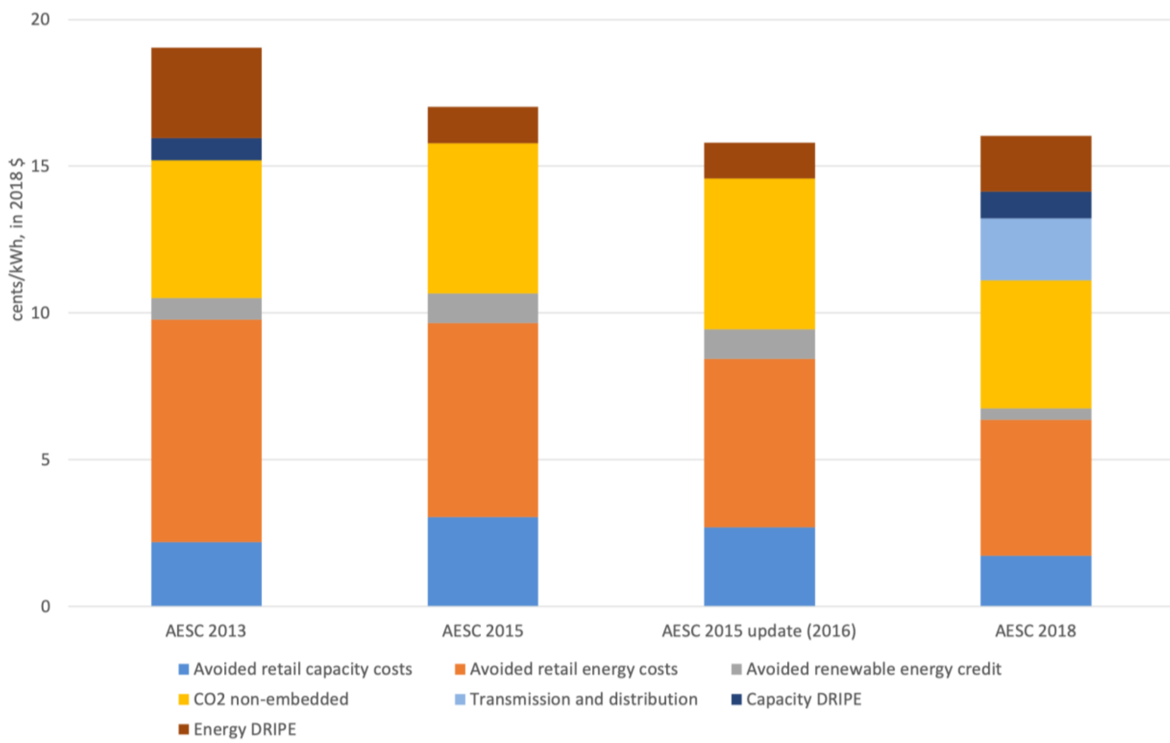

Figure 8. Avoided retail summer on-peak electricity cost components in 2013, 2015, and 2018. AESC (avoided energy supply costs) is the sum of each cost component. DRIPE (the demand reduction induced price effect) is the reduction in prices in the wholesale markets for energy and capacity as a result of reduced demand caused by energy efficiency and/or demand response programs. Specific values for avoided costs of transmission and distribution were included in 2018 calculations, but not in prior years. *Source:* Synapse 2018.

However there are countervailing forces suggesting increased system costs and the ongoing need for low-cost energy efficiency. These include the significant recent increase in transmission and distribution infrastructure investment, which is likely to continue, and the increased need for investment in system flexibility to accommodate variable renewable resources (EIA 2018b; Cochran et al. 2015). Costs may also increase if a federal carbon tax or other mandated cost of carbon emerges in the future, and some states are already monetizing the carbon mitigation value of energy efficiency in cost-effectiveness tests or markets. For example, Minnesota and New York consider the cost of carbon and other GHG emissions in their primary cost-effectiveness tests (NESP 2019).

Electrification

Several of the states we profiled noted that electrification—fully or partially switching from technologies that directly use fossil fuel to those that use electricity—is an emerging priority. Where the grid is increasingly powered by lower-carbon sources, shifting from technologies that directly use fossil fuels to those that use electricity has the potential to reduce emissions.

What Is Beneficial Electrification?

Electrification is a form of fuel switching that either fully or partially displaces direct fossil fuel use with electricity use, for example shifting to electric heat pumps to heat homes and businesses. As the electric grid gets cleaner, electrification often provides societal benefits in the form of reduced emissions of greenhouse gases and other pollutants and lower customer energy costs. Local conditions, such as heating and cooling needs, heating fuel types and costs, generation resource mix, and seasonal and daily variation in marginal generation mix, will be factors in determining these benefits.

Most organizations define electrification as beneficial when it provides net societal and participant benefits. For example, the Regulatory Assistance Project states that electrification must meet one or more of the following conditions without adversely affecting the other two:

- Saves consumers money over the long run
- Enables better grid management
- Reduces negative environmental impacts (Farnsworth et al. 2018)

ACEEE views electrification as a form of energy efficiency only when it saves total primary energy and meets customer savings and emissions reduction criteria. There are energy efficiency measures that are not beneficial electrification, including appliances and equipment that save the same fuel, or whole-building shell measures that save multiple fuels. Similarly, depending on the definition, there may be forms of beneficial electrification that do not meet our criteria for energy efficiency or do not *yet* meet that definition because of economics or the local grid mix, as with existing gas space heating in some cold climates.

Electrification in many applications may save energy, as in the cases of electric vehicles and high-efficiency heat pumps for space and water heating in many climates. Even where these technologies do not meet our criteria as energy efficiency, they may offer climate, grid, and customer value. As a result, policymakers are considering how to incentivize both beneficial electrification and energy efficiency in tandem.

As shown in figure 9, energy efficiency and replacing fossil fuel generation with renewable resources will achieve significant emissions reductions, but electrification of end uses is also a critical piece of a comprehensive strategy for meeting electric-sector climate goals. Electrification also increases load for electric utilities, a particularly attractive prospect for their business in an era of generally flat or declining retail sales.[10]

[10] While policies such as decoupling and shareholder incentives can help mitigate throughput and capital expenditure biases, they do not do so entirely.

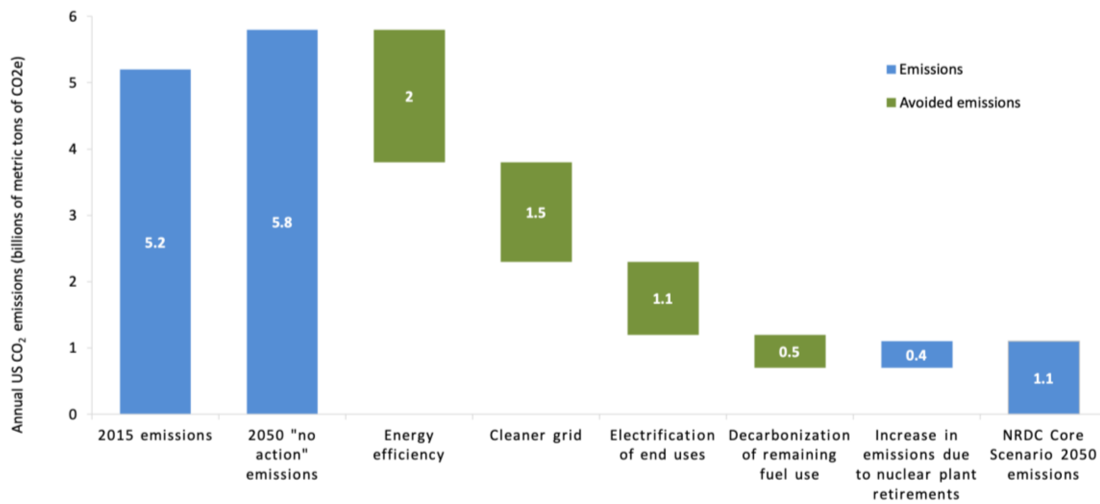

Figure 9. Drivers of US GHG emissions reductions under NRDC's scenario analysis of options to cut emissions 80% by 2050, relative to 1990. *Source:* Adapted from Gowrishankar and Levin 2017.

TOP DRIVERS OF EERS POLICY CHANGE

Through our interviews with national and regional experts and in our analysis of the states in our case studies, we identified four primary policy drivers for reexamining EERS policies:

- *Decarbonization.* Increased urgency on climate change and more aggressive GHG reduction goals by states, cities, and companies require greater attention to the most promising GHG reduction opportunities. In addition, where electricity is increasingly produced from low-carbon sources, fully or partially shifting from technologies that use fossil fuels to those that use electricity will often reduce emissions. Attention is required to maximize beneficial electrification in the buildings, industrial, and transportation sectors while also supporting efficiency that does not require fuel switching.
- *Cost.* With changes in lighting standards, decreasing avoided costs, and declining customer loads, efficiency programs face pressure to reduce costs to continue to be the least-cost resource.
- *Equity.* A growing affordability gap and utilities' universal service obligation place pressure on efficiency programs to serve as a resource for all customers, regardless of ratepayer class, income, or race. Efficiency programs can deliver major bill savings for the customers that are most in need but may fail to do so without policy directives that call for inclusive program development and fair distribution of efficiency benefits across all customer segments.
- *Grid value.* As the penetration of variable renewables increases, some hours of the day and times of the year will result in zero or negative marginal cost of electricity. Energy efficiency will need to deliver in the times and at the locations where it offers the most grid value and in many cases the most carbon reduction.

Table 1 shows the primary drivers of policy change according to interviews with program administrators, policymakers, and advocates in each state that we analyzed (see case studies in Appendix A for more details):

Table 1. Top two drivers of EERS updates in each case-study state

State	Cost	Equity	Grid value	Decarbonization
California			•	•
Hawaii		•	•	
Massachusetts	•			•
Minnesota	•			•
New York	•			•

Source: Stakeholder interviews

These trends overlap—the use of expensive, carbon-intensive fossil fuel plants at peak times means that decarbonization typically correlates with grid value, so energy savings that occur at peak times deliver cost, carbon, and grid value benefits. However these factors do not perfectly correlate. In this example, because retail and wholesale rates differ, off-peak electricity savings might not offer as much value to the system as a whole, but consumers without time-varying rates may still see these savings as valuable as at peak.

Many stakeholders said that all four drivers were important in the discussion. Still, as shown in table 1, decarbonization is the top driver pushing these states to reexamine energy efficiency target design. Most of the states we profiled have joined a longer list of states in setting ambitious clean-energy targets. These goals align with a shift toward a grid powered by renewables, but energy efficiency also plays a central role. In New York, the New York State Energy Research and Development Authority's (NYSERDA) *New Efficiency: New York* white paper quantified efficiency's role in GHG reductions, finding that energy efficiency can deliver nearly one-third of the GHG emissions reductions needed to meet New York's goal to reduce overall GHG emissions by 40% from 1990 levels by 2030. That translates to a reduction of more than 22 million metric tons of carbon dioxide equivalent (CO2e) annually by 2025. California, meanwhile, has modeled a variety of pathways to achieve deep decarbonization. Each pathway relies on the four pillars shown in figure 10, including at least a doubling of energy efficiency (Mahone et al. 2018).

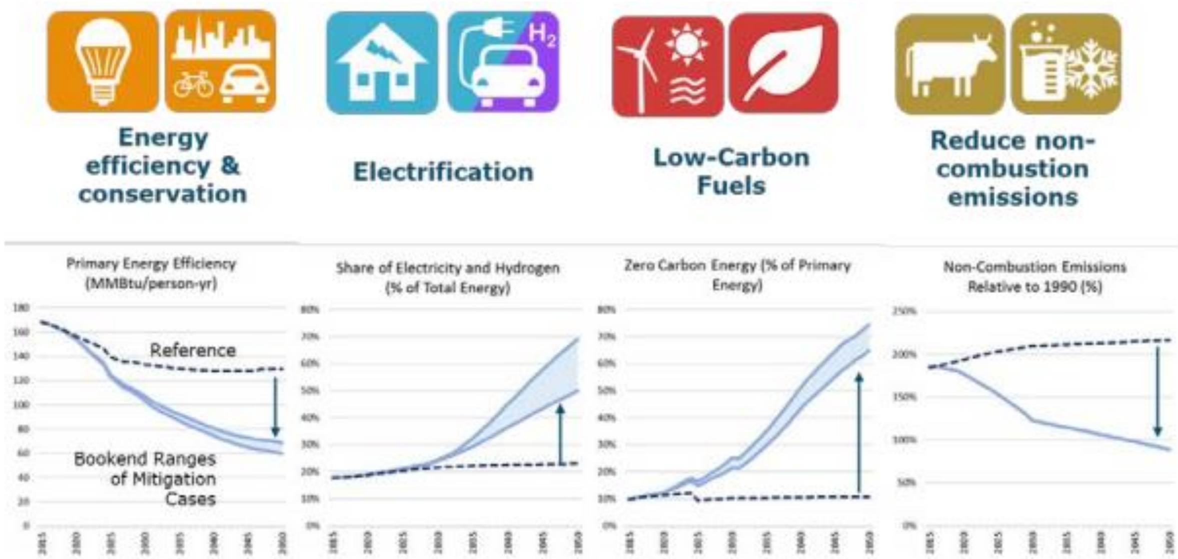

Figure 10. Representative ranges of each of California's four pillars used in 10 modeled scenarios to achieve deep decarbonization. Scenarios include at least a doubling of energy efficiency. Shaded areas include the range of inputs included in modeling deep decarbonization scenarios. *Source:* Mahone et al. 2018.

Each of the states we reviewed for this study has a strong focus on emissions. This focus has influenced approaches toward efficiency goals in various ways. In Massachusetts, recent legislation recognized the value of a comprehensive approach to reducing emissions, strengthening the state's renewable portfolio standard (RPS), setting a clean peak standard, and expanding the definition of energy efficiency to allow more flexibility in leveraging energy efficiency to reduce emissions. Although in interviews with Hawaiian stakeholders decarbonization did not rise to the top as a driver for policy change, the state was the first to pass a 100% RPS, and the state energy office has conducted modeling showing the role of the state's energy efficiency standards in meeting that target.

Structural Options for Next-Generation EERS Policies

The states we reviewed for this report are at various stages of policy development. Massachusetts and New York have developed well-defined new policy frameworks that are poised for implementation. California is meeting emerging policy priorities through incremental updates. And Hawaii and Minnesota are still actively discussing possible future directions.

GOAL SETTING

Our interviews with state stakeholders and national experts uncovered three main energy efficiency target designs that these states are considering to meet their emerging policy goals:

- *Resource-specific goals.* This model aligns with most current EERS structures, setting savings targets by fuel type (e.g., electricity and natural gas). Some states have also included resource-specific peak demand targets.

- *Fuel-neutral goal*. This structure creates an overarching goal for a portfolio of programs and may not specify the resources from which utilities must derive energy savings. It may be an energy goal, measured in British thermal units (Btus), or it may be a GHG reduction goal, measured in carbon-dioxide equivalents.
- *Multiple goals***.** This approach sets a variety of distinct goals and may combine resource-specific and fuel-neutral goal strategies. We distinguish multiple goals from resource-specific goals in that they include some additional elements beyond energy savings goals, for example GHG emissions reductions or net benefits calculations.

Figure 11 illustrates how these approaches are combined in New York and Massachusetts. New York has a fuel-neutral overarching target plus multiple resource-specific goals, for electricity and heat pumps. In addition, New York utilities have proposed a separate gas savings target. Massachusetts has multiple goals, including three broad, overarching goals for fuel-neutral MMBtus, CO2e reductions, and net economic benefits, as well as resource-specific goals for therms, MWh, and summer and winter peak MW.

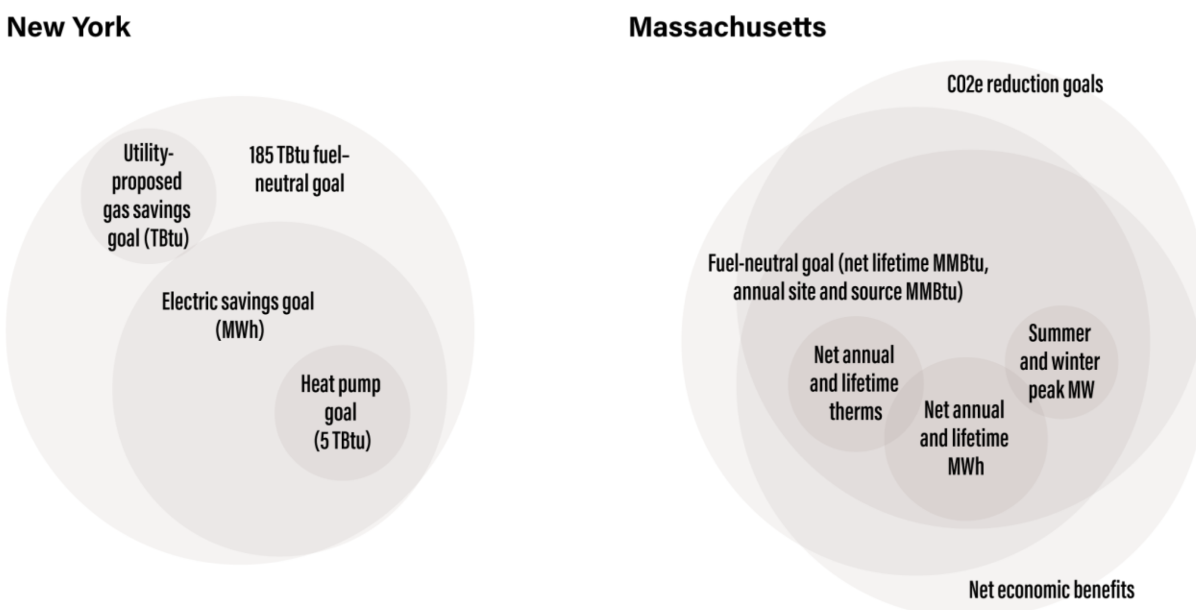

Figure 11. How resource-specific, fuel-neutral, and multiple goals are combined in New York and Massachusetts

Table 2 summarizes the approaches taken by the five case-study states. Most have combined (or are considering) several approaches in designing their EERS.

Table 2. Current EERS design in case-study states

State	Resource-specific goals	Fuel-neutral goal	Multiple goals
California	Yes		
Hawaii	Yes		Under discussion: • Cumulative persisting electricity and peak demand savings • CO2e reductions • Fossil fuel reductions
Massachusetts	Yes	Yes, Btu	• Lifetime all fuels MMBtus • CO2e reductions • Electric/natural gas savings • Summer and winter peak demand savings • Air source heat pump installation target (not a savings goal)
Minnesota*	Yes		*
New York	Yes	Yes, Btu	• All fuels MMBtus • Electric savings • Heat pump savings • Natural gas savings (in utility filings)

* In Minnesota, legislation was introduced in 2019 that would have lifted a prohibition on fuel switching to allow beneficial electrification. Although this legislation did not pass, the Department of Commerce is currently developing a statewide electrification plan that could result in further consideration of policies to enable fuel switching.

As evidenced by our case-study states, there are multiple ways to evolve EERS policy designs to meet a range of policy goals. However some policy designs may be better suited than others to achieve specific outcomes. In this section, we evaluate each of the structural approaches relative to the policy objectives that have emerged as most important for state efforts. For cost, equity, grid value, and decarbonization (including beneficial electrification), we ask:

- How does this EERS design achieve the desired outcomes?
- What are the benefits and risks of this option?
- What issues and lessons learned have emerged about implementation of this EERS design structure?

Resource-Specific Goals

The resource-specific goal approach is the policy framework most commonly used by states to date. Resource-specific goals can include targets for electricity and natural gas (although several states have set targets for only electricity). Some states have also set targets for peak savings within this framework.

All of the states we reviewed for this paper have maintained resource-specific goals, even as most consider ways to address emerging priorities by adding fuel-neutral goals or program or sector carve-outs. California, Hawaii, and Minnesota have resource-specific savings goals in place that hew closely to policies of most other states with EERS policies. Massachusetts has maintained both electric and natural gas goals while layering on additional goals addressing emissions. New York, meanwhile, continues to include an electric-specific goal within its framework. Although the state did not propose stand-alone natural gas savings goals in favor of a more fuel-neutral policy, utilities proposed natural gas savings goals in their 2021–2025 budgets and targets.

Table 3 addresses the ways that resource-specific goals might advance or hinder various policy priorities. This table analyzes resource-specific goal design in isolation, although we recognize that in reality, states are managing the risks and benefits highlighted below using a combination of approaches. Where we write "neutral," no clear benefit or risk for that driver emerged from our research.

Table 3. Benefits and risks of resource-specific goals

Outcome	Benefits	Risks
Cost	There are limited cross-subsidization issues as electric customers typically pay for electricity efficiency programs and gas customers pay for gas efficiency programs.	In some locations, some investments in particular types of resource-specific efficiency may not be the least-cost option. Siloed programs may leave some low-cost fuel substitution measures on the table.
Equity	Neutral	If electric and gas efficiency programs are siloed, it may be more difficult to address needs of certain housing types, businesses, or communities.
Grid value	Efficiency measures can function as DERs.	Efficiency is typically valued at the same amount at all times of the day but actually offers different grid value at different times, so portfolios might not be optimized to provide grid value.
Decarbonization	Neutral	May be a hindrance if fuel-switching rules are not well defined. Also may be at odds with beneficial electrification if goal is structured on a rolling basis. May not allow for savings from fuel oil, propane, and other unregulated fuels. No incentive for electrification to save energy if there is only a savings goal for electricity.

In addition to the benefits and risks laid out in table 3, one clear benefit to this model is the relative simplicity of administration and planning. Resource-specific goals make the obligated entity clear: The utility providing a resource (or a third party funded by the customers of that utility) is responsible for the energy savings associated with that resource. Where utilities have an integrated resource planning process in place, a specific directive to achieve electricity savings typically results in greater energy savings than the utility might otherwise propose—a boon for cost savings. The same might be true for gas savings, but treatment of energy efficiency as a gas resource is rarer (Sloan and Dikeos 2018). And because resource-specific goals have been the approach relied on by nearly every state to date, states have been able to learn from their neighbors and adopt tried-and-true policy models and EM&V frameworks.

Several interviewees expressed concern that a resource-specific EERS framework was inherently at odds with the electrification required to support long-term decarbonization. However this perceived conflict can be resolved in three ways: (1) by conducting, at regular intervals, comprehensive potential studies that account for new technologies, regulations, and the interactions between energy efficiency and electrification; (2) by allowing for fuel substitution measures to be included in efficiency portfolios and clearly defining the rules for eligibility; and (3) by considering appropriate baselines and planning periods when setting energy savings goals.

POTENTIAL STUDIES

In many states, energy efficiency targets are informed by potential studies and updated on a regular basis (e.g., every three years). Electrification may impact the results of those potential studies, both by making more electric efficiency opportunities available as end uses are electrified and by changing the baseline against which energy savings are measured. Furthermore, as some states expand the scope of energy efficiency programs to include complementary measures that reduce emissions, potential study methodologies will need to be updated to account for these additional measures.

Massachusetts passed legislation in 2018 that expanded the definition of eligible energy efficiency measures to include a wider range of options including active demand management, renewables, storage, EV charging, and emerging technologies (General Court of the Commonwealth of Massachusetts 2018). This approach addresses utility concerns that targets may become more difficult to reach over time, and it also addresses the need to integrate renewables, efficiency, and storage to reduce carbon emissions. However the change in definition also means that a new potential study is necessary to ensure that program administrator goals are adjusted to reflect these new opportunities. Since most states tend to set targets on three- to five-year cycles, the results of updated potential studies can naturally be built into the target-setting process.

FUEL SUBSTITUTION

Some of the stakeholders we spoke to pointed to regulatory frameworks that prevent or constrain, rather than spur, beneficial electrification. Clear guidance will be required to help assess the cost-effectiveness of fuel-switching measures and ensure they are beneficial. In California, for example, the existing fuel-switching guidance has led to significant uncertainty as to whether programs would be judged cost effective.[11] This has limited fuel-switching proposals despite clear, fuel-neutral state policy promoting decarbonization. In Minnesota, earlier guidance explicitly prevented targeted fuel-switching projects using funding from the Conservation Improvement Program (the state's ratepayer-funded efficiency framework), and the state is now considering a new, four-part definition for beneficial electrification, including net reductions in source energy use, a reduction in total customer energy costs, lifetime carbon emissions reductions, and no increase in coincident peak electricity demand (Edwards et al. 2018).

BASELINES

If state policy encourages utilities toward electrification, thereby growing load, some are concerned that it could potentially make energy savings goals beyond electrification more difficult to attain. This concern may be valid in the very long term for states that structure their resource-specific goals with a rolling baseline. Recent studies on electrification posit that electric load could increase by 21–67% over the next 30 years (Mai et al. 2018; EPRI 2018). Figure 12 illustrates the potential impacts of electric load growth for two 1.5% electricity savings targets, one using a fixed basis, the other using a rolling basis (where savings targets are a percentage of the prior year's sales), in the medium and long term.

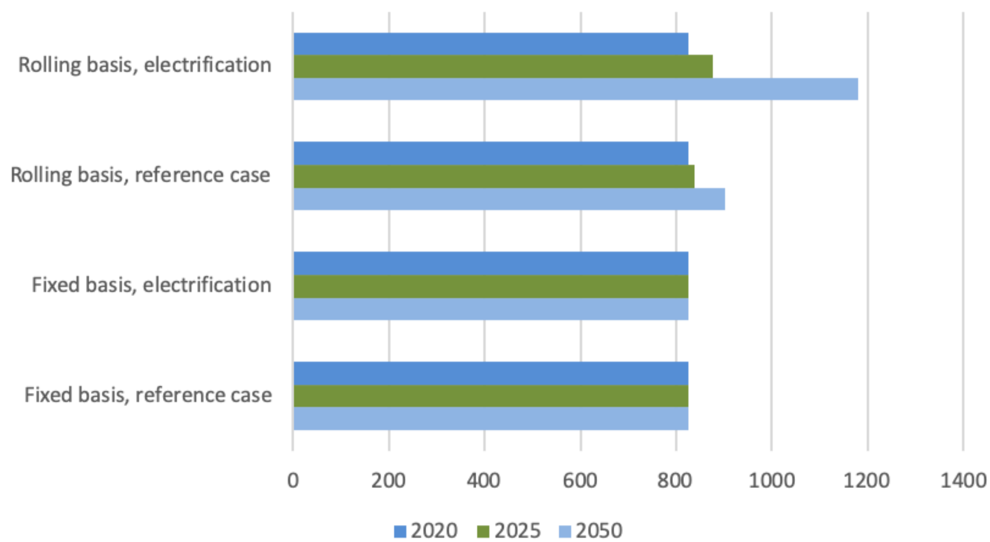

Figure 12. Electricity savings required for a state with a 1.5% target in 2020, 2025, and 2050. Analysis uses a state with sales of 55,000 GWh in 2018 (the median for all states). Reference case growth is 0.3%, based on EIA 2019. Electrification scenario follows a growth rate of 1.2%, based on Mai et al. 2018.

In the example we examined, the electricity savings goals do not increase over the period 2020–2050 when the basis is fixed, regardless of electrification. The impact is that electricity

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[11] The current three-pronged test compares fuel-switching options to same-fuel substitute technologies that would be cost effective, and requires that programs do not increase source fuel consumption, degrade the environment, or increase total resource costs, currently using assumptions that do not take into account the current and forecast renewable energy supply. The California Public Utilities Commission (CPUC) is currently considering changes to the test for determining whether funding is appropriate for energy efficiency projects and measures in docket R.13-11-005.

savings are proportionally smaller over time. Even without concerted electrification efforts, savings will be slightly smaller (1.47% in 2025 and 1.36% in 2050). In a scenario where electrification leads to increased electric load, savings make up an even smaller portion of sales (1.38% in 2025 and 1.02% in 2050).

For the sample state using a rolling basis (where savings targets are a percentage of the prior year's sales), the absolute amount of electricity savings required to meet targets increases under both scenarios, although more dramatically in the electrification scenario. Overall, in order to meet a savings target of 1.5% in 2025, incremental electricity savings in 2025 would need to grow by about 1.5% in 2025 in the reference case and 6% in the electrification scenario. In 2050, the required savings would be about 9% higher in the reference case and 43% higher in the electrification scenario.[12]

While the increased savings required under a rolling baseline scenario may cause concern for some, it is important to note that the impacts are minimal in the medium-term scenario, typically the time horizon under which utility planning efforts occur. Furthermore, increased building electrification should offer new opportunities to achieve electric savings in many existing buildings, for example from weatherization and improved equipment. States could also choose to address the long-term growth in required savings by adjusting regulatory frameworks. They could widen the definition of what can be counted as energy efficiency, allowing program administrators to claim credit for a wider variety of measures as targets call for achieving more electricity savings (as in Massachusetts). For example, electrification will likely amplify the focus on peak load management, and states may choose to develop goals or incentives that encourage efficiency programs that both save energy and reduce peak demand. Some states might also choose to move away from a rolling basis approach if they anticipate significant increases to electric load. In the long term, however, this may mean that states could miss opportunities for cost-effective energy efficiency as new technologies enter the marketplace while targets remain flat.[13]

RAMPING UP

Finally, although many states have not yet changed the resource-specific structure of their EERS policy, many have made improvements to facilitate better program design and delivery. For example, Arkansas established an EERS in 2010, and the state has gradually increased savings goals for electric and gas utilities since then. Stakeholders have also worked to ensure that these goals enable comprehensive programs that address whole-building energy usage and achieve deep savings. Through the official stakeholder process, the Parties Working Collaboratively, the state has expanded evaluation procedures to

[12] Note here that in all cases the goal itself remains 1.5% of retail sales. What changes is the magnitude of the savings required to meet that goal. In the example above, the sample state would be required to save 825 MWh in 2020 and 875 MWh in 2025 under the electrification scenario (an increase of about 6%). In the reference case, required savings in 2025 would also rise relative to 2020, to about 837 MWh.

[13] There may be additional hurdles for states in *assessing* energy savings as they simultaneously move to electrify buildings and transportation and also encourage pay-for-performance program models that measure energy savings using metered data.

include the counting of nonenergy benefits including other fuel savings, public water and wastewater savings, and avoided and deferred equipment replacement costs (NEEP 2017).

Fuel-Neutral Goal

The fuel-neutral goal approach establishes an overall goal in primary energy or GHG emissions and may or may not specify the resources from which utilities must derive energy savings. This approach enables flexibility in meeting the standard for program administrators. Both Massachusetts and New York have versions of a fuel-neutral goal.

In New York, the 2018 *New Efficiency New York* white paper and subsequent Commission Order set one overarching energy savings goal for the state, measured as 185 TBtus total annual site energy savings over the 2015–2025 time frame, relative to forecast energy consumption in 2025. [14] In addition, the state included an electricity sub-target under which electric efficiency savings reach 3% of investor-owned utility sales by 2025, as well as a clean heating target. The state specifies that measurement of the electricity sub-target should estimate and net out electricity consumed for heating via efficient heat pumps.

Massachusetts considered adopting one lifetime site MMBtu goal in early iterations of its 2019–2021 plan but abandoned a sole focus on that approach because one goal could not accommodate resources with competing profiles like combined heat and power (CHP) and beneficial electrification. Instead, the state included a fuel-neutral goal alongside GHG reduction and net benefits goals, as well as annual and lifetime resource-specific goals. Wisconsin's third-party administrator, Focus on Energy, in effect adopted a fuel-neutral goal. It has a Btu goal with sub-targets for electricity and natural gas. Minimum thresholds for kWh and therm savings are set at 90% of the overall four-year MMBtu goal, while the remaining 10% of the goal can be met through either type of savings (Wisconsin PSC 2018).

As of this writing, there are no states with a purely fuel-neutral goal. Such an approach would enable a range of demand-side resources to support decarbonization or energy goals, including both beneficial electrification and energy efficiency. A single goal could enable a program administrator to prioritize the highest-potential GHG mitigation measures across fuels and sectors. When implemented with limited fuel-switching restrictions, one goal could enable electrification and ensure that it is beneficial.

However utility program administrators with one fuel-neutral goal and no sub-targets would be likely to prioritize investment in those resources that best fit their business model, possibly at the expense of other investments that would be beneficial to consumers. Figure 13 illustrates utilities' typical order of preference for procuring demand-side options for a fuel-neutral energy savings goal.[15] Long-term MWh savings are least attractive for electric

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[14] Site energy is the amount of heat and electricity consumed by a customer as reflected on their bill. It represents the total amount of raw fuel required to serve that customer, including all transmission, delivery, and production losses. See the text box below, "Site Versus Source Considerations in Calculating Fuel Savings: A Massachusetts Example," for details.

[15] This typology was originally developed by ACEEE in technical assistance to the New Hampshire Office of the People's Council, and then filed in comments to the Minnesota PUC (Kushler 2019).

utilities because of their potential to displace capital expenditures on which utilities can earn a return. Both short-term MWh savings and passive demand savings from energy efficiency serve to reduce distribution system needs and sales (Lazar and Colburn 2013).[16] In contrast, beneficial electrification and load shifting are neutral or even net positives for utilities' business models. As a result, fuel-neutral goals may disincentivize some of the resources, like long-term MWh savings and other within-fuel savings, that are required to meet long-term GHG reduction targets. Further, under a fuel-neutral goal, utilities may be incentivized to enable fuel switching regardless of whether it is actually beneficial to the consumer, the grid, or the environment.

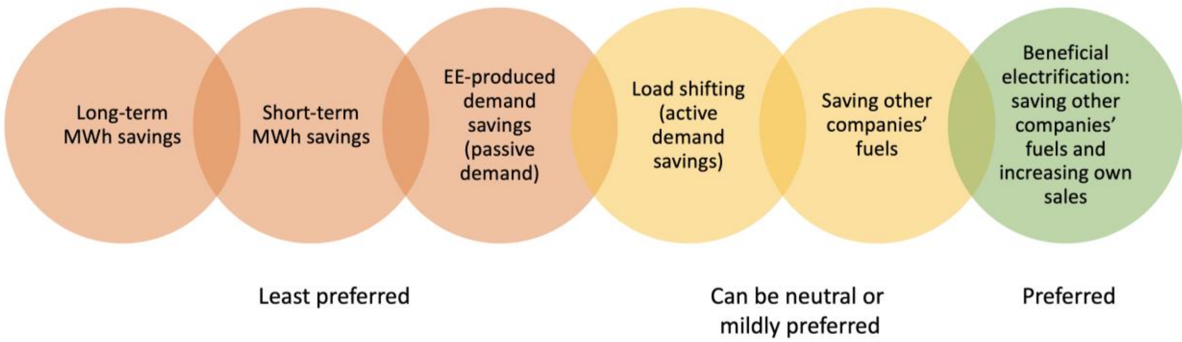

Figure 13. Electric utility incentives to procure demand-side resources. All of these categories may provide societal benefits, but utilities will likely need more regulatory incentives to the left.

There is limited experience to date with fuel-neutral goals and their impact on decarbonization and beneficial electrification in the buildings and industrial sectors. New York's approach to combine fuel neutrality and flexibility with a resource-specific goal for electricity encourages utilities to address barriers to beneficial electrification and supports continued electricity savings. In addition to these primary purposes, a single goal may have secondary cost and grid value benefits. NYSERDA's *New Efficiency: New York* white paper describes two cost-related benefits: (1) more cost-effective procurement through design and evaluation on a holistic, fuel-neutral basis, and (2) administrative efficiencies from alleviating the need to coordinate separate electric and gas programs and avoiding potential lost opportunities from single-fuel programs (NYSERDA 2018a).

The white paper also suggests possible grid value benefits from a single goal. In the Northeast, natural gas and heating oil face winter constraints; where customers lower gas needs through efficiency or electrification, some of that pressure might be alleviated. On the other hand, absent grid interactivity, electrification on its own might exacerbate those constraints. Furthermore, beneficial electrification has the potential to enable grid interactivity, as in efficient grid-interactive heat pump water heaters, enabling energy efficiency to serve a key flexibility role. In addition, states with fuel-neutral goals should anticipate some administrative burden associated with identifying which entities are

[16] While full revenue decoupling can ameliorate the throughput incentive and performance-based incentives can address the capital expenditure bias (York and Kushler 2011), these general utility preferences among demand-side resources remain, both culturally and because few mechanisms fully address capital expenditure bias between rate cases (Lazar et al. 2016).

accountable and how to measure and track savings. Table 4 summarizes these benefits and the concomitant risks in isolation. In practice, states are managing the risks and benefits by combining fuel-neutral goals with other approaches.

Table 4. Benefits and risks of a fuel-neutral goal

Outcome	Benefits	Risks
Cost	Enables a greater number of cost-effective options for customers. Can include fuel oil and propane customers. May incentivize coordination across gas and electric utilities.	May pit utilities (where separate) against each other, encourage fuel switching that raises costs and/or emissions, or encourage cross-subsidization.
Equity	More cost-efficient programs will produce less overall pressure on ratepayers and those with the highest energy burdens. Reduction in silos may enable programs for hard-to-reach housing types, businesses, or communities.	Programs may focus on customers with highest overall energy usage, possibly to the detriment of customers with lower usage but higher energy burden.
Grid value	Electrification has the potential to enable grid interactivity. Combined with other energy efficiency measures, may support passive peak savings as well.	Electrification will exacerbate winter peaks.
Decarbonization	Offers clearer alignment with climate goals. Allows beneficial electrification to count toward energy savings progress. Acts as incentive to do more-comprehensive measures. Allows greater participation/wider reach from fuel oil and propane customers in buildings sector. Could also allow consideration of transportation fuels if transportation sector is included (as it is in Vermont's Tier III RES).	Introduces some risk of missed climate mitigation because energy and climate savings are not perfectly correlated Without an electricity sub-target, utilities will have an incentive to do beneficial electrification over energy efficiency because of business model

Multiple Goals

The multiple-goal approach, currently used by Massachusetts, creates a portfolio of related goals that program administrators must meet in parallel.

In Massachusetts, the multi-stakeholder Energy Efficiency Advisory Council (EEAC) negotiated a portfolio of goals, including fuel-neutral goals (in net lifetime MMBtus and annual site and source MMBtus), resource-specific goals (in net annual and lifetime MWh and therms), CO2e reductions, net economic benefits, and peak demand goals (in summer and winter MW) (Program Administrators 2019). Although the EEAC considered establishing one fuel-neutral goal, it found that competing objectives—e.g., to increase CHP savings while simultaneously increasing cost-effective fuel switching—required use of multiple goals. Their multiple-goal structure is managed at the portfolio level, and these goals are shared across all programs to support flexibility, although the 2019–2021 filing allocated goals to each program in the filing. In practice, any given measure or program in Massachusetts is likely to meet multiple goals. For example, a switch from a propane furnace to a grid-interactive air source heat pump may contribute to reductions in net lifetime MMBtus, net annual site MMBtus, summer MW, and CO_2 emissions while increasing winter MW.

The primary benefit of multiple goals is the ability to meet multiple objectives and address the concerns of different groups of stakeholders, making it a useful strategy for each of the outcomes states seek from energy efficiency. Table 5 addresses how multiple goals might advance or hinder those policy priorities.

Site versus Source Considerations in Calculating Fuel Savings: A Massachusetts Example

In Massachusetts, program administrators (PAs) proposed in their draft three-year plans a portfolio-wide net lifetime MMBtu savings target measured at site for all fuel sources except combined heat and power, which would be measured at source. This variation in savings measurement was meant to recognize that measuring savings only at site can misrepresent relative savings in buildings served by CHP systems and other technologies since it does not account for both the eliminated waste from generation and transmission losses or the reduced waste from recovering heat typically lost in central generation (Mutyal and Galiasso 2017).*

Accounting for savings for a given CHP system requires a broader consideration of multiple expended fuels that can be accounted for only using a source-level calculation of savings. This includes measuring the fuel that would have been utilized to generate the grid electricity (along with transmission and distribution losses) that is now instead being supplied by the CHP system, the fuel that would have been used to generate the thermal energy recovered from the CHP system, and the increase in gas utilized at the site by the CHP system. A site-level analysis focused primarily on impacts to end-use consumption would fail to fully account for the full upstream benefits of CHP systems and cause them to appear less attractive in terms of potential savings.

In its January 2019 order approving the program administrators' 2019–2021 plan, the Department of Public Utilities (DPU) expressed concerns regarding the Massachusetts PAs' approach to converting electric savings to MMBtus, particularly for not considering embedded energy savings in the conversion of electricity used onsite but generated off-site, as well as for using imputed savings values for CHP based on marginal GHG emission rates, rather than heat values. The DPU directed the PAs to further study and propose a more refined method within its 2019 reporting.

* CHP offers additional nonenergy benefits such as possible reduced CO_2 emissions, increased grid resilience, and congestion and transmission relief.

Table 5. Benefits and risks of multiple goals

Outcome	Benefits	Risks
Cost	Using multiple metrics enables broader set of resources to offer different forms of value and lowers costs of meeting goals.	Multiple goals require more complex optimization and may miss some least-cost resources, although inclusion of a goal based on cost effectiveness or net benefits may reduce this risk.
Equity	Portfolio of multiple-goals approach could include low- and moderate-income savings targets.	Neutral
Grid value	Can set peak demand (active and passive) goals. Can separate into specific goals by time of year or product where markets are unavailable.	There is potential for economic efficiency loss in setting peak management goals at state rather than regional level.
Decarbonization	May include a CO_2 target, which can overlap with other resource-specific targets. Can enable CO_2 tracking to build experience with measurement. If goals include site Btus, can enable fuel switching. With complementary goals, may still support electricity and source Btu savings.	If goals include site Btus, can enable fuel switching.

In addition to these benefits and risks, multiple goals may allow policy flexibility as markets shift and resource availability changes. In Massachusetts and Hawaii, the decreasing availability of residential lighting savings is cited as a driver for policymakers to consider or adopt an expanded set of metrics and allowable resources in standards. Multiple goals may also pair well with multifactor performance incentive frameworks, where program administrators are rewarded for performance on multiple dimensions.[17] Nine states plus Washington, DC, have such incentives (Relf and Nowak 2018).

However multiple metrics risk confusion and duplication unless there is a clear framework for how the goals interact with each other and which resources are eligible. In Massachusetts, the EEAC term sheet clearly outlined which entities (electric or gas utilities) were responsible for which goals, and which goals were portfolio-level obligations. The state's recent law H. 4587, An Act to Advance Clean Energy (2018), also expanded the set of resources eligible to participate in the portfolio to include energy storage, renewable energy, and strategic electrification that results in cost-effective reductions in GHG emissions, even when the result is an ultimate increase in electricity consumption. Multiple goals may also

[17] Note that we distinguish between energy savings goals and outcomes driven by performance incentives, although the two strategies are often paired. Performance incentives are the mechanisms that offer financial rewards or earnings opportunities for energy efficiency outcomes.

generate increased complexity and administrative burden for program administrators and regulators. To reduce this complexity, multiple goals should be limited in number to address top priorities and should be mirrored in other areas of policy, like performance incentives and program design.

Discussion

In practice, the regulatory landscape is complex, and the shift toward the next generation of EERS policy is shaped by policy goals, stakeholder input, administrative realities, and historic precedent. All of the states we reviewed for this paper have maintained resource-specific goals, even as many have layered on additional goals and complementary regulatory mechanisms. The relative administrative simplicity of resource-specific goals is an important consideration. This structure makes the obligated entity clear, providing assurance that targets will be met. This model can also minimize cross-subsidization concerns, as energy savings are delivered to the same pool of ratepayers who are contributing the funds. However, as states increasingly look to take broad action to address climate change, they may run up against limitations in a resource-specific approach. Fuel substitution and electrification are important strategies for reducing emissions, but these types of measures are limited in some states with resource-specific models. A fuel-neutral approach offers the flexibility to achieve energy savings and emissions reductions but may not actually encourage all of the lowest-cost strategies. Single-fuel utilities may be incentivized to reduce other forms of energy while building their own load. In practice, as states have sought to revise their EERS policies, many have taken a hybrid approach, setting multiple goals to give program administrators the flexibility and incentive to reduce emissions and save energy in low-cost ways while also establishing a specific vision for how significant portions of energy savings will be achieved.

While each of the goal structures above can help a state meet its policy goals, they do not operate in a bubble. This is an especially important consideration for states wishing to ensure equitable distribution of the benefits of energy efficiency, where reshaping the broad goal structure may not be an effective way to guarantee that programs are being targeted to those who are most in need. Regulators should think comprehensively about the regulatory landscape for energy efficiency, considering mechanisms beyond goal setting to encourage administrators to deliver programs that address the state priorities.

ADDITIONAL TOOLS FOR DEALING WITH PRIORITIES

Policymakers and program administrators can use tools beyond goal setting to help steer energy efficiency programs toward reduced cost and emissions, improved equity, and grid value capture. In our review of state cases and the literature on energy efficiency goal setting, we identified seven additional tools: carve-outs, tracking, performance incentives, cost-effectiveness rules, program design, spending, and separate portfolios.

Carve-Outs

New York, Massachusetts, and California all have carve-outs for specific resources or sectors. Unlike a multiple-goal approach, carve-outs are fully subsumed within a broader goal (e.g., electricity savings). Carve-outs are most commonly used to support equity objectives, ensuring that the benefits of energy efficiency programs are available to and used by all types of customers. For example, a carve-out may require that a certain percentage of electricity savings come from a specified set of customers (e.g., low- and moderate-income customers, small businesses) or a set of measures or programs (e.g., clean heating). The purpose of carve-outs is to ensure that a difficult-to-reach group or a difficult-to-procure resource is incentivized in a portfolio.

While carve-outs can play an important role in ensuring an equitable distribution of the benefits of efficiency, they can also potentially lead to higher total costs because they place constraints on how program administrators can procure resources. However, in many states, including those we reviewed for this report, the goals of an EERS go beyond low-cost resource acquisition, so these added costs are justifiable. Unless carve-outs are tied directly to performance incentives or other regulatory oversight mechanisms, they may be viewed as less important than the overall goal, with correspondingly less attention from program administrators. Finally, carve-outs may introduce tension between different elements of a portfolio, placing additional constraints on portfolio managers and making it difficult to optimize and find a portfolio that meets all requirements.

Tracking

Regulators in several states also emphasize important goals by requiring utilities to track and report on progress in certain areas without setting a goal or target. For example, in California the state Public Utilities Commission (CPUC) has distinguished between metrics, for which targets are set and progress is tracked, and indicators, which utilities report in each reporting cycle but are not associated with targets. These indicators address stakeholder priorities by making data consistently available. In California, indicators include data points like percentage of the total square footage of public-sector buildings participating in building projects, average energy intensity of single-family homes and multifamily buildings, and improvement in customer satisfaction (CPUC Decision 18-05-041). In some states, these tracking goals are associated with a performance incentive.

Performance Incentives

States are also using performance incentives to drive energy-saving activities, with regulators increasingly establishing multifactor incentives to encourage utility investment in specific energy-saving activities. Nine states have established multifactor performance incentives, and 20 have adopted other models, including incentives based on the net benefits an efficiency portfolio delivers or how much a utility invests in energy efficiency. In Michigan, for example, the multifactor performance incentive includes savings-based metrics as well as program goals like expanding low-income programs, creating consistency in rebate amounts, promoting deep energy savings, and reducing peak demand. A multiplier is applied to incentive calculations for activities that address these goals. For example, a 10% savings multiplier is awarded to measures with lives of 10 years or more, and lifetime savings are used in the calculation of incentives awarded for low-income programs (Relf and Nowak 2018).

Cost-Effectiveness Rules

States have commonly used modifications to cost-effectiveness rules to enable programs that meet policy goals. For example, 11 states exempt low-income programs from cost-effectiveness rules through formal regulatory orders or legislative guidance, and in practice about half of the states do this. States may relax cost-effectiveness rules for low-income programs or use "adders" to account for nonenergy benefits associated with these programs. For instance, Vermont utilities apply a 15% adder for unique benefits associated with low-income-sector programs (Berg and Drehobl 2018). This approach can also be used to encourage investment in market transformation programs or pilot program development. In Texas, for example, program administrators may demonstrate cost effectiveness of market transformation programs over a long-term time horizon rather than in a single program year (Texas Rev. Code §25.181). States can also use cost-effectiveness rules to recognize the important air-quality benefits and other environmental boons of energy efficiency. At least 12 states include environmental impacts in their cost-effectiveness tests, with some specifically including the social cost of carbon (NESP 2019). Finally, cost-effectiveness rules are a key tool for enabling fuel switching, although if not properly designed they can be a barrier for these types of programs.

Program Design

Several states have used efficiency program design to address policy concerns. For example, in its order establishing expanded energy savings goals, the New York Public Service Commission (PSC) noted that fine-tuning customer incentives could help bring down costs, as energy efficiency has different values at different times of the day or year. For this reason, the commission authorized utilities to add a "kicker" to customer incentives for measures that address specific grid needs. The increased incentive is meant to reduce barriers to customer adoption at times when efficiency is most valuable, thereby lowering overall system costs (NYPSC 2018b). In its 2019–2021 plan, Massachusetts announced a variety of program design updates to improve equity and increase customer participation. A new Residential Coordinated Delivery initiative is intended to provide more granular reporting and a more customized approach for complex multiunit properties. For example, two- to four-unit multifamily properties previously considered single family will receive a more targeted multiunit approach.

Spending

In some states, regulators have addressed priorities through spending (rather than savings) carve-outs. This strategy is commonly used to promote investment in the low-income sector. Eighteen states have adopted spending requirements for low-income efficiency programs, setting a fixed dollar amount or a percentage of overall efficiency spending to be directed toward this customer class (Berg and Drehobl 2018). In New York, for example, the PSC directed utilities to spend at least 20% of incremental portfolio budgets on programs for low- and moderate-income customers (NYPSC 2018b). Unlike savings-based EERS carve-outs, there is no specific savings target associated with these spending requirements. While this strategy offers less assurance of actual outcomes, it does provide a pathway for encouraging utilities to invest in programs that may have higher acquisition costs or be less cost effective overall.

Separate Portfolios

Some states have also set goals for utilities that fall outside the bounds of the EERS but nonetheless impact efficiency spending and energy savings. While most utilities include low-income programs within their EERS program portfolio, California addresses low-income programs through a separate docket. In establishing a framework for the Energy Savings Assistance Program (ESAP), CPUC set goals for individual investor-owned utilities for delivering savings (MWh and MMTherms) to low-income households (CPUC 2016). In 2017 ESAP was expanded to include multifamily housing and weatherization. While these targets function similarly to an EERS, the process for setting and tracking achievement is separate from the state's resource-specific goals. California has also used this separate-portfolio approach to address other priorities. Much of the state's building electrification work has happened outside the EERS to date. In late 2018 the CPUC approved an electrification pilot that will target 11 disadvantaged communities in the San Joaquin Valley. These pilot programs are not included within the state's EERS or ESAP portfolio, but the commission notes in its decision that utilities should supplement the $58 million approved for electrification by leveraging opportunities in other existing demand-side management programs (CPUC 2018b). The CPUC also recently opened a separate proceeding on building decarbonization (R.19-01-011) that could result in a new portfolio of programs aimed at reducing emissions in buildings.

OTHER CONSIDERATIONS

The approaches to goal setting and other aspects of energy efficiency policy address the primary drivers we found in our analysis: cost, emissions and electrification, grid value, and equity. However several other key considerations that may also affect the design and implementation of EERS policies emerged from our interviews with national experts and state stakeholders. Below we highlight some of these considerations.

Market Transformation

Market transformation, or the process of strategically intervening in a market to create lasting changes in market behavior, is critical for scaling savings from energy efficiency. At the same time, as markets transform, utilities may find themselves in the difficult position of no longer being able to claim credit toward goals for programs associated with that market. Historically, this has been the cause of some tension between codes and standards and utility efficiency programs. Some states have begun to address this issue. For example, Massachusetts, Rhode Island, California, and Arizona all allow utilities to earn credit for their work to promote and support building energy codes (Mass Save 2015b; DNV GL 2017). In California, savings from codes and standards are projected to significantly outpace savings from resource acquisition programs over the next 10 years (CPUC 2018a).

Most of the stakeholders we interviewed for this report noted that market transformation was a priority for regulators pushing forward new models of energy efficiency. However recent research has also found regulatory viewpoints to be a barrier. York et al. (2017) note that a regulator's traditional focus is resource acquisition, and regulators in many states may not support utility investments that do not yield energy savings in the short term. Some states have addressed this by working to transform markets by nonutility means. In New York, NYSERDA has historically led these initiatives, beginning with direct investments in market transformation efforts in 2012 and shifting in more recent years toward its 10-year Clean Energy Fund portfolio and a New York Green Bank–led strategy to encourage private market investments (NYSERDA 2018b).

Lifetime Savings and Persistence

Another theme that emerged is the persistence of savings over time. Most energy efficiency targets are structured as first-year savings goals. Of the 27 states with an EERS, 25 currently focus on first-year or incremental annual savings. By not accounting for savings over time, first-year goals alone tend to emphasize measures with low first-year costs and high initial cost effectiveness. In addition, they may not align with a long-term perspective, especially for integrated resource planning and climate planning, each of which requires a multiyear, if not multidecade, perspective.

However a growing number of states are redesigning energy efficiency targets in a way that encourages longer-term savings. We have found a range of approaches among them (Gold and Nowak 2019). In Illinois, electric programs use total annual goals, counting the savings in a particular year from measures installed in that year plus the savings persisting from measures installed in prior years, whereas gas programs use first-year savings but have a portfolio measure life minimum.[18] Ontario's gas utilities use projected savings goals, which include the savings from measures installed in a program year as well as the savings from those measures projected throughout their lifetime. These different structures are often called cumulative or lifetime savings, depending on the jurisdiction.

Gold and Nowak (2019) detail these policy responses and results to date. Although there is some early evidence that these changes may support longer lifetimes and better alignment with resource planning, the magnitude of their impact is largely unknown. States implementing GHG targets may consider measuring savings with total annual goals or projected savings in order to capture lifetime savings and to recognize the shifting benefit from electrification over time as the grid mix gets cleaner.

Transportation Electrification

Energy efficiency resource standards typically obligate utilities to deliver energy efficiency services to the residential, commercial, and sometimes industrial sectors. Transportation electrification is a critical climate mitigation tool and energy efficiency measure, especially in states where the grid is already low carbon. Increasingly, states and utilities are considering how to enable transportation electrification as a climate mitigation strategy, a load growth opportunity, and a response to customer demand. None of the cases reviewed in this paper explicitly considered modifying targets to include transportation electrification.

However the question of how transportation electrification might affect energy efficiency targets has come up in some states. As with beneficial building and industrial electrification, targets designed with a rolling relative basis would require a larger absolute amount of electricity savings in the long term given changes to the baseline savings from transportation electrification. Transportation represents the bulk of electrification potential projected in the National Renewable Energy Laboratory's (NREL) electrification futures studies (Mai et al. 2018). It may be the factor most likely to affect rolling relative energy savings target design, as suggested in figure 14. For example, in North Carolina, which has rolling relative targets, environmental advocates have noted challenges in encouraging vehicle electrification because it adds to the baseline of requirements for energy efficiency

[18] Illinois calls the type of energy savings used for goal setting *cumulative annual persisting savings*.

achievement. No states to our knowledge have attempted to separate out transportation consumption in setting goals, so states have implicitly decided thus far that the impacts of transportation on electricity sales is too small to merit attention.

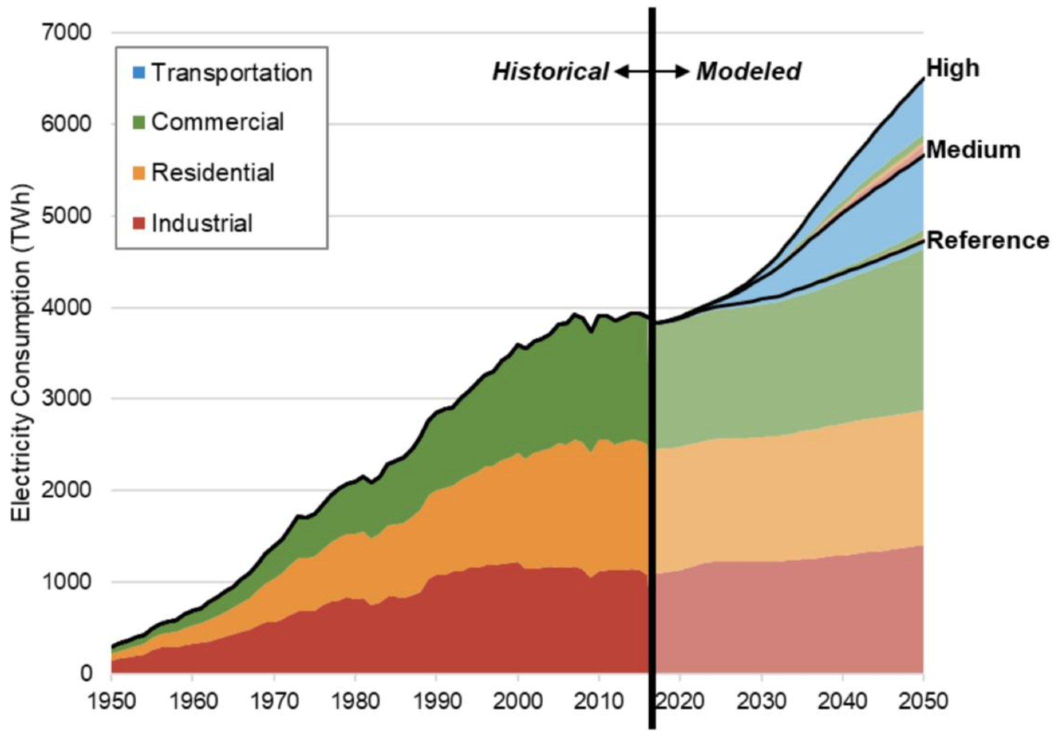

Figure 14. Historical and projected annual electricity consumption, by sector. *Source:* Mai et al. 2018.

Transportation efficiency also offers new opportunities for demand management. Because electric vehicles frequently sit idle, they offer flexibility both in adding load to the grid and in serving as a generator. However the ability to leverage this flexible resource depends on a variety of regulatory structures, including rate design that incentivizes charging at certain times of day and a strategy to deploy sufficient charging infrastructure (Farnsworth et al. 2019).

Rate-Basing Expenditures on Energy Efficiency

Robust increases in energy efficiency targets tend to prompt concerns about initial impacts, because any incentive or rebate cost associated with an efficiency investment is typically incurred upfront. In addition, higher levels of savings exacerbate business model issues for utilities when they lack appropriate reforms like decoupling and performance incentives (Molina and Kushler 2015).

Regulators in some states address these two issues by allowing a return on equity for demand-side investments in a manner similar to traditional infrastructure investments.[19] In

[19] In exchange for the ability to operate as monopolies outside a competitive market, utilities are allowed to earn a rate of return on their assets (called the rate base) as defined by their regulatory entities.

some cases the return is built into cost recovery mechanisms. Treating efficiency program costs as capital expenditures can help to minimize customer bill impacts from utilities that want to quickly increase efficiency spending by recovering costs over a longer period of time rather than in the year they are incurred, such as through bill surcharges. This amortization also tends to align costs with the period in which energy savings occur. However most states with these mechanisms do not include a performance basis for the rate of return received, unlike other performance incentive methods used to put efficiency on an even playing field with other resources (Nowak et al. 2015). In Illinois, efficiency rate basing is built into the state's performance incentive mechanism. Earnings are triggered by achievement of energy savings targets.

Relf and Nowak (2018) provide detail on Maryland, Utah, Illinois, and New York, each of which has shifted toward cost recovery or performance incentives that treat energy efficiency as a part of the rate base.

Natural Gas Efficiency

While many states in the Northeast and West place emphasis on electrification, natural gas remains an important resource. Recent studies of electrification have predicted a decline in natural gas usage over the next 30 years, but far from a complete elimination. A 2018 NREL study found that natural gas could decline by 37% over this period—a significant amount, but natural gas would nonetheless still make up a large portion of the overall resource mix (Mai et al. 2018). Absent climate policy that aims to rapidly decarbonize the economy in line with Intergovernmental Panel on Climate Change recommendations, natural gas is likely to continue to play a major role in providing energy to homes and businesses in many, if not all, states past 2050. As a result, maintaining and strengthening natural gas savings goals will be crucial in reducing energy bills and meeting other state goals. Furthermore, natural gas utilities may be able to play a role in electrification in states that treat electrification as gas energy efficiency measures, especially in cold climate locations that target heat pumps with gas backup.

Still, low natural gas market prices can at times make it difficult for gas-saving measures to pencil out cost effectively. But natural gas efficiency offers an important shield from volatile prices, a particular concern for large energy users, and significant cost-effective opportunities remain to reduce natural gas consumption. For example, the Northwest Energy Efficiency Alliance (NEEA) identified a portfolio of cost-effective natural gas efficiency opportunities for 2020–2024, including emerging technologies like lightweight triple-pane windows, gas-driven combination systems capable of heating space and water at greater than 100% efficiency, and superefficient gas-fired heat pump water heaters (NEEA 2019). Recent research also finds that gas furnaces are likely to continue to save more money and energy for customers than electric heat pumps in very cold regions of the country (Nadel 2017). Absent a price on carbon, this can be expected to continue.

Conclusions and Recommendations

Energy efficiency resource standards have been critical drivers of significant energy savings for the states that implement these policies. Our research finds that states are looking to further align these policies with evolving priorities including decarbonization, cost, equity, and grid value. During the redesign process, a variety of stakeholders will have influence over decision making about targets, with legislators and public utility commissioners making the ultimate decisions about how these targets are structured at a policy level. Program-level decisions may be made by those policymakers, by program administrators, or by energy efficiency stakeholder councils. Below, we offer a set of recommendations and strategies for these groups as they align energy efficiency targets with other policy priorities.

MAP STATE POLICY DRIVERS AND IDENTIFY OPPORTUNITIES TO REALIGN POLICY

A state's energy efficiency and clean energy goals, rules, and program designs should align with its policy goals. States should identify their policy drivers for energy efficiency in legislation, commission orders, advisory board decisions, or guidance and then align energy efficiency policies with those drivers. They may need to redesign targets or iterate them to include carve-outs or tracking mechanisms, or they may have to develop an entirely new portfolio of programs. These policies also include changes to how utilities invest in energy efficiency, including cost-effectiveness rules, program designs, spending requirements, and performance incentives. Aligning each of these elements reinforces a state's priority policies and sends clear signals to the marketplace.

UPDATE RESOURCE PLANNING AND POTENTIAL STUDIES

As states explore new models for setting energy savings goals, they should consider that the lens through which they view eligible energy efficiency measures will impact the magnitude and design of the targets they set. States should conduct high-quality resource planning and energy efficiency potential studies that are well aligned with their definitions of energy efficiency and their policy drivers. States should follow best practices in potential studies (see, for example, Neubauer 2014) and avoid common pitfalls (see, for example, Reed and Kramer 2012).

Furthermore, cost–benefit analysis in potential studies and in program design should reflect the state's policy priorities, which may require updates to traditional cost-effectiveness tests. The National Standard Practice Manual (NSPM) is a comprehensive framework for cost-effectiveness assessment of energy efficiency and offers principles and methodologies for developing balanced assessments of resource cost effectiveness that address state policy priorities (Woolf et al. 2017). For example, states that prioritize emissions reductions should consider valuing avoided greenhouse gases in avoided-cost calculations, as California does, or as a nonenergy benefit in cost-effectiveness screening, as New York does. To do so, these states will require better visibility into the sources of high costs and emissions on the grid.

SET MULTIPLE GOALS BASED ON POLICY PRIORITIES

In states that adjust their targets to match emerging policy drivers, we recommend a multiple-goals approach that includes both fuel-neutral targets and resource-specific targets where appropriate for a state's priorities.

Multiple goals enable states to meet multiple policy objectives, reflecting the multiple benefits from energy efficiency and the variety of policy priorities the resource can support. Multiple goals also allow policymakers and collaboratives to consider how to best balance those policy priorities by adjusting the relationship between goals, including how they overlap and how much flexibility to grant administrators. In this way, multiple goals can help states resolve complex issues, like how to accommodate CHP and building electrification in the same set of goals. Our research reveals that multiple goals, especially where they include both fuel-neutral and resource-specific objectives, are best positioned to meet an emerging set of desired outcomes, as follows.

Addressing GHG emissions. Meeting climate goals requires policymakers to maximize achievement of all available options, including resource-specific energy efficiency, beneficial electrification, and decarbonization of grid supply. Carefully designed multiple goals can enable the broad set of resources needed to address climate needs. Setting resource-specific goals can address concerns that utilities might otherwise neglect energy savings of the fuels they sell (which would reduce GHGs) in favor of saving other fuels and promoting electrification.

Reducing system and program costs. Multiple metrics, including fuel-neutral goals, can lower overall system costs by expanding the total cost-effective options available for customers. For example, these goals can enable greater participation from fuel oil and propane customers, encourage coordination across gas and electric utilities, and streamline program delivery with other program administrators (if policymakers explicitly incorporate these design elements). The administrative burden of tracking and reporting must be carefully managed, as discussed below.

Enabling beneficial electrification. Multiple goals, especially those that include a fuel-neutral goal and remove prohibitions on fuel switching, can enable energy efficiency from both beneficial electrification and resource-specific efficiency. One fuel-neutral goal on its own, meanwhile, may discourage investment in resource-specific energy efficiency because of utilities' business model incentives to focus on fuel switching over actions that save the fuel they sell. By emphasizing both emissions reductions through electrification and additional efficiency measures, a multiple-goal approach can also help lower the costs of electrification.

Maximizing grid value. Multiple goals including fuel-neutral and peak demand targets can enable additional grid-interactive energy efficiency and beneficial electrification and may alleviate future pressures on fuel systems (natural gas and heating oil) where winter peaks are a concern. However complementary valuation and planning are required to maximize use of energy efficiency and beneficial electrification as distributed energy resources.

Increasing equity. Multiple goals can help address equity challenges by prioritizing all fuel savings opportunities with shared metrics. Comprehensive approaches to energy savings should better enable deep energy savings, but states will still need to take care that the benefits of energy efficiency programs are distributed fairly and prioritize those who are most in need. It is likely that a specific goal, tracking metric, or carve-out will be needed requiring program administrators to direct spending or achieve some level of energy savings or emissions reduction in disadvantaged communities.

Multiple goals also offer a pathway for innovation. For new efforts, like heat pumps, states can set initial goals in promising markets like new construction and oil conversions, which helps to drive down product costs and to build demand in segments where the economics are not yet as favorable. In addition, where a state is interested in getting to one overarching goal like reducing GHG emissions or MMBtus, multiple goals can be a stepping-stone to build stakeholder experience in using that metric in potential studies, technical reference manuals, and data collection.

However the use of multiple goals requires a clear framework establishing how the goals interact with each other and which resources are eligible. In addition, multiple goals may increase complexity and administrative burden for program administrators and regulators. To reduce this complexity, multiple goals should be limited in number to address top priorities and should be mirrored in other areas of policy, including performance incentives and program design. Where states shift to a multiple-goals approach, it is critical that the transition be built on a foundation of good data, high-quality potential studies, and cost-effectiveness screening. Stakeholder engagement will also be critical to ensure that shifts in metrics are transparent, are informed by stakeholder input, and allow sufficient time for the market to adjust.

Summing Up

Energy efficiency resource standards have been a key tool for delivering energy savings in states across the country. The 27 states that have adopted these policies have delivered the lion's share of energy savings in recent years. There is clear evidence that energy savings goals are achievable and effective, and with 23 states not yet adopting these standards, there are significant opportunities for energy savings still on the table.

States are also looking to their energy efficiency policies to do more. Not only can efficiency programs deliver energy savings, but they can help states meet aggressive climate goals, lower costs, give utilities the flexibility they need to meet demand, and deliver benefits like bill savings and healthier homes to those with the greatest need. While some states are working to maximize these benefits within their existing frameworks, others are looking to restructure their energy savings goals. The path forward builds on success, pairing new strategies like fuel-neutral goals and multiple goals with the tried-and-true framework of resource-specific goals. Growing from these roots, EERS policies will continue to meet the challenges of our 21st-century energy future.

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Appendix A. Case Studies

CALIFORNIA

Structure of EERS

- Targets for IOUs are established through a rolling process every two years and cover a 10-year period.
- Separate targets exist for electricity, natural gas, and demand reduction.
- Program administrators develop business plans detailing how they expect to meet targets.
- Utilities are required to shift 60% of program delivery to third-party implementers by the end of 2022 through a competitive bidding process.

Drivers of change

- Push toward decarbonization driven by legislation and executive order (SB350, AB3232, SB1477, EO B-55-18)
- Market transformation linked to efforts to institutionalize decarbonization strategies
- Better integration of efficiency into integrated resource planning

Current status

- Traditional energy savings goals (kWh, therms, and MW) for IOUs set by the CPUC
- Energy savings targets including components for resource acquisition and savings from codes and standards.
- Layered approach to statewide energy savings goals. Nonutility energy savings are tracked by the California Energy Commission in order to assess progress toward state energy and climate goals.

Legislative and Regulatory Background

California's investor-owned utilities (IOUs) have been delivering energy efficiency programs to their customers since the 1970s, with oversight from the California Public Utilities Commission (CPUC). In the late 1990s, California passed legislation that established a "loading order" that calls on both IOUs and publicly owned utilities (POUs) to first procure cost-effective efficiency resources before acquiring energy from other sources. Efficiency goals were established in 2004 based on a potential study. These goals also reflected the work of the California Energy Commission to identify achievable potential in the state (CPUC 2004).

In 2015 the CPUC established a "rolling portfolio" process for reviewing and updating efficiency targets and portfolios (D.15-10-028). These include portfolio-level savings goals for electricity, natural gas, and demand. Efficiency program administrators (PAs), including IOUs, community choice aggregators, and regional energy networks, submitted business plans in 2016 detailing how they will meet these targets. The CPUC distinguishes among targets, metrics, and indicators. Targets are quantitative goals. PAs are required to report metrics that assess progress toward targets at the portfolio, sector, and program levels. The CPUC also requires PAs to report a variety of indicators, but these are not attached to specific targets.

There are more than 40 POUs in California, serving about 25%–30% of the state's annual retail electricity needs. POUs have been obligated since 2006 to establish energy efficiency targets for their own programs, separate from those set for the IOUs by the CPUC, and report those goals and energy savings progress to their customers and the Energy

Commission, contributing to the state's overall climate and energy goals (PRC § 9505, most recently amended by SB 350 [deLeón, Chapter 547, Statutes of 2015]).

Recent Changes

Doubling efficiency statewide. In 2015 the California legislature passed SB 350, requiring the Energy Commission to set annual statewide targets to achieve a doubling of energy efficiency savings in electricity and natural gas end uses by 2030. Currently the Energy Commission's planning process has been informed by existing IOU targets, with the goal of layering savings from additional sources to achieve the legislative goal. In October 2017, the Energy Commission issued a report quantifying energy savings from these sources and making recommendations for ways to ramp up savings. These recommendations included: ensuring adequate funding for existing efficiency programs through 2030; identifying new technologies and developing new programs by engaging stakeholders, leveraging partnerships, conducting workforce training, and developing a comprehensive approach to fuel substitution programs; improving reporting, including collecting hourly data from large POUs and developing systems for PACE program administrators to report savings; and establishing an aggregate statewide target for electricity and natural gas savings (Jones et al. 2017).

Pushing toward decarbonization. In 2018 the state legislature passed AB 3232, requiring the Energy Commission to assess mechanisms for reducing emissions from the state's building stock by 40% below 1990 levels by 2030 (California Assembly 2018). Achieving this goal will require a concerted focus on space and water heating, the two largest sources of building emissions in California (Delforge and Borgeson 2018). Many elements of existing utility portfolios—smart thermostats and efficient insulation, for example—are well designed to make progress toward this goal. However stakeholders noted that programs involving fuel switching would also play an important role, and that fuel substitution rules will need to be taken up at the CPUC. In early 2019 the CPUC launched a separate process to implement SB 1477, a law aimed at decarbonizing buildings, with initiatives that focus on technologies that can be implemented in new buildings, like high-efficiency heat pumps and storage, and another initiative focused on space and water heating technologies for both new and existing buildings (R.19-01-011).

Process

Energy savings targets for IOUs are set through a stakeholder process at the CPUC that begins with an assessment of annual energy efficiency potential through 2030. The most recent updates to these goals were made in September 2017 in a process intended to inform the Energy Commission's statewide target-setting process under SB 350 (CPUC 2018a). While required targets for IOUs are built into the Energy Commission's assessment of progress toward doubling energy efficiency, these targets are determined by cost-effectiveness assessments rather than driven by the Energy Commission's long-term statewide goals. IOUs and other PAs submit Annual Budget Advice Letters and Implementation Plans that detail strategies to achieve their annual goals.

In addition to the goal-setting process, California frequently has several open energy efficiency–related dockets, each focusing on a separate issue. In this way, the state has dealt with complementary policies and programs outside, rather than within, the target-setting process. For example, while the state's IOU energy efficiency goals account for energy savings potential in the low-income sector, regulators have also established a separate docket to consider energy efficiency within the Energy Savings Assistance Program (ESAP). Funding for energy efficiency programs running through ESAP comes from a separate funding stream. Similarly, the state has considered addressing energy affordability through electrification in a separate docket, the San Joaquin Valley Disadvantaged Communities Pilot (D.18-12-015)

While the CPUC oversees energy efficiency targets and related issues for IOUs, the Energy Commission is the regulatory body tasked with implementing statewide energy policy. The Energy Commission tracks progress toward efficiency and other energy goals through Integrated Energy Policy Reports (IEPRs), adopted every two years with updates every other year. The IEPR is developed through a docketed system in which stakeholders provide comments. The 2018 IEPR update spread over nine dockets, including dockets focused on doubling energy efficiency savings, energy equity, and decarbonizing buildings. The 2019 IEPR is currently under development, with proceedings spread across 10 dockets.

Outcomes and Savings Goals

UTILITY SAVINGS GOALS

Energy savings goals for investor-owned utilities are shown in table A1, below. Utilities earn savings for both resource procurement (incentive programs) and work with codes and standards. For 2018–2019, more than half of the savings goals were attributable to codes and standards. Later in the period, the savings goals lean slightly more toward incentive program savings.

Table A1. Incremental energy savings goals for IOUs for 2018–2030

	PG&E			SCE			SDG&E		
Year	GWh	MW	MMTherms	GWh	MW	MMTherms	GWh	MW	MMTherms
2018	983	204	31	961	206	46	201	44	3.3
2019	1079	222	33	1014	216	48	220	47	3.6
2020	1076	234	35	1028	234	54	225	51	4.1
2021	1134	269	40	1071	268	60	242	60	4.5
2022	1128	266	43	1072	267	59	246	60	4.6
2023	1197	304	44	1157	310	63	269	70	5.1
2024	1183	298	44	1175	310	62	273	71	5
2025	1178	296	44	1174	310	61	279	71	5.2
2026	1152	290	39	1151	305	53	278	72	4.7
2027	1141	288	37	1149	305	49	280	72	4.7
2028	1108	282	38	1117	300	49	277	71	4.8
2029	1077	277	38	1086	295	48	272	70	4.8
2030	1049	273	39	1046	289	49	266	69	5.1

Source: CPUC 2017

In addition to energy goals, the CPUC has directed PAs to include a variety of metrics and indicators in their business plans. Table A2 shows portfolio-level common metrics.

Table A2. Common portfolio-level metrics for IOU business plans

Issue area	Associated metrics
Capturing energy savings	First-year and life-cycle gas, electric, and demand savings (gross and net)
Disadvantaged communities	First-year and life-cycle energy savings in disadvantaged communities
Hard-to-reach markets	First-year and life-cycle energy savings in hard-to-reach markets
Cost per unit saved	Levelized cost of energy efficiency for electric, gas, and demand programs (using TRC and PAC)

Source: CPUC 2018a

GHG savings metrics are tracked at the sector level. Other sector-level metrics and indicators include depth of interventions (measured in average savings per participant, project, or square foot), penetration of programs in eligible markets, and energy intensity. Some metrics and indicators speak to issue areas identified for specific markets. For example, PAs track use of whole-building metered data to estimate savings for commercial projects and new participation from industrial customers. Metrics for codes and standards work are tied to capturing energy savings as well as to specific advocacy activities and measure adoption at the state and federal levels. Business plans also include measures of workforce development activities. PAs report on training activities, partnership development, and diversity of participants (D.18-05-041).

STATEWIDE SAVINGS GOALS

While utility energy savings goals follow a traditional format, statewide savings goals are broader, encompassing savings from IOUs but also those attributable to POUs, financing programs, market transformation, savings from nonutility efficiency in agricultural and industrial processes, and codes and standards, as shown in figure A1.

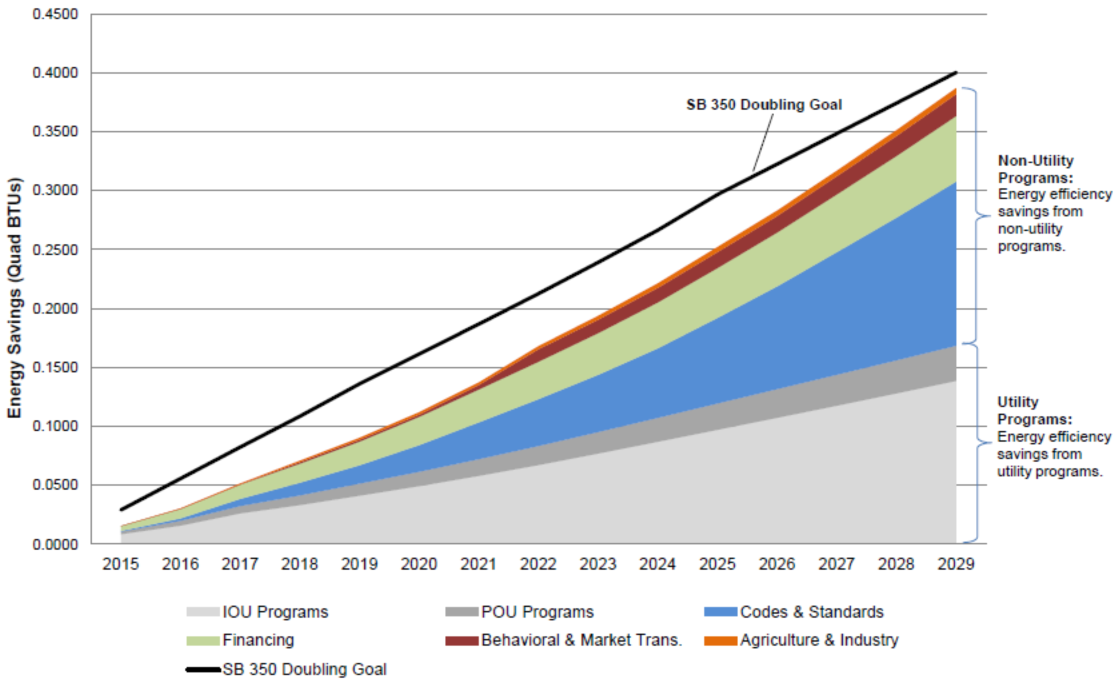

Figure A1. SB 350 doubling energy efficiency goal, and programs being tracked toward the target. *Source:* Jones et al. 2017

Next Steps for Program Implementation and Future Considerations

Fuel substitution considerations. California's rules for fuel substitution for regulated fuels are guided by a three-pronged test for cost effectiveness that was established by the CPUC in the early 1990s to address utility concerns over potential "fuel wars" as efficiency programs were ramping up. The three-pronged test stipulates that programs (1) must not increase source-Btu consumption, (2) must have total resource cost (TRC) and program administrator cost (PAC) test ratios greater than 1.0, and (3) must not adversely impact the environment. Stakeholders have argued that in practice, the test has been a significant barrier to fuel substitution and progress toward California's climate goals. In particular, there has been significant uncertainty with how fuel substitution programs should be assessed using standard cost-effectiveness tests (CPUC 2017). The CPUC issued a rulemaking accepting comments on the three-pronged test in 2018 as part of R.13-005.

Innovation through private-sector program design and delivery. In an effort to lower the costs of delivering programs, California has begun a shift toward competitive markets for both design and delivery of efficiency programs. Although there is a long history of third-party delivery of ratepayer-funded programs in the state, regulators have required utilities to shift increasingly toward a third-party design and delivery approach for efficiency programs, with 60% of IOU portfolios to be designed and implemented by third parties by the end of 2022.

Measuring savings at the meter. Program administrators are increasingly using Normalized Metered Energy Consumption (NMEC) approaches to measure savings. NMEC approaches may improve the measurement work done by PAs and regulators by making it more streamlined, granular (to include time and location), and informative. In addition, PAs and implementers may leverage NMEC approaches as a way to increase innovation and competition in program design and delivery. By using NMEC as a measurement approach, PAs and implementers may have more incentive to achieve better metered results and more latitude to introduce new program designs and process innovations.

More emphasis on time and locational value of energy efficiency. In the CPUC's order establishing 2018–2030 targets, the commission noted that "future goal updates may reflect a more comprehensive goal-setting process, in the context of the Commission's Integrated Resource Plan process." Stakeholders expect the process to include a more integrated analysis of overall grid needs, including a better reflection of the time and locational value of energy efficiency. Meter-based savings data may serve a key role in better valuing these aspects of efficiency. The CPUC has approved efforts for locational targeting of energy efficiency to avoid or defer grid upgrades and evaluation methods that use normalized metered energy consumption (NMEC) to increase visibility (R.13-11-005).

Market transformation. Building energy codes and appliance and equipment standards make up a significant portion of California's strategy for meeting statewide climate and energy goals. This focus is integrated into IOU targets, as utilities can claim savings from work advocating for codes and standards. In this way, efficient technologies may first be socialized through the resource-acquisition portion of utility savings targets, and later become components of statewide codes and standards supported by IOUs. In 2018 the Energy Commission adopted the 2019 Building Energy Efficiency Standards update as a major tool to achieve the state's climate change and grid value goals. These standards take a broad view of optimizing the energy impacts of new construction and include requirements for customer-owned photovoltaics and compliance credit for battery storage and other demand flexibility measures (including smart inverters and controls). The CPUC also opened a rulemaking in April 2019 on a comprehensive market transformation framework that was developed by a working group of the California Energy Efficiency Coordinating Committee (R.13-11-005).

HAWAII

Structure of Energy Efficiency Portfolio Standard (EEPS)

- 4,300 GWh of statewide electricity savings by 2030
- Annual cycles, cumulative performance measurement in three-year cycles, and five-year reports to legislature
- Most programs and savings (80%) delivered by third-party administrator Hawaii Energy, which is under contract to the Hawaii Public Utilities Commission (PUC)
- Hawaii achieved its 2015 interim reporting goal and appears on track to meet its 2020 interim goal (Hawaii PUC 2018).

Drivers of change

- High penetration of renewables, and desire for customer-side energy efficiency investments to provide additional time- and location-specific value to the grid
- Energy affordability challenges pushing stakeholders to ramp up equity achievement from energy efficiency, especially for low-income families and small businesses
- Focus of system energy efficiency on lighting has largely evolved to other end uses and sources of grid value.

Current status

- No changes have been made to the EEPS yet. In its report to the legislature in December 2018, the PUC indicated that it will consider changes to the EEPS framework, including goals and metrics (HI PUC 2018).
- The PUC has initiated an update of the 2014 Energy Efficiency Potential Study to help evaluate the long-term goals.
- Hawaii Energy has begun the process of revising those goals and has proposed goals that address three areas: (1) clean energy transition, (2) accessibility and affordability, and (3) economic development and market transformation.

Legislative and Regulatory Background

Hawaii initially established energy efficiency goals through a partnership with the US Department of Energy to establish the Hawaii Clean Energy Initiative (HCEI) in 2008, which set a goal of meeting 70% of the state's energy needs through renewable energy and energy efficiency by 2030. Following that, the Hawaii State Legislature passed Act 155, which established the state's energy efficiency goals as an Energy Efficiency Portfolio Standard (EEPS). It also created a public benefits fee administrator under contract to the Public Utilities Commission (PUC), called Hawaii Energy, which serves the islands of Hawaii, Maui, Lanai, Molokai, and Oahu.

Hawaii established a 100% renewable portfolio in 2015 (HB 623) and last year passed legislation requiring carbon neutrality by 2045 (HB 2182). While energy efficiency goals did not increase, energy efficiency will be important to reduce the total load those renewables will need to serve, lowering the cost of compliance with this ambitious decarbonization legislation. Further, all four counties in the state have adopted 100% clean transportation goals, which will likely increase electricity needs, making energy efficiency even more critical for the state's efforts to meet the 100% renewable energy goal.

During the first EEPS performance period (2009–2015), Hawaii achieved an estimated 2,030 GWh of electricity savings, exceeding the 2015 goal of 1,375 GWh by nearly 50%. An additional 530 GWh of savings was achieved in 2016–2017 (HI PUC 2018). Figure A2 shows these savings.

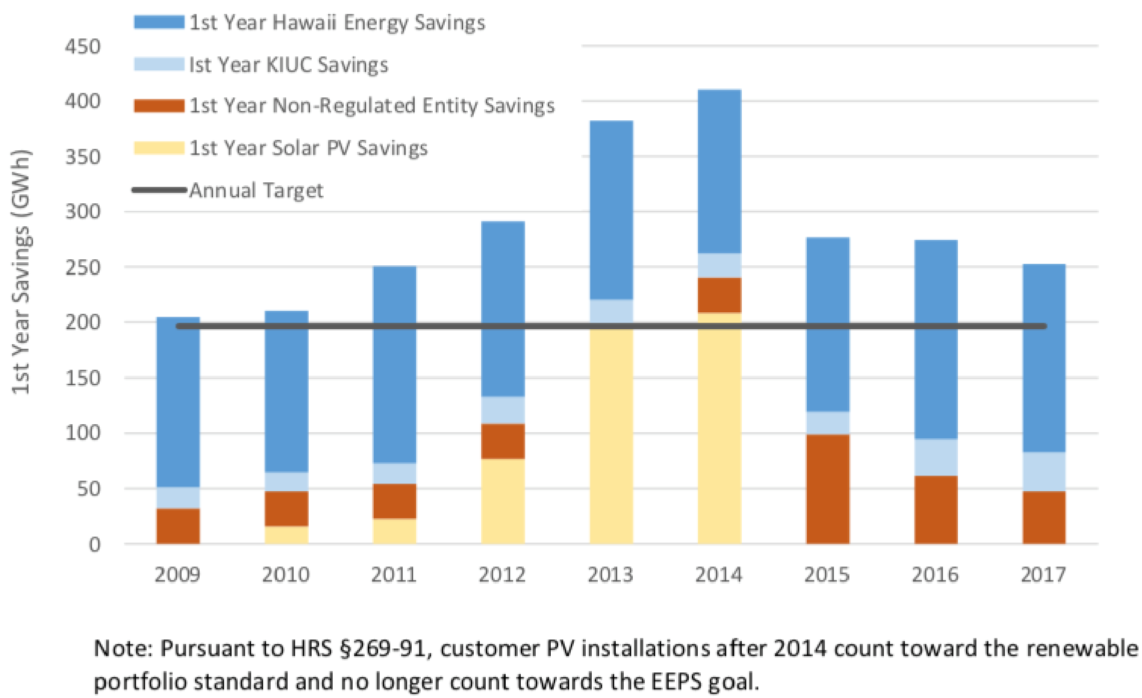

Figure A2. Hawaii statewide annual first-year savings. *Source:* Hawaii PUC 2018.

Against this backdrop of successful energy efficiency performance, Hawaii's renewable energy industry grew substantially, driven by favorable economics and state policy. The state further extended its efforts beyond the initial HCEI goals in 2015 when it adopted a Renewable Portfolio Standard calling for 100% renewable energy by 2045.

Recent Changes

The increasing penetration of renewables and Hawaii's desire to meet aggressive decarbonization goals have raised the question of how energy efficiency can best support renewables integration and GHG reduction. In the past year, Hawaii Energy and the PUC have led two working groups—the Technical Working Group, which advises Hawaii Energy, and the Technical Advisory Group (TAG), which advises the PUC on the EEPS—in a series of workshops to consider how changing goals and programs might address that question.

Hawaii Energy has also conducted two external stakeholder engagements to understand community needs, and both Hawaii Energy and the PUC have shared with stakeholders early drafts of possible changes to metrics.

Outcomes and Savings Goals

In 2018, Hawaii Energy created a new proposed goals structure for the next program cycle, with three broad program goals and initial proposed objectives and metrics, which are summarized in table A3.

Table A3. Hawaii Energy proposed energy efficiency goals, October 2018

Goal	Objectives	Metrics
CLEAN ENERGY TRANSITION: Accelerate Hawaii's transition to clean, resilient, cost-effective energy systems.	Reduce kWh usage and shift demand in alignment with EEPS. Reduce carbon emissions from buildings and transportation. Transform buildings into a smart, resilient grid resource.	· Total Resource Benefit (in $), including more standard, comparable, and comprehensive valuation · First-year energy savings · Peak demand savings
ACCESSIBILITY AND AFFORDABILITY: Include everyone in the clean energy transition.	Provide assistance to low-income households, small businesses, and other hard-to-reach customer segments.	· % of $ spent for counties and city of Honolulu · Small-business and multifamily customers served, energy saved
ECONOMIC DEVELOPMENT AND MARKET TRANSFORMATION: Strengthen local communities and businesses and boost Hawaii's economy.	Make long-lasting changes through strategic interventions to overcome market barriers. Enable smart energy choices through increasing energy awareness and literacy. Develop dynamic, data-driven 10-year program road map that fosters innovative solutions.	· Number of BPI certification or in-network partners · Demand-management-ready products installed or customers serviced · "Clean Energy Collaboration" projects · "Energy Culture" baseline, trends, and target reports · Code compliance reports

Source: Hawaii Energy 2018

These goals were reflected and slightly updated in the plan for program years 2019–2021 submitted to the Hawaii PUC in May 2019. Hawaii Energy's proposed performance metrics focus on clean energy technologies (70%); accessibility and affordability (20%), including island equity; market transformation and economic development (8%); and customer satisfaction (2%). Table A4 outlines these metrics. In addition, Hawaii Energy proposes tracking but not assigning performance metrics to estimates of GHG emissions and barrels of oil saved.

Table A4. Hawaii Energy proposed energy efficiency goals, May 2019

Goal	Existing metrics (continuing into FY 2019–2021 cycle)	Proposed new metrics
Clean energy transition (70%)	First-year energy savings (15%) Peak demand savings (15%) Total Resource Benefit (20%)	Lifetime energy savings (15%) Grid services–ready metric (5%)
Accessibility and affordability (20%)	Economically disadvantaged, based on specific program performance and participation (10%) Island Equity targets (10%)	Consistent with previous years
Market transformation and economic development (8%)	Behavior change (2%) Professional development (4%) Energy in decision making (1%) Codes and standards (1%)	No additional metrics, but changes to baselines and targets
Customer satisfaction (2%)	Based on online surveys of residences	Adding businesses to survey in FY2019–2021

More broadly, the EEPS framework stipulates a review this year of the goals and framework elements. Commissioner Jennifer Potter, the PUC's lead commissioner for energy efficiency, proposed a series of metrics designed to better align energy efficiency with state policy goals (Potter 2018). In addition to maintaining the current EEPS goal to "achieve all cost-effective energy use in Hawaii by 2030," she proposed that energy efficiency investments reduce (1) system demand during peak demand periods to maximize grid value, (2) imported fossil fuel related to electricity generation, and (3) net GHG emissions (from generation and other sources).

Persisting savings. For the current EEPS goal, Commissioner Potter proposed a shift to track "persisting energy savings achieved to date," which would value energy efficiency gains over time, including market effects attributed to programs. After the 2019 Potential Study is completed, this could include changes to the 4,300-GWh goal as well. Although data from Hawaii Energy could be sufficient for tracking persisting energy savings, some contributing entities do not collect the data required to assess persisting kWh impacts with market effects.

Cumulative persisting peak demand reductions. This metric would measure peak period demand reduction, with time periods differentiated by island. Given likely changes to peak periods, this would require an update mechanism for the peak periods.

GHG emissions. This metric would measure reduced emissions from avoided generation, electrification, and other end-use GHG reduction strategies, in tons CO2e. It would also require grid carbon intensity values from Hawaiian Electric Company to be challenging for other contributing entities where a lack of hourly load shapes might make such calculations uncertain.

Fossil fuel reduction. Hawaii's resource mix relies heavily on expensive fossil fuels. The state may add a metric for avoided fossil fuel use as a result of reduced electricity use, measured on the basis of overall kWh savings per barrel or hourly oil intensity of generation.

Commissioner Potter also noted additional policy objectives whose goals would not be stipulated explicitly in the EEPS framework, but which the state should begin to track over time:

- The state's energy portfolios should focus energy efficiency investments to save energy where and when most needed on the grid. This tracking would begin with three to six defined time periods with approximate cost values and eventually move to hourly avoided cost with island or sub-island locations.
- Hawaii's energy portfolio should accelerate market penetration of DER-ready equipment and systems capable of responding to demand response events to provide on-call resources to the grid. Hawaii Energy could measure participation rates and annual kWh impacts by small-business and hard-to-reach customers, as well as the percentage of total expenditures serving defined areas with high percentages of HTR and asset-limited, income-constrained, employed (ALICE) customers.
- Hawaii's energy investments should ensure equitable levels of energy efficiency benefits (including energy bill reductions) accrue to hard-to-reach and income-constrained communities during the clean energy transition. This tracking would begin with grid-flexible building pilots and then build toward metrics for DER-ready capacity at specified time intervals or percentage of building stock with DER-ready resources (Potter 2018).

In addition, these metrics might be used for other demand-side management measures, including demand response–enabled technologies, grid-interactive hot water heaters, smart charging, and smart buildings.

Next Steps

Hawaii Energy proposed its FY2019–2021 plan in May 2019; it is under review as of the publication of this report. The PUC will continue stakeholder discussions with the EEPS Technical Working Group throughout 2019. It will finalize key policy objectives to integrate into the EEPS Framework and iterate on specifics for each metric and proposed revised language for the EEPS Framework.

Massachusetts

Past structure of EERS

- The state's Green Communities Act (GCA) of 2008 established the policy framework requiring electric and gas program administrators to develop statewide electric and gas efficiency investment plans.
- Efficiency programs also serve parallel goals for emissions reductions and clean energy job creation established by the state's 2008 Global Warming Solutions Act.

Drivers of change

- Anticipated reductions in claimable savings for lighting changes in industry standard baseline
- The need to more closely align energy efficiency with GHG reduction goals
- Emphasis on containing capacity cost and peak period energy costs as well as strengthening grid resilience
- Increased efforts to serve all customers, including income-eligible, moderate-income, and rental customers, as well as non-English-speaking customers

New structure of EERS

- An Act to Advance Clean Energy of 2018 amended the Green Communities Act, broadening the definition of efficiency to include:
    - Focus on reducing overall energy use through measures such as strategic electrification and fuel conversion to renewable energy sources and other clean energy technologies
    - Addition of new Active Demand Reduction Offerings including energy storage, and corresponding targets, to reduce summer and winter peak demand

Current status

- Savings targets continue to be based on the GCA's specified goal to attain all available cost-effective electric and gas savings and demand reduction, negotiated through collaboration between PAs, the Energy Efficiency Advisory Council, and the Department of Energy Resources and approved by the Department of Public Utilities.
- The recently approved 2019–2021 plan calls for electricity savings of 3,461,000 MWh (2.7% of retail sales). Natural gas targets are set at 1.25% of retail sales for 2019–2021.
- As PAs increasingly embrace strategic electrification, they will not specifically recommend one fuel over another, but they do intend to educate customers about the environmental and cost benefits of converting from heating fuels to electric heat or high-efficiency natural gas equipment.

Legislative Background

The 2008 Green Communities Act drives energy savings goal setting and program development in Massachusetts. It requires that electric and gas utilities pursue all cost-effective energy efficiency, eliminating energy waste whenever it is cheaper to do so than to buy additional supply. The legislation requires energy distribution companies and municipal aggregators to jointly prepare electric and gas energy efficiency plans every three years. These programs also support the state's Global Warming Solutions Act (GWSA), which aims to reduce GHG emissions by 25% (relative to 1990 levels) by 2020 and 80% by 2050.

Required components of each energy efficiency plan are outlined in Section 21 of the GCA and include an assessment of lifetime costs, reliability, and magnitude of all available efficiency and demand reductions that are cost effective. Also required are descriptions of program offerings, including efficiency and demand response programs, market transformation initiatives, programs supporting building energy code adoption, research and development programs, and others. The law calls for a collaborative planning process soliciting feedback from the Energy Efficiency Advisory Council (EEAC) and the public, and it requires the PAs to submit draft efficiency plans for review and comment every three years, followed by an updated official filing to the Department of Public Utilities (DPU) that addresses the EEAC's comments.[20] Final approval is determined by the DPU.

Recent Changes

In August 2018, Governor Charlie Baker signed H. 4857, An Act to Advance Clean Energy, ushering in a slate of ambitious updates to the state's renewable energy policy framework along with significant changes that impact design and administration of energy efficiency programs. While the legislation stopped short of including Senate-approved carbon pricing and strengthening the state's appliance efficiency standards, the bill upgraded the renewable portfolio standard (RPS), established a clean peak standard, and set an energy storage goal. Most significantly for energy savings programs, the bill also expanded the list of eligible measures and technologies that efficiency plans may include, adding energy storage, renewable energy, and strategic electrification that results in cost-effective reductions in GHG emissions, regardless of whether it increases overall electricity consumption. Electric efficiency plans were broadened to energy efficiency plans to reflect a focus on reducing overall energy usage including delivered fuels.

In planning for the 2019–2021 program cycle, the EEAC established a set of priorities that include:

- Developing a goal for active demand management (ADM) separate and distinct from goals for traditional energy efficiency;
- Setting a clear and increasing target to grow CHP savings by streamlining participation, improving outreach to small/medium customers and vendors, and focusing more on resilience;
- Increasing process savings goals among industrial customers through expanded technical assistance and provision of better energy consumption data;
- Providing new methods of realizing savings, including promotion of cost-effective fuel-switching measures, integration of ADM and storage into energy efficiency programs, and coordinating electric vehicle charging and other distributed energy resources with efficiency.[21]

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[20] The EEAC is composed of 15 voting members representing diverse interests specified in Section 21 of the GCA, as well as 12 nonvoting members that include PAs from the investor-owned electric and gas utilities and other stakeholder groups. Members are appointed to five-year terms by the Department of Public Utilities. While the full EEAC meets monthly to discuss and vote on important decisions, the state's four electric and six gas PAs meet biweekly in sector-specific management committee meetings.

[21] "EEAC Resolution Concerning Its Priorities for the Development, Implementation, and Evaluation of the 2019–2021 Three-Year Energy Efficiency Plan," February 28, 2018.

Process

The process for developing program goals and budgets is highly collaborative and includes stakeholders at all levels, from the state down to the PAs, though the resulting goals are ultimately PA-specific and vary by program and initiative. The development of goals incorporates several analytical processes including:

- A bottom-up assessment of savings opportunities in individual PA service areas
- A review of recent evaluation study findings
- A collaborative consideration of statewide policy objectives that balances savings goals with the total cost of achieving savings

The bottom-up process looks at savings by measure as forecasted by projected quantities and customer incentive amounts for each piece of energy efficient equipment. Informing this effort is an examination of historical data regarding participation trends, savings achieved, and cost to achieve annual and lifetime savings. The process is a fluid one in which PAs, management committees, and working groups assess both achievable savings and required program adjustments, based on recent or anticipated changes in federal efficiency standards and industry standard practice, as well as trends in technological adoption and consumer needs. Each PA uses this information to develop a forecast of energy efficiency that can be achieved in its service territory.

The top-down planning process assesses achievable savings for the portfolio as a whole by examining impacts to the markets that programs are targeting, as well as cost implications to the PA and its participating and nonparticipating customers. Instrumental to this effort is the review of potential studies to determine both what is technically feasible given current technologies and economic conditions, and what is practically achievable based on current real-world program and market barriers. Territory-specific potential studies are undertaken by directive of the DPU in advance of the planning process to inform program design.

Outcomes and Savings Goals

Following review of the draft plan submitted in April 2018, the EEAC issued a resolution expressing disappointment with a lack of program details and analytics support in addressing the council's priorities (MA EEAC 2018). The EEAC also called for a substantially higher savings goal, more in line with a target of 3.15% of retail electric sales and 1.65% of retail gas sales previously recommended by consultants to the EEAC. The resolution recommended higher active electric demand savings goals than those presented in the draft plan as well. Ultimately, statewide goals were set at 2.67% for electric programs and 1.25% for gas programs in the plan approved in January 2019. The electric goals were expanded to include higher peak demand reduction (including active demand management) and higher overall MMBtu savings targets. Table A5 provides a comparative summary of key savings goals associated with the 2016–2018 and 2019–2021 program years.

Table A5. Mass Save energy efficiency goals for 2016–2018 and 2019–2021 program cycles

Goals	2016–2018	2019–2021
Statewide		
Net adjusted lifetime all fuel (MMBtus excluding active demand reduction)	N/A	261,931,735[b]
CO2e reductions (MMTCO2e)	1.95[a]	2.63
Benefits ($M)	7,948.4	9,334.0
Budget ($M)	2,523.0	2,769.3
Electric		
Net annual MWh (no fuel switching)	4,117,539 (2.93%)	3,464,441 (2.70%)
Net lifetime MWh (no fuel switching)	40,384,043	36,259,718
Net annual site MMBtus (EE other than CHP)	N/A	10,892,732[b]
Net annual source MMBtus from CHP	N/A	1,107,268[b]
Total adjusted annual MMBtus	N/A	12,000,000[b]
Net lifetime site MMBtus (EE other than CHP)	N/A	120,396,475[b]
Net lifetime source MMBtus from CHP	N/A	22,071,692[b]
Total adjusted lifetime MMBtus	N/A	142,468,167[b]
Summer MW (including active)	598	693
Winter MW (including active)	649	544
CO2e reductions	N/A	1,990,345
Benefits ($M)	6,249.6	7,011.8
Budget ($M)	1,857.5	1,969.9
Performance incentive	100.0	114.7
Gas		
Net annual therms	85,809,618 (1.24%)	96,462,193 (1.25%)
Net lifetime therms	1,149,211,383	1,249,959,422
Net lifetime MMBtus	N/A	119,463,568[b]
CO2e reductions (tons)	N/A	638,606
Benefits ($M)	1,698.8	2,322.2
Budget ($M)	665.5	799.4
Performance incentive ($M) (design level)	18.0	22.5

[a] Mass Save 2015a. [b] Preliminary values taken from Term Sheet, dated October 19, 2018, for the 2019–2021 Three-Year Energy Efficiency Plan. According to staff at the state Department of Energy Resources (DOER), the DPU did not yet approve a lifetime MMBtu target due to concerns regarding methodologies for measuring site- versus source-level savings. However the PAs, in coordination with DOER and others, are working on further developing the metric, which will be submitted to DPU at the end of 2019.

Multiple-goal framework including a fuel-neutral component. The PAs continue to primarily pursue fuel-specific savings goals for electricity and natural gas, with the addition of new goals for active demand reduction and reducing energy usage during times of summer and winter peak demand, as well as an overarching net lifetime all-fuels MMBtu target. The latter is designed to recognize previously unaccounted net savings from measures that may increase electric load but ultimately reduce consumption on a total-MMBtu and total-GHG emissions basis.[22] This metric will provide a transparent calculation of the net effect of all fuel savings, including electric, gas, oil, and propane, as well as impacts of energy-saving fuel conversions.[23] It is meant to enable PAs to pursue strategic electrification opportunities that had been limited due to a prior restriction on promoting fuel-switching measures. For example, while electric savings could be claimed for heat pump installations, any savings associated with oil or propane usage could not (VEIC 2018).

Focus on demand reduction. The 2016–2018 program recognized the importance of achieving demand reduction goals and set out plans to develop and pilot new demand/peak reduction initiatives. These new statewide programs, known as Active Demand Reduction Offerings, will officially launch during the 2019–2021 program period with the intent of reducing summer and winter peak demand. To recognize and reward utility efforts to develop the relatively nascent active demand market, an electric demand target has also been added to the savings component for determining utility performance incentives, with a potential $5 million achievable.

Tracking metrics. In addition to the targets listed above, the 2019–2021 plan includes several other goals and trackable metrics, though their achievement is not a required condition within the statewide performance incentive mechanism. These include goals for cold climate air source heat pump installations, measured by the number of heat pumps installed across different market sectors, and GHG emissions reductions. The 2019–2021 plan proposes CO2e reductions of more than 2.6 million short tons, an increase of more than 400,000 short tons relative to the 2016–2018 plan. These savings are based on adjusted gross savings, including full energy reductions, rather than net savings, since, for the purposes of calculating GHG emissions, attribution is not necessarily relevant (PAs 2018).[24] Reductions are calculated using updated GHG emissions factors for NOx, SO_2, and CO_2, applied to electricity, gas, oil, and propane savings. PAs are also required to track and report participant data by renter/owner status, income, and primary language in order to ensure that programs are reaching customers with the greatest need.

Valuing emissions reduction benefits of energy efficiency. The 2019–2021 plan is the first to monetize energy efficiency benefits related to avoided GHG emissions. The DPU approved the use of a regional marginal energy abatement cost calculated in a 2018 report by a study group comprising regional utilities and advocates (Synapse 2018). This value is approved for use in deriving the non-embedded cost of GHG emissions to be applied in assessing the

[22] Excluding savings associated with active demand reduction efforts.

[23] MMBtu savings will be reported on the basis of source savings for combined heat and power and site savings for all other measures.

[24] Gross adjusted savings include nonelectric savings from electric PAs, and non-gas savings from gas PAs, but do not subtract for free ridership.

cost effectiveness of the three-year plan.[25] In its January order the DPU directed the PAs to include the New England marginal abatement cost of $68 per short ton CO_2 equivalent toward calculating the non-embedded cost of GHGs in benefit–cost ratios.

Goals proposed but not adopted for 2019–2021. Stakeholders proposed two goals that were not ultimately adopted for the next program cycle. PAs proposed a separate 22.1 MMBtu lifetime metric for CHP savings, measured at source rather than site in order to account for upstream fuel savings that site-level analyses would fail to capture. However the DPU asked in its rulemaking that the PAs refine this metric due to concerns regarding the method of imputing savings from GHG emission rates. Stakeholders also identified the renter market as an underserved customer sector that, while having access to multiple programs, had not been consistently tracked, leading to a lack of data about participation and savings achieved. PAs proposed a renter component goal and corresponding performance incentive associated with achieving the goal, but this was ultimately rejected by the DPU due to a concern that this goal and associated incentive would enable PAs to earn multiple incentives for the same action. An existing legislative requirement under the Green Communities Act continues to require that 10% of electric utility program funds and 20% of gas program funds be spent on low-income energy efficiency and education programs.

Next Steps for Program Implementation and Future Considerations

Clarifying fuel-neutral accounting methodologies. In the DPU's January order approving the 2019–2021 plan, it expressed concerns regarding the PAs' method for converting all fuel savings to MMBtus, specifically its methods for converting electricity used onsite but generated off-site, which had not accounted for embedded energy heat values associated with the fuel mix used to generate the electricity. The DPU also noted concerns regarding the PAs' mixing heat values with GHG emissions rates in calculating MMBtus for CHP. The DPU directed the PAs to further refine methods for MMBtu conversion for inclusion in their 2019 annual reports.

Increased customer engagement. The transition toward more comprehensive energy savings goals calls for a shift in the PAs' approach to customer engagement, from encouraging only more efficient versions of what customers already use to a holistic energy optimization approach that educates customers on the broader energy and economic benefits of a wider set of heating and cooling options. While the PAs will not recommend one fuel over another, they will allow customers to compare "the installed costs, operating costs, and environmental impact of their primary heating fuels with other available options" (Mass Save 2018). Efforts to update and strengthen customer engagement include development of an online calculator, to be available on MassSave.com, that will enable users to estimate and compare savings from oil, propane, electric, and natural gas heating equipment. In order to streamline customer service, PAs are also exploring strategies other than an onsite visit to confirm current customer equipment, such as submission of past heating fuel bills. In its

[25] Non-embedded GHG costs are those not already folded into existing prices through Regional Greenhouse Gas Initiative (RGGI) allowances and state regulations such as the Massachusetts GWSA. These are calculated by estimating the total cost of GHG emissions less the smaller, embedded portion.

updated February 2019 memo describing priorities for the 2019–2021 program cycle, the EEAC requested that the PAs provide quarterly updates to track the number of customers displacing nonelectric fuels, organized by type (both displaced and replaced) (EEAC 2019).

Measuring efficiency's impact in meeting the state's broad climate goals. Reductions in GHG emissions achieved through energy efficiency and other sectors are tracked on an ongoing basis by the Massachusetts Department of Environmental Protection in periodic emissions inventories (MassDEP 2019). According to the state's recent GWSA 10-year progress report, statewide efficiency programs have produced electric, natural gas, and other heating fuel savings that together have saved more than 3.9 million metric tonnes of CO2e (MA EEA 2019). GHG emissions were 21.4% below the 1990 baseline in 2016, on track to reach the reduction target of 25% by 2020. According to the progress report, state policies to implement all cost-effective energy efficiency, primarily through Mass Save programs, had contributed a 3.4% reduction in GHGs from 1990 levels. This is projected to grow to a 5.4% reduction by 2020, the highest contribution toward reduced emissions of all policies outlined in the state's 2015 update to its Clean Energy and Climate Plan for 2020.

MINNESOTA

Structure of EERS

- Energy efficiency spending requirements have been in place for utilities since 1991. However these have been overtaken by energy savings goals of 1.5% for electric and gas utilities established under the 2007 Next Generation Energy Act.
- Under the state's large customer opt-out provision, approximately 13% of electric load and gas sales are exempt from contributing to the Conservation Improvement Program's energy efficiency offerings.

Drivers of change

- Anticipated dip in potential savings from lighting upgrades beginning in 2022, due to EISA lighting standards scheduled to take effect in 2021
- Increasing interest in exploring opportunities to achieve greater carbon savings and grid optimization by enabling beneficial electrification. Minnesota's grid has grown cleaner through the ongoing replacement of fossil fuel–generated electricity in line with current state policies requiring a reduction of carbon emissions by 80% from 2005 levels by 2050.

Current status and next steps

- Utilities have proposed expanding eligible Conservation Improvement Program (CIP) offerings to measures that do not produce energy savings but do provide other clean energy benefits, such as reduced carbon emissions and load shifting.
- A 2020–2029 Energy Efficiency Potential Study led by the Center for Energy and Environment (CEE) found that declines in claimable lighting savings could be made up through transitioning programs to non-lighting technologies, particularly air source heat pumps, even with the current prohibition on fuel switching in place. Lifting this restriction would make available even greater levels of savings.
- Fuel switching is currently prohibited under a 2005 Minnesota Department of Commerce (DOC) order. A legislative proposal that would lift this prohibition did not pass in 2019.
- The DOC is also exploring other, non-legislative channels to pursue electrification, such as potentially rescinding the department rule prohibiting fuel switching. The DOC has received a US Department of Energy State Energy Program (SEP) grant for a two-year study to produce a statewide electrification plan.

Legislative and Regulatory Background

Minnesota's long-standing Conservation Improvement Program (CIP) provides the energy efficiency policy framework for the state. Since 1991 Minnesota's utilities have been required to spend a set percentage of gross operating revenue on energy efficiency: 0.5% for natural gas utilities, 1.5% for electric utilities, and 2% for a public electric utility that operates a nuclear plant (Xcel).[26,27] In 2007 the Next Generation Energy Act (Minnesota Statutes 2008 § 216B.241) established the state's EERS to become the primary policy driver for energy efficiency, mandating specific utility energy savings goals of 1.5% of annual retail sales for electricity and natural gas. However utilities may also request that this goal be adjusted to

[26] The 2% figure for Xcel was increased from 1.5% in a 1994 Prairie Island settlement.

[27] Per legislation signed in 2017, electric coops serving less than 5,000 members and municipalities serving less than 1,000 retail customers are exempt from the Conservation Improvement Program. This includes 12 electric cooperatives and 38 municipal electric utilities. Currently 140 of 213 electric and natural gas utilities are covered.

as low as 1% per year if warranted on the basis of experience, customer types, cost effectiveness, and other factors.

In 2013, HF 729 went further to declare energy efficiency the preferred energy resource and clarified that the state energy policy goal of saving 1.5% of retail energy sales annually is a floor, not a ceiling (M.S. § 216B.2401). For electric utilities, at least 1% energy savings must come from customer-side efficiency improvements; the remaining 0.5% may come from energy codes and appliance standards and efficiency enhancements to each utility's generation, transmission, and distribution infrastructure (M.S. § 216B.2401). However, while the DOC provides regulatory oversight regarding utility-specific goals, progress toward the broader 1.5% goal is not tracked or regulated.

Regulated utilities recover the cost of energy efficiency programs through a cost-recovery rider outside of a rate case, which includes consideration of program costs and incentives.

Minnesota Statute 216B.241 (Subdivision 7) also requires both natural gas and electric utilities to provide a minimum level of spending for low-income energy efficiency programs. Municipal and public gas utilities must spend at least 0.2% and 0.4%, respectively, of their recent three-year average gross operating revenue from residential customers on low-income programs. Electric utilities must spend at least 0.2% of their gross operating revenue from residential customers on low-income programs.

Program plans are developed and submitted for approval by the DOC on a three-year cycle for investor-owned utilities and a one-year cycle for electric cooperatives and municipal utilities. Approved CIP expenses are trued up annually.[28]

Recent Changes

Recently, utilities have recommended allowing CIP funding to be spent on demand response programs that do not necessarily produce energy savings but do provide other benefits like reducing carbon emissions or shifting load profiles, such as through renewable energy and storage technologies. In March 2019, House lawmakers passed HF 2208, which would have lifted the current prohibition on fuel switching to allow beneficial electrification in cases that met four criteria:

- They result in a net reduction in the cost and amount of source energy used on a fuel-neutral basis.
- They produce a net reduction in GHG emissions.
- They are cost effective from a societal perspective.
- They do not increase utility system peak demand or require significant new utility infrastructure investment.

However the Senate failed to take up this bill. Other provisions of HF 2208 would have increased the state's broader energy savings goal—one that includes savings from building energy codes, appliance standards, and other measures—to 2.5% of annual retail energy

[28] database.aceee.org/state/customer-energy-efficiency-programs

sales of electricity and natural gas. The bill also would have increased the existing 1.75% goal achieved through current electric and natural gas utility programs (Minnesota Legislature 2019).

Outcomes and Savings Goals

Annual reporting shows that Minnesota's electric utilities, taken together, have met or exceeded the state's 1.5% annual energy savings goals every year since 2011. The state's electric IOUs, including Xcel Energy, Minnesota Power, and Otter Tail Power, have reported savings above 2% of sales in both 2016 and 2017, helping make up for lower savings of 1.1%–1.4% typically reported by the state's cooperatives and municipal utilities. Reported annual savings levels by Xcel and CenterPoint are shown in table A6.

Table A6. 2013–2019 energy savings goals for Minnesota's largest investor-owned utilities

Goal	2013	2014	2015	2016	2017	2018	2019
Xcel electricity							
Budget ($M)	$86.76	$86.06	$86.06	$89.04	$96.01	$94.11	$97.31
Proposed energy savings (GWh)	436	436	435	435	434	433	433
Total adjusted sales (GWh)	28,987	28,987	28,987	28,987	28,751	28,751	28,751
Savings as % of retail sales	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	1.5%
Xcel gas							
Budget ($M)	$13.62	$14.39	$14.37	$14.4	$16.83	$17.17	$17.55
Proposed energy savings (Dth)	696,415	691,908	696,474	696,474	719,365	721,929	720,223
Total adjusted sales (Dth)	69,458,419	69,458,419	69,458,419	69,458,419	71,897,513	71,897,513	71,897,513
Savings as % of retail sales	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%
CenterPoint gas							
Budget ($M)	$24.63	$24.68	$25.00	$29.43	$34.56	$33.40	$34.64
Proposed energy savings (Dth)	1,367,966	1,439,003	1,445,180	1,556,160	2,578,054	1,747,816	1,823,106
Avg. weather-normalized energy sales	136,490,212	136,490,212	136,490,212	136,490,212	141,120,375	141,120,375	141,120,375
Savings as % of retail sales	1.00%	1.05%	1.06%	1.14%	1.83%	1.24%	1.29%

Gas utilities have exceeded the 1% minimum goal every year since 2013 but exceeded the 1.5% goal only in 2017. Investor-owned utilities CenterPoint and Xcel led with savings of 1.9% and 1.1%, respectively, in 2017, offsetting lower levels of savings by the state's three other IOUs (Minnesota Energy Resources, Great Plains Natural Gas, and Greater Minnesota Gas) and municipal utilities (MN DOC 2018).

While not mandated by statute, utilities also track progress toward several other performance goals, including demand savings (both electric and gas) and participation in low-income programs.

Next Steps

Replacing savings from lighting. Looking forward, the DOC's Division of Energy Resources released a 2020–2029 Energy Efficiency Potential Study led by the Center for Energy and Environment, in collaboration with Optimal Energy and Seventhwave (MN DOC 2018). The study included a review of utility energy efficiency programs both in Minnesota and elsewhere in the United States. The study found that while there was sufficient cost-effective energy efficiency potential all over the state to allow utilities to continue to reach or exceed current CIP goals, doing so will likely require increased but still cost-effective spending. Modeling found forthcoming EISA federal lighting standards will impact claimable savings, but that a shift toward non-lighting technologies, particularly air source heat pumps, could eventually make up the loss of these savings even within the current program framework prohibiting fuel switching. Lifting this restriction would make available even greater levels of savings.[29]

Fuel substitution and electrification. A key finding of the aforementioned study is that efficient fuel switching could significantly increase overall efficiency, decrease emissions, and reduce costs for consumers. In particular, it notes the potential savings available in the 278,000 single-family households in the state that heat with propane. A 2017 study by the DOC found that an equivalent 2,600 GWh per year in heating fuel could be saved by switching existing propane customers to air source heat pumps while maintaining propane fuels as backup heat (MN DOC 2017).

In addition, the DOC is exploring avenues to pursue electrification outside the legislative arena, such as by rescinding the department rule prohibiting fuel switching. The DOC has received a US Department of Energy State Energy Program (SEP) grant for a two-year study to produce a statewide electrification plan, with stakeholder discussions expected to begin in June.

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[29] Given that fuel switching is currently prohibited under a 2005 department order, savings were modeled exclusively for the 17% of residential customers in the state that heat primarily with electric heat.

NEW YORK

Past structure of Energy Efficiency Performance Standard (EEPS)

- Separate incremental annual savings targets for electricity and natural gas for investor-owned utilities
- Long-term (10-year) electricity and fuels savings targets for NYSERDA Clean Energy Fund (CEF)

Drivers of change

- Push toward decarbonization in Governor Andrew Cuomo's 2018 State of the State and New Efficiency New York goals, including desire to support beneficial electrification
- Market animation efforts in ongoing Reforming Energy Vision (REV) process, alongside ongoing pressure to improve resource acquisition performance
- Concerns about energy efficiency costs over time

New structure of EEPS

- Statewide all-fuels energy savings (TBtu) goal for buildings and industrial sectors, replacing separate resource-specific goals only
- Incremental annual savings targets for investor-owned utilities and long-term savings targets for NYSERDA CEF remain core commitments to deliver the statewide goal.
- Separate electricity savings annual sub-target of 3% of sales by 2025 (kWh), with investor-owned utilities responsible for 2% and the remainder through NYSERDA, codes and standards, and other state activities
- Savings carve-out for heat pumps in the targets for investor-owned utilities
- Spending carve-out on incremental new investments of 20% for low- and moderate-income (LMI) programs

Current status and next steps

- December 2018 order set new structure of EERS for 2021–2025. Utilities (in consultation with NYSERDA) filed a proposal for accelerated annual incremental targets in April 2019 and a revised proposal in May. Subsequent order is expected by the end of 2019.
- Investor-owned utilities will propose updated utility performance incentives in their individual rate cases to align with new policy direction in the December order.
- The utilities and NYSERDA will develop implementation plans and then effect those plans, which may include the creation of a statewide heat pump program, more uniform contractor requirements, and a statewide LMI platform (New York PSC 2019).

Legislative and Regulatory Background

New York's long-standing energy efficiency programs began in the State Energy Office in the 1980s, moving to the New York State Energy Research and Development Authority (NYSERDA) in the 1990s. These efforts ramped up with the creation of the ratepayer-supported System Benefits Charge in 1996 (NYSERDA 2019a). New York's energy efficiency targets, called the Energy Efficiency Portfolio Standard (EEPS), were created by the Public Service Commission (PSC) in 2007 and authorized through 2015. They were originally structured as resource acquisition programs, with separate targets for kWh and therms, and individual targets for each investor-owned utility (IOU) and for NYSERDA.

In 2015 the PSC reauthorized energy efficiency programs as a part of the Reforming Energy Vision (REV) process, establishing a new framework for EE programs of electric IOUs. The commission extended that framework to gas utilities later in 2015 (New York PSC 2015b). In this framework, programs would transition over time to market- and value-based approaches, with utilities required to submit Energy Efficiency Transition Implementation Plans (ETIPs) that detailed how energy efficiency portfolios would achieve PSC-authorized energy savings targets (NY PSC 2015b). The ETIP process provided stability but not growth in funding from 2015 to 2018, until the commission approved expanded energy efficiency activities in the recent Con Edison and Niagara Mohawk rate proceedings. The PSC did not change the structure of goals at the time but did require all utilities to track CO_2 emissions reductions, customer bill reductions, reductions in MWs, and private investment in energy efficiency technologies and solutions.

In June 2017 the utilities filed proposed 2018–2020 energy efficiency plans including electric (net MWh) and gas (net Dth) targets. In approving these plans, the PSC changed measurement from net savings to gross savings, but there were no other major changes to targets, and funding remained at similar levels. However utilities were required to report acquired and committed energy savings data expressed as gross MWh savings, gross MMBtu savings, gross peak MW savings, carbon emissions reductions, expenditures, encumbrances, effective useful lives, participant bill savings, and private investment (NY PSC 2018). NYSERDA and the New York Power Authority support additional components of the energy efficiency used to meet New York's GHG reduction goals; table A7 outlines their roles.

Table A7. Structure, purpose, and metrics for energy efficiency delivery in New York before December 2018

Obligated entity	Purpose	Metric
NYSERDA Clean Energy Fund	Market transformation (particularly in deep energy retrofits and "bridge" incentives for promising interventions) and low-income programs	MWh (electric) and MMBtu (nonelectric) savings over 10 years
Investor-owned utilities and Long Island Power Authority	Resource acquisition: providing a mix of offerings and incentives to their customers to encourage the installation of efficient equipment and sometimes shell measures	First-year cumulative annual MWh and MMBtu savings
New York Power Authority	Operations and programs aimed at improving the energy performance of state-owned buildings and street lighting,	Emissions reductions toward state's GHG reduction goals

Source: NYSERDA 2018a

Recent Changes

After years of stagnation in energy efficiency relative to peer states, 2018 brought new vitality to energy efficiency in New York State. In March 2018, Governor Andrew Cuomo renewed New York's commitment to energy efficiency as a tool for decarbonization in his 2018 State of the State address. He directed the Department of Public Service (DPS) and NYSERDA to work with stakeholders to propose a new 2025 energy efficiency target by Earth Day.

To that end, DPS and NYSERDA conducted five technical conferences, including one on "Target Metric and Framing Considerations." At that conference, there was an "overwhelming" call for a fuel-neutral approach to metrics tracking and for clarity in responsibilities assigned to different entities (NYSERDA 2018a).

In April 2018, DPS and NYSERDA published the *New Efficiency: New York* (NENY) white paper, which established a more ambitious 2025 energy efficiency target for New York State and proposed a comprehensive initiative to meet that target. The proposed statewide target was 185 TBtus of site energy reductions relative to forecast energy consumption in 2025, including savings beyond customer-funded energy efficiency programs from the utilities and NYSERDA's Clean Energy Fund (CEF) portfolio. Driven by the state's desire to reduce emissions from all sources, the goal is set across all fuel sources (electricity, natural gas, heating oil, and propane) and market segments in the buildings and industrial sectors. Underneath the overall goal, the paper called for sub-targets for electricity savings of 30,000 GWh statewide, equivalent to 3% of IOU sales in 2025. The paper also proposed dedicating at least 20% of any new incremental public investment in energy efficiency to the low- and moderate-income (LMI) sector, and setting a separate goal to support fuel switching through heat pumps.

The PSC then built the record through a series of 13 technical conferences and a formal stakeholder comment process. In December the PSC issued an order that builds on and largely retains the key elements of the NENY white paper. It adopted increased efficiency targets for the investor-owned utilities, with overall goals structured in TBtus.[30] The order lists additional savings goals alongside the overall target for electricity savings and heat pumps, as well as spending requirements for LMI initiatives. The order also creates a new central process expected to transition every investor-owned utility in the state to electric and natural gas efficiency targets that save a consistent proportion of sales, and it establishes additional flexibility for cost recovery, allowing each utility to propose tailored cost recovery structures.

The order also prioritizes cost reductions in the delivery of energy efficiency through new program approaches, including better valuation of locational benefits, pay-for-performance models, and expansion of access to customer data. It creates a budget cap based on the lesser of CPC-authorized or current actual run rates for each utility's existing portfolio for 2019-2020, and it establishes a total budget cap of $1.6 billion to achieve the incremental 31 TBtu target. The New York utilities, in consultation with NYSERDA, filed detailed electric, gas, and heat pump targets and budgets through 2025 (NY Utilities 2019).[31] This filing is currently before the PSC for decisions on implementation strategies and translation into utility-specific targets for 2021–2025, with a decision anticipated later in 2019.

Outcomes and Savings Goals

The December PSC order adopts an overarching TBtu goal, with carve-out targets for reductions in electricity sales and heat pumps and spending carve-outs for LMI programs.

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[30] Although the 185 TBtu goal includes elements of the NYSERDA CEF portfolio, the order did not change NYSERDA's targets nor require a subsequent NYSERDA filing.

[31] ConEdison filed a more detailed "utility specific" chapter in conjunction with its pending rate case in which it proposes to manage its electric energy efficiency, gas energy efficiency, and heat pump programs as a single combined portfolio, with combined MMBtu goals across fuels.

FUEL-NEUTRAL (TBTU) GOAL

The December PSC order endorses a target of 185 TBtus of customer-level energy reduction statewide by 2025. Toward the achievement of that goal, it adopts an incremental increase of 31 TBtus to be delivered by investor-owned utilities (in addition to sustaining their previously authorized target levels). Adopting the recommendations of the white paper, it takes a fuel-neutral approach measured as site savings. The white paper described five benefits from a fuel-neutral approach to goal setting:

- Design and evaluation on a fuel-neutral basis may allow the most holistic cost-effective benefits.
- Fuel-neutral programs may create administrative efficiency by alleviating the need to coordinate separate electric and gas programs and by avoiding potential lost opportunities from single-fuel programs.
- Fuel-neutral programs may alleviate future pressures on fuel systems (natural gas and heating oil) where winter peaks are strained by systems that are more dependent on renewables.
- Fuel-neutral programs will more readily support fuel switching, including beneficial electrification.
- Fuel-neutral programs may better enable a whole-building approach to energy efficiency.

The white paper also recommended a move toward site savings. Although the 2015 State Energy Plan expressed the 2030 energy efficiency target as a reduction in total primary energy use, stakeholders found the primary energy methodology difficult to understand and staff noted the challenges of using average heat rates as the penetration of renewable generation increases (NYSERDA 2018a). Table A8 shows incremental targets for IOUs.

Table A8. New Efficiency New York incremental targets for IOUs

Target type	2019–2020	2021–2025	Total
Electric			
Gross MWh	301,636	4,037,590	4,339,226
MMBtu equivalent	1,029,181	13,776,258	14,805,439
Gas (gross MMBtu)	473,576	6,217,862	6,691,438
Heat pump (gross MMBtu)	N/A	5,000,000	5,000,000
Total (gross MMBtu)	1,502,757	24,994,120	26,496,877

Total is less than 31 TBtus. December PSC order states, "Of the total 31 TBtu of incremental achievement through 2025, the Commission has already authorized 4.6 TBtu in recent rate cases." *Source:* NYPSC 2018a, Appendix E, Table 2.

CARVE-OUT: ELECTRICITY

The December PSC order further adopts a subsidiary target of an annual reduction of 3% in investor-owned utility electricity sales by 2025.[32] Detailed targets will be proposed by the

[32] The 2025 statewide sub-target for electric efficiency is a 30,000 GWh reduction from forecast site electricity consumption in 2025, based on the electricity reference forecast provided in the NENY white paper.

utilities, but the PSC assumes that each utility will ramp up savings over the 2021–2025 period to reduce sales by 2% in 2025. The electricity sub-target will also account for NYSERDA's achievements in the state and in each utility service territory to meet the total 3% statewide target. The electricity target will also need to be adjusted for increased electricity sales from beneficial electrification activities, which are counted toward total statewide site energy reductions across all fuels. No sub-target is specified for gas targets, although the order lists an incremental gas target for investor-owned utilities. The New York utilities filed incremental 2021–2025 budgets and targets for electricity, gas, and heat pumps as applicable by company in April 2019 and subsequently updated them in May.

CARVE-OUT: HEAT PUMPS

The PSC order calls for a subsidiary target of at least 5 TBtus in energy savings through heat pump deployment by the electric utilities. This builds on the white paper, which recommended a separate target for heat pumps as well as an overall fuel-neutral goal. Although heat pumps generally increase overall electricity consumption, especially during the heating season, the increase in onsite use of electric energy is typically offset by the reduction in onsite fuel use, resulting in net reductions in GHG emissions. NYSERDA's analysis found that heat pumps could meet approximately one-third of New York's heating and cooling needs while delivering net societal benefits, specifically about 8 TBtus of onsite energy savings in 2025. The utilities and NYSERDA will be responsible for jointly preparing a heat pump statewide framework, with roles for the utilities in program delivery and locational targeting and for NYSERDA's CEF in workforce training, quality assurance, and marketing, education, and outreach.

In consultation with NYSERDA, the New York electric utilities filed for an accelerated heat pump program in response to the December order. Filed savings were 45% lower than proposed in the NYSERDA heat pump potential study, and spending was $155 million higher than the $83 million proposed in the NYSERDA heat pump potential study (New York PSC 2019).[33] The utilities noted concerns that the heat pump TBtu target and budget estimates were premised on uncertain assumptions related to regional variations in market growth, required levels of financial support, and general customer receptivity and adoption rates over the next six years (New York PSC 2019).

LOW- AND MODERATE-INCOME SPENDING CARVE-OUT

The December order included a requirement that at least 20% of any additional levels of investment in energy efficiency be dedicated to services for low- to moderate-income New Yorkers.[34] The NENY white paper noted the scale of the challenge in that sector and suggested that additional strategies and interventions will be required to increase access to energy efficiency and its multiple co-benefits. While there is no specific LMI savings goal in

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[33] Con Edison increased budgets but kept the target constant, citing more modest assumptions for discount rates and reductions in real installed costs. Niagara Mohawk reduced both budgets and targets because of a lack of understanding of savings potential, adaption rates, or budgetary needs. NYSEG and RG&E are still assessing heat pump potential and so assumed 0 GBtu and spending the April filing.

[34] The carve-out is applied over the 2019–2025 period and is not imposed on an annual basis to support flexibility.

the December PSC order, in 2016 the commission adopted a separate Affordability Policy establishing an energy burden goal of 6% of household income (NY PSC 2016). The PSC cites that policy as another driver for the spending carve-out.

GOALS PROPOSED BUT NOT INCLUDED

Although jobs and climate mitigation were referenced in the December order and NENY white paper, the final order did not directly structure targets to address either of these categories of value.

Jobs. The NENY white paper referenced commitments from NYSERDA to support an additional $36.5 million to train more than 19,500 New Yorkers for clean energy jobs to support this rapidly growing industry. In its "Workforce Development and Training" chapter, NYSERDA's *Clean Energy Fund Investment Plan* describes implementation of this commitment.

GHG reductions. Although reducing GHG emissions is one of the primary objectives of energy efficiency in New York State, the goals are structured indirectly as Btu goals. State agencies and advocates considered but chose not to create direct GHG targets because this would raise complicated accounting questions and could slow progress in energy efficiency achievement. However the NENY white paper described the potential for avoiding more than 22 million metric tons of carbon dioxide equivalent (CO2e) annually by 2025 from energy efficiency, which will deliver nearly one-third of the GHG emissions reductions needed to meet the state's climate goal of a 40% reduction in GHG emissions from 1990 levels by 2030. Furthermore, both NYSERDA and the utilities track CO2e savings over time.

Process

Goals for both the investor-owned utilities and NYSERDA are set by the PSC in regulatory proceedings. In this case, the PSC and NYSERDA used a combination of stakeholder meetings, regulatory proceedings, and the white paper as tools to share policy proposals and solicit input from stakeholders. For the investor-owned utilities, 2019–2020 goals were set by the December order, and 2021–2025 goals will be finalized in response to the New York utilities' filing. The PSC also oversees and approves utility shareholder incentives to encourage energy efficiency, including the mechanism of cost recovery and the structure and size of performance incentive mechanisms (called earnings adjustment mechanisms, or EAMs). For NYSERDA, the PSC previously set long-term (10-year) electricity and fuels savings targets for the Clean Energy Fund (CEF).

Next Steps

Utilities submitted a report on April 1, 2019 (updated on May 21, 2019) with proposed 2021–2025 targets and budgets for electric efficiency, gas efficiency, and heat pump programs toward the incremental 31 TBtu target. Approval from the PSC is likely by the end of 2019. The utilities, in consultation with NYSERDA, will then develop implementation plans and effect those plans, which may include the creation of a statewide heat pump program, more uniform contractor requirements, and a statewide LMI platform (New York PSC 2019).

The utility business model in New York includes decoupling and performance incentives. Utilities will propose additional energy efficiency EAMs designed to align with these goals as a part of future rate cases; ConEd has already done so in its rate case and energy efficiency filing. Its proposed EAMs include three cross-commodity incentives that encompass electricity and gas: Annual MMBtu, Share the Savings EAM based on $/lifetime MMBtu, and GHG reductions (New York PSC 2019).

Increased clean heating targets. The PSC noted that the clean heating target of 5 TBtus may be adjusted upward in future orders based on confirmation of benefit estimates, experience with programs, and strategies for extending heat pumps to larger buildings. NYSERDA's study found 7.5 TBtus in incremental site savings potential in the small residential sector from oil and resistance heating replacements by 2025,[35] and the Vermont Energy Investment Corporation suggested that 12 TBtus would be achievable under moderate growth (NYSERDA 2019b; VEIC 2018).

Emphasis on time and locational value of energy efficiency. The December order allows for a kicker for customer incentives where it drives additional grid value, but there were no changes to goals.

Shifting market toward deeper and longer-term savings. The December order sets goals on a "first-year cumulative annual basis," but EAMs will use a dollars-per-lifetime MMBtu structure to encourage longer-lived savings.

[35] This statewide figure includes Long Island, which is outside the PSC jurisdiction for heat pump targets.

Appendix B. EERS Policy Details

Table B1. Key features of state EERS policies

State	% sales covered*	Authority	Basis type	Current EERS policy
Arizona	56%	Regulatory	Relative: rolling	Electric: Cumulative electric savings of 22% of retail sales by 2020. Approximately 2.5% incremental annual savings starting in 2016. Natural gas: Cumulative gas savings of 6% of retail sales by 2020. Approximately 0.6% incremental annual savings.
Arkansas	50%	Regulatory	Relative: fixed	For 2020–2022, savings targets are 1.20% of 2018 baseline sales for electric utilities and 0.5% of baseline sales for natural gas utilities.
California	73%	Legislative	Absolute: all cost-effective	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: Current incremental savings targets average about 1.3% of retail sales of electricity from 2020–2025. Natural gas: Current incremental savings targets average 0.87% from incentive and codes and standards programs for natural gas from 2020–2025.
Colorado	56%	Legislative	Relative: fixed	Electric: HB 17-1227 extended existing programs and calls for 5% energy savings by 2028 compared with 2018. Starting in 2019, incremental savings goals for PSCo were increased from 400 GWh to 500 GWh, or roughly 1.7% of sales. Natural gas: Savings targets commensurate with spending targets (at least 0.5% of prior year's revenue).
Connecticut	93%	Legislative	Absolute: all cost-effective	Electric: Average incremental savings of 1.11% for 2019–2021. Natural gas: Average incremental savings of 0.59% for 2019–2021.
Hawaii	100%	Legislative	Absolute	In 2009, transitioned away from a combined RPS-EERS to a standalone EEPS goal to reduce electricity consumption by 4,300 GWh by 2030 (equal to ~30% of forecast electricity sales, or 1.4% annual savings).
Illinois	89%	Legislative	Relative: fixed	Electric: Future Energy Jobs Act requires ComEd to achieve a cumulative 21.5% reduction and Ameren to achieve a 16% reduction in energy use by 2030 compared with deemed average weather-normalized sales of electric power and energy during 2014, 2015, and 2016. These translate to incremental savings targets averaging 1.77% of sales from 2018 to 2021, 2.08% from 2022 to 2025, and 2.05% from 2026 to 2030. Natural gas: Targets remain the same, 0.2% of sales starting in 2010, ramping up to 1.5% by 2019.
Iowa	75%	Legislative	Absolute	Requirements for utility submission of energy efficiency goals to the Iowa Utilities Board (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% for natural gas). Current savings targets average 0.9% of electric sales and 0.2% for natural gas according to utility five-year plans (2019–2023). 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.

State	% sales covered*	Authority	Basis type	Current EERS policy
Maine	100%	Legislative	Relative: rolling	Electric: Incremental savings between 2.2% and 2.6% of retail sales for 2017–2019. Natural gas: Incremental savings of about 0.2% for 2017–2019.
Maryland	97%	Legislative	Relative: fixed	Order 87082 (July 2015) requires utilities to ultimately achieve savings of 2% per year by ramping up incremental savings at a rate of 0.2% per year beginning in 2016. Measured as percentage of 2016 weather-normalized gross retail sales and electric losses.
Massachusetts	85%	Legislative	Absolute: all cost-effective	Electric: Savings goals of 2.7% of retail sales. Net annual savings of 3.45 million MWh (not including fuel switching) for 2019–2021. Natural gas: Savings goals of 1.25% of retail sales. Net annual savings of 95.9 MMTherms for 2019–2021. Additional goal of 261.9 million net lifetime MMBtus for 2019–2021.
Michigan	100%	Legislative	Relative: rolling	PA 341 and PA 342, passed in December 2016, carried forward current 1% electric and 0.75% natural gas efficiency targets.
Minnesota	100%	Legislative	Relative: rolling	1.5% of gross annual retail energy sales (electric and natural gas) based on the most recent three-year, weather-normalized average.
Nevada	88%	Legislative	Relative: fixed	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 allowances phase out 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.
New Hampshire	100%	Regulatory	Relative: rolling	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.
New Jersey	100%	Legislative	Relative: rolling	Under 2018 legislation A3723/S2314, utilities must achieve 2% electric savings and 0.75% natural gas savings (as a percentage of average annual usage from the prior three years) within five years.
New Mexico	69%	Legislative	Relative: fixed	The state's three public utilities must achieve 5% savings of 2020 retail sales by 2025 (~1% incremental annual savings). HB 291 (2019) directs the Public Regulation Commission to set additional targets through 2030.

State	% sales covered*	Authority	Basis type	Current EERS policy
New York	100%	Regulatory	Absolute	Statewide target of 185 TBtus of cumulative annual site energy savings under the 2025 energy-use forecast. In January 2017, the PSC authorized NYSERDA's Clean Energy Fund framework, which outlines a minimum 10-year energy efficiency goal of 10.6 million MWh measured in cumulative first-year savings. In December 2018, the PSC adopted an overall increase in the savings targets for the state's investor-owned utilities, with utility-specific 2021–2025 targets to follow.
North Carolina	74% (combined RPS/EE target)	Legislative	Relative: rolling	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.
Ohio	88%	Legislative	Relative: rolling	Beginning in 2009, incremental savings of 0.3% per year, ramping up to 1% in 2014 and 2% in 2021.
Oregon	63%	Oregon	Absolute	Electric: Incremental targets average ~1.3% of sales annually for the period 2015–2019. Natural gas: 0.3% of sales annually for the period 2015–2019.
Pennsylvania	96%	Legislative	Absolute	Varying five-year targets have been set for IOUs, amounting to yearly statewide incremental savings of 0.8% for 2016–2020. EERS includes peak demand targets. Energy efficiency measures may not exceed an established cost cap.
Rhode Island	99%	Legislative	Absolute: all cost-effective	Electric: Average incremental savings of 2.5% for 2018–2020. Natural gas: Average incremental savings of 0.97% for 2018–2020.
Texas	74%	Legislative	Rolling: relative	Peak demand reduction targets of 0.4% relative to previous year, equivalent to 0.2% of annual sales.
Vermont	98%	Legislative	Absolute	Electric: Annual incremental savings totaling 357,400 MWh over 2018–2020, or approximately 2.4% of annual sales. Natural gas: Three-year annual incremental savings of 192,599 Mcf spanning 2018–2020, or 0.5% of sales.
Washington	83%	Legislative	Absolute: all cost-effective	Utilities set biennial targets to achieve all cost-effective electricity conservation. 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 available conservation measures that are cost effective. Each company must establish an acquisition target every two years, with initial targets taking effect by 2022.

State	% sales covered*	Authority	Basis type	Current EERS policy
Wisconsin	100%	Legislative	Absolute	Four-year goal for 2019–2022 of 224,666,366 total net life-cycle MMBtus (combined electric and natural gas). Electric: Minimum electric net life-cycle savings target of 22,832 GWh for 2019–2022, or 1,840 GWh first-year savings across 2019–2022. This translates to roughly 0.6%–0.7% of sales per year in 2019–2022. Natural gas: Minimum net life-cycle natural gas savings goal of 1,243 MMTherms for measures implemented in 2019–2022, or 95.9 MMTherms of first-year savings, equating to approximately 0.6% savings as a percentage of sales on a net basis.

*** "Sales covered" includes total retail sales of utilities obligated to achieve energy savings under the EERS policy. It does not account for customer opt-outs or similar policies that may place additional limits on customers served by energy efficiency programs.**

Appendix C. Interviewees

We interviewed each of the individuals below to gain background knowledge and confirmation of our primary desktop research. We gratefully acknowledge their contributions and note that these interviews do not imply affiliation or endorsement.

General Expertise

Exelon: Val Jenson
Schlegel & Associates: Jeff Schlegel
Regulatory Assistance Project: Ken Colburn and Jessica Shipley
Rocky Mountain Institute: Leia Guccione and Mike Henchen
Vermont Energy Investment Corporation: Emily Levin and Pierre Van Der Merwe

California

California Public Utilities Commission: Jeorge Tagnipes
California Energy Commission: Bill Pennington, Brian Samuelson, Michael Kenney, and Gavin Situ
Common Spark Consulting: Michelle Vigen Ralston
NRDC: Lara Ettenson and Mohit Chhabra

Hawaii

Blue Planet Foundation: Melissa Miyashiro
Hawaii Energy: Brian Kealoha
Hawaii PUC: Ashley Norman, Commissioner Jennifer Potter

Massachusetts

Eversource: Michael Goldman
Massachusetts Department of Energy Resources: Emily Powers, Jerrylyn Huckabee, Maggie McCarey, and Ian Finlayson
Navigant: Jeremy Newberger
Schlegel & Associates: Jeff Schlegel

Minnesota

Minnesota Department of Commerce: Anthony Fryer
Xcel Energy: Aaron Tinjum

New York

ConEdison: Raghu Sudhakara
NRDC: Miles Farmer and Frank Murray
NYSERDA: John Williams, Vanessa Ulmer
Sealed: Andy Frank

Appendix D. Calculating State-Level Utility Savings Relative to EERS Targets

This section summarizes the approach we took to determine and present electric and natural gas savings achieved by utilities relative to target levels for those 25 states with an EERS as of 2016 and 2017, as reported in figures 3 and 4 in the "EERS Achievements" section.

It should be noted that the structure of utility savings targets can vary among states, from incremental annual savings as a percentage of sales (Arkansas, Minnesota, Maryland, Michigan, Ohio) to long-term, cumulative targets relative to a future year's projected sales (Arizona) to absolute multiyear targets determined by an all-cost-effective efficiency mandate (California, Connecticut, Massachusetts). For comparative purposes, we decided to express all targets and achieved savings on a net incremental annual basis. This made it necessary to perform adjustments for certain states, such as assuming an incremental ramp-up of targeted savings for states like Arizona and Maryland in which programs are designed to gradually scale up to meet a future year's target.

Net-to-gross adjustments. Also, while most states and utilities with an EERS report net values for achieved savings, there are several that report savings primarily on a gross basis. These include AZ, CA, IA, ME, NH, OH, TX, and WA. For consistency, we applied a net-to-gross (NTG) adjustment factor to utilities within these states to report all savings on a net basis. For electric utilities we used an NTG ratio of 0.856, as used in *The 2018 State Energy Efficiency Scorecard* based on the median NTG ratio of those states that reported both net and gross savings in our annual data request. For natural gas utilities we used an NTG ratio of 0.897, also based on *2018 State Scorecard* data.

We used several sources to gather and calculate levels of achieved savings.

Electric utility savings data sources. All savings targets are expressed as a percentage of annual incremental sales and converted as needed based on targets listed in utility annual demand-side management reports and efficiency plans, as well as annual EIA electric (EIA-861) and natural gas sales (EIA-176).

For Illinois, under the Future Energy Jobs Act, utilities transitioned programs from a fiscal-year to a calendar-year cycle in 2017; goals for 2017 indicate original program year 9 goals for Ameren and ComEd rather than extended transition-year goals.

Annual electric savings data for AZ, AR, CA, CO, HI, IL, IA, ME, MA, NV, NM, PA, TX, and VT were drawn directly from utility or program administrator annual demand-side management reports. Annual electric savings data for CT, MD, MI, NY, NC, OR, and RI were gathered from ACEEE's 2017 and 2018 *State Energy Efficiency Scorecard*s as reported in ACEEE's annual data request to state utility commissions. Savings target levels for CA, CT, HI, IL, IA, ME, MA, NV, NM, PA, RI, TX, VT, and WI were gathered from utility demand-side management plans and annual reports. Savings target levels for AZ, AR, CO, MD, MI, and OH were calculated or inferred from legislative or regulatory targets. Minnesota data were reported as presented in Schoenbauer et al. (2018). Washington data were provided by Washington Department of Commerce (2018). Utility savings data for Ohio were sourced from EIA-861.

Natural gas utility savings data sources. All savings targets are expressed as a percentage of annual incremental sales and converted as needed based on targets listed in utility annual DSM reports and efficiency plans, as well as annual natural gas sales (EIA-176). Annual natural gas savings data for AZ, AR, CA, CO, CT, IA, MA, RI, and VT were gathered directly from utility or program administrator annual demand-side management reports. Annual natural savings data for IL, ME, MI, MN, NY, OR, and WI were drawn from ACEEE's 2017 and 2018 *State Energy Efficiency Scorecard*, as reported in ACEEE's annual data request to state utility commissions. Savings target levels for CA, CT, IA, IL, MA, ME, OR, RI, and VT were drawn from utility demand-side management plans and annual reports. Savings target levels for AZ, AR, CO, MI, NY, and WI were calculated or inferred from legislative or regulatory targets. Minnesota data were provided by Minnesota Department of Commerce (2018).