

On a Rising Tide: The Future of U.S. Utility Customer-Funded Energy Efficiency Programs

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ABSTRACT

We develop estimates of future spending and savings for energy efficiency programs funded by electric and gas utility customers for three scenarios that capture a range of state policy and program spending paths through 2025. Our analysis relies on a detailed bottom-up modeling approach of state energy efficiency policies, regulatory decisions, and utility resource and demand-side management plans. Spending on efficiency programs is projected to more than double from 2010 levels to \$10.8 billion in 2025 in the medium scenario, which is premised largely on compliance with existing energy efficiency policies, and would more than triple to \$16.8 billion in the high case scenario. Spending on electric efficiency programs comprises about 80% of total spending; increases in electric program spending are driven primarily by regulatory and utility compliance with statewide legislative or regulatory savings targets (61%). Our analysis suggests that efficiency spending will assume a more even geographic distribution over time. Assuming public projections of slow economic recovery and demand growth are borne out, our results suggest that energy savings from these programs could nullify the majority of annual U.S. electric load growth sometime before 2025. Achieving these savings is subject to significant uncertainties. Our analysis indicates that administrators of gas energy efficiency programs will have difficulties meeting more aggressive state savings targets, but electricity programs will sustain sufficient spending growth to more than compensate for an expected plateau in gas program spending. This paper underscores the policy and market influences, uncertainties, and challenges that programs face.

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Introduction

Over the past four decades, policy support and utility customer funding for energy efficiency programs has ebbed and flowed. The western energy crisis of 2000-2001 and the New England blackout of 2003 ushered in the current period of growth, marked by movement in many states toward making energy efficiency a priority. Policymakers in these states have required more rigorous resource planning, developed funding mechanisms and energy savings targets, and created business incentives for delivering energy efficiency to customers.

However, the longer term path for these electric and gas customer-funded programs has been unclear. Will states retain and increase their commitments to energy efficiency? Where is the energy efficiency industry likely to be most vibrant and produce the greatest energy and

economic benefits? What forces most influence these programs and the industry that surrounds them? This analysis is meant to provide those insights while quantifying the programmatic efficiency market for policymakers, energy and efficiency service providers, and the host of stakeholders engaged in the realm of energy efficiency.

A large body of research has catalogued national, state and local energy efficiency policies. Gillingham et al (2006) provide a survey of the U.S. policy landscape. Likewise, numerous studies have grappled with utility customer-funded efficiency program spending, savings, or both (Nadel 1992). This paper departs from these efforts by using a highly detailed, bottom-up analysis, similar to that used in Barbose et al. (2009).

We developed low, medium, and high case projections of electric and natural gas efficiency program spending in a spreadsheet-based model, as well as accompanying projections of electric program energy savings, based on a state-by-state review of current policies, regulatory rulings, utility planning documents, annual reports, and evaluations, as well as the larger economic and market environment in which programs operate. The scenarios also were informed by interviews with regional and national energy efficiency experts, program administrators, regulatory staff and other industry stakeholders.

Building on Barbose et al. 2009, the scope of this study covers 45 states and the District of Columbia and extends over a longer time horizon, which brings more policy and market influences into play. This analysis also reflects deeper inquiry and fuller grasp of the policy and market dynamics at work. The result is a highly resolved portrait of the most widely available, consistently growing source of energy-efficiency program funding in the United States, starting in 2011 and evolving through scenario-based projections to 2025.

The Policy and Market Environment for Utility Customer-Funded Energy Efficiency Programs

Over the last decade, an increasing number of states have adopted policies that encourage or require utility customer-funded energy efficiency programs. Broader market forces such as the state of the economy, fuel prices and impending environmental regulations also influence the composition, design, and implementation of these programs. In this section, we summarize trends in energy efficiency policies and characterize the interplay of policy and market forces.

Energy Efficiency Policy Trends

Utility-sector efficiency policies include statutory program spending or energy savings targets; requirements that program administrators acquire all energy savings less costly than supply; demand-side management plans; and long-term resource plans (see Table 1).

Table 1. Policy Drivers for Utility Customer-funded Energy Efficiency Program Spending and Savings

Key Policy Drivers for Energy Efficiency Spending and Savings	Where Applicable for Electric Efficiency Programs	Where Applicable for Natural Gas Efficiency Programs
Statutory requirement that utilities acquire all cost-effective energy efficiency	CA, CT, MA, RI, WA	CA, CT, MA, RI, WA
Energy Efficiency Resource or Portfolio Standard (EEPS/EERS) 1	AZ, CA, CO, HI, IL, IN, MD, MI, MN, NM, NY, OH, PA, TX	AZ, CA, CO, MI, MN, NY, IL
Energy efficiency eligibility under state RPS/Alt. Energy Standard	HI (until 2015), MI, NC, OH, NV, WV (non-binding)	
Recently-approved Integrated Resource Plan	ID, MT, UT, SC, TVA, ² VA	UT
Demand Side Management plan or multi-year energy efficiency budget	AR, DC, FL, GA, IA, KY, ME, NH, NJ, OR, VT, WI, ³ WV	IA, ME, OR, VT

During the last 13 years, 19 states have established spending or energy savings mandates for energy-efficiency programs funded by utility customers or required those programs to acquire all cost-effective energy savings – with nearly all of those states adopting or strengthening those policies in the last five years. Most of the 10 states that dominate total U.S. spending on electric and gas energy efficiency programs have one or both of these policies.

Regional or cross-border effects have been important drivers of this policy proliferation, most recently in the South and Midwest, as states witnessed policy adoption in neighboring states and set comparable targets. Multi-state utilities also have developed efficiency programs to meet one state’s mandates but through territory-wide plans swept those policy-driven programs into neighboring states.⁴ Lastly, the move by the Tennessee Valley Authority⁵ to set savings targets and encourage its member distributors to offer programs is expected to expand the pursuit of energy efficiency across seven states in the Southeast.

Market Context

Fallout from the recession that began in 2007 remains a dominant feature in the near-term market environment, according to regulatory filings and interviews with program administrators. A key uncertainty is how long it may take for the U.S. economy to recover.

¹ In this study, we define Energy Efficiency Resource or Portfolio Standards as requirements under statute, regulatory order or executive order for specified, statewide minimum savings or spending levels over a period greater than three years. We differentiate these policies from shorter-term targets and utility-specific targets to reflect a generally more certain level of commitment in terms of time and application to all state-regulated entities.

² The Tennessee Valley Authority is the largest U.S. public power company and serves 155 distributors and 57 industrial customers in TN, KY, AL, MS, GA, NC and VA.

³ The Wisconsin legislature repealed the state’s EERS targets in 2011.

⁴ For example, North Carolina’s renewable portfolio standard includes energy efficiency as an eligible resource. Duke Energy Carolinas and Progress Energy Carolinas submitted a pro rata version of the same efficiency plan from North Carolina for their service territory in South Carolina. Likewise, West Virginia’s requirement that an American Electric Power subsidiary initiate efficiency programs resulted in submission of similar program plans in neighboring Virginia.

⁵ Key drivers for TVA’s more aggressive energy efficiency plans included a compliance order from the U.S. Environmental Protection Agency and a judicial consent decree with several states and environmental organizations, both addressing emissions from TVA generators. In both cases, TVA agreed to a minimum level of energy efficiency program spending, as well as specific emissions reductions and retirements of coal-fired units.

Economic uncertainty dampens customer participation and thus savings. The recession also has heightened sensitivity to the potential near-term rate impacts associated with efficiency program spending.⁶ Policymakers in some states also have re-directed or attempted to redirect program funds to shore up state budgets.⁷

The abundance of nonconventional natural gas – shale gas, tight gas and coalbed methane – may also adversely impact the size of future energy efficiency programs. Low or moderate gas prices reduce the benefits of energy efficiency programs because of lower avoided energy costs. Program budgets drop because fewer programs and energy efficiency measures pass cost-effectiveness screening. With lower commodity charges on their bills, customers also have less financial incentive to save on energy costs.

A key additional driver for utility customer-funded electric energy efficiency programs is state and federal emissions regulations. For example, many utilities are planning on using demand-side resources as a “solution” to several challenges:

- As part of a strategy for complying with emissions requirements (e.g., Tennessee Valley Authority)
- As a prerequisite for utility customer funding of low carbon replacement generation (e.g., American Electric Power in West Virginia, Florida Power & Light in Florida)
- As a means of deferring retirement and replacement decisions, pending greater regulatory certainty (e.g., Duke Energy Carolinas).

To the degree that emissions regulations informed the resource plans of affected utilities, the impact of those regulations is explicitly modeled in this analysis.

Modeling Approach

We developed low, medium, and high case projections of electric efficiency program spending to 2025, as well as accompanying projections of electric program energy savings based on a state-by-state review of current policies, regulatory decisions, utility planning documents, and annual reports as well as the larger economic and market environment in which programs operate. The scenarios were also informed by interviews with regional and national energy efficiency experts, program administrators, regulatory staff and other industry stakeholders.

These projections represent alternative scenarios or pathways that characterize the future evolution of energy efficiency programs. At a conceptual level, the low scenario represents a less prominent role for energy efficiency as a resource in many states. Program spending remains at current levels, increases very modestly, or, in a few states, decreases slightly.⁸ The medium

⁶ Policymakers in Wisconsin and Florida cited rate impacts in repealing or lowering energy savings targets. The Florida Public Service Commission left earlier regulatory targets in place but rejected utility efficiency plans to meet those targets and instead approved a continuation of existing portfolios keyed to achieving 2004 targets.

⁷ Thirty-nine states reported having to close \$95 billion in budget gaps for fiscal year 2012. <http://www.nga.org/files/live/sites/NGA/files/pdf/FSS1111.PDF> Actual diversions of SBC funds to state general funds have been uncommon but are notable for occurring in states with historically strong commitments to energy efficiency, e.g. nearly a third of program revenues in Connecticut were redirected to the state general fund, and California lawmakers diverted \$161 million in gas SBC funds to the state general fund, although a state court later blocked the appropriation of those funds.

⁸ There are a few exceptions (e.g. Wisconsin, New Jersey, Delaware, Florida and a few other southern states) where spending is expected to decrease in the low case as a result of a recent change in policy or program strategy.

scenario reflects a future in which states that historically been leaders in energy efficiency continue down that path and in some cases expand the role of energy efficiency as a resource. Other states are fairly successful in ramping up their energy efficiency programs to meet legislative saving targets, subject to some constraints, e.g., the ability for energy efficiency services infrastructure to ramp up quickly in early years and rate caps that limit program spending increases in later years. The high scenario reflects a future in which many states establish a very prominent role for energy efficiency as a resource. States with EERS are assumed to overcome constraints and fully meet their savings targets. States in each region are inclined to follow the example – and goals – of leading states. Those states with modest spending or policy commitments are assumed to adopt policies that lead to savings in 2025 roughly equal to national average savings achieved by all program administrators today.

Our electric program spending projections are based primarily on state-specific assumptions about how effectively and aggressively current energy efficiency policies in each state are implemented. For simplicity, the scenario assumptions are summarized by region in Table 3; state-level details are provided in Technical Appendix of the full report available [here](#).⁹

Table 2. Scenario Assumptions for Electric Energy Efficiency Projections

Region	Scenario	Representative Assumptions (specific assumptions vary by state)
South	Low	Annual savings levels are based on current DSM plans, although funding decreases in a few states
	Medium	IOUs follow current DSM plans.
	High	Utilities in states with savings targets achieve those targets.
Midwest	Low	Spending continues indefinitely at current approved DSM levels.
	Medium	Spending continues at currently approved levels then shows a slight increase in out years.
	High	Savings targets for IOUs are largely reached. Spending caps are lifted to meet those goals.
West	Low	IOUs largely reach minimum compliance with savings targets.
	Medium	IOUs meet savings targets without relying on retroactive credit or showing a decline in spending in the out years.
	High	IOUs meet or exceed savings targets.
Northeast	Low	Spending levels remain stable at current levels, with the exception of Connecticut, New Jersey and Pennsylvania where funding is decreased (CT, NJ) or declines to legislatively mandated levels (PA).
	Medium	Spending levels continue at current levels, states with all cost-effective mandates ramp up spending to achieve savings.
	High	Achieved savings based on capturing all achievable potential, or meeting current legislative targets. Pennsylvania removes the spending cap. ¹⁰
Uncommitted	Low	Spending increases linearly to 0.3% above current levels in 2025
	Medium	Spending increases linearly to 0.5% above current levels in 2025
	High	Spending increases linearly to 0.8% above current levels in 2025

States with very modest program activity and no comprehensive state efficiency policy are considered “uncommitted” at this time. For these states, we employ a standardized set of

⁹ States were assigned to their respective regions based on the U.S. Census Bureau categorization. http://www.census.gov/geo/www/us_regdiv.pdf

¹⁰ Potential studies were identified for several states and a determination of the total efficiency from codes and standards imbedded in the potential savings was subtracted from the total, leaving the remaining values for voluntary utility programs in the high case targets.

assumptions. In the low case, we assume these states increase spending to 0.3% above current levels by 2025. Similarly, spending under the medium and high cases grows 0.5% and 0.8% respectively. Under the high case, “uncommitted” states reach the current national average spending levels by 2025.

Gas Program Modeling

For the purpose of developing gas efficiency program spending projections, states were divided into three categories: the 12 states that comprise more than 80% of national funding for gas efficiency programs (Tier I), those states outside of the 12 highest spending states where current spending is greater than \$0.50 per capita (Tier II), and all of the remaining states, where current spending is less than \$0.50 per capita (Tier III).

Projections of gas efficiency program spending for the 12 highest spending states (Tier I) are based on state-specific policies and program plans. The low case reflects large impacts from new furnace equipment standards and moderate gas prices that make it more challenging for residential gas efficiency programs to remain cost effective. The medium case also shows a decrease in residential program spending, however some of the reduction in residential program spending is assumed to be shifted to other market sectors and end uses, for a more modest net impact. The high case for gas efficiency programs is based on the assumption that program funding continues at the current percentage of gas utility revenues. In all Tier I scenarios, we assume that the very substantial funding devoted to low-income programs remains constant as a percentage of total portfolio spending.

For Tier II states, several of which have relatively aggressive spending levels on a per capita basis but small populations (and thus have small spending levels in absolute terms), projections were based on regional spending benchmarks. These benchmarks in turn were based on the projections of the Tier I states. The regional benchmarks were developed by averaging the change in spending as a percentage of revenues per year by region for the Tier I states. Those growth curves were then applied to the 2010 spending of the Tier II states.

For states in Tier III that currently have little or no customer-funded gas program activity, in the low case, we assumed that spending will stay flat at 2010 levels. In the medium case, we assume that program administrators maintain gas efficiency spending at their present percentage of gas distribution utility revenues. The high case posits that program administrators will increase program spending to approximately 0.25% above their current levels by 2025.

A fuller description of our approach to modeling gas program spending, and the full results of that modeling, may be found in the complete paper and Technical Appendix [here](#).

Results: Customer-Funded Energy Efficiency Program Spending and Savings Through 2025

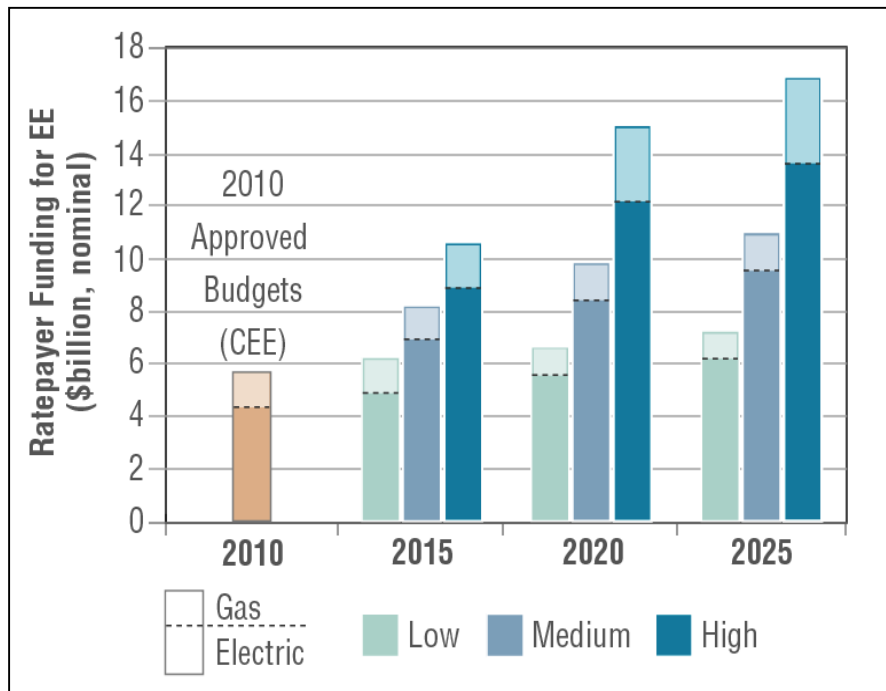
Electric and Gas Efficiency Program Spending

Across all scenarios, spending on electric and gas energy efficiency programs is expected to increase throughout the study period. We project that spending would rise from \$5.4 billion in 2010 to \$7.0 billion in the low case by 2025, \$10.8 billion in the medium case, and \$16.8 billion in the high case for electric and gas efficiency programs (see Figure 1). Across all scenarios, spending on electric energy efficiency programs is projected to increase throughout the study

period. In the medium case, funding for electric efficiency programs is expected to almost double, rising to \$9.5 billion in 2025 (Figure 1.). In comparison, the low case projects a modest but steady increase to \$6.1 billion in 2025, reflecting a scenario in which regulators and program administrators adopt a “stay-the-course” approach to program spending or are unable to meet savings targets, e.g., because continuing economic uncertainty or low gas prices reduces policymaker and customer interest in energy efficiency. The high case projects a significant increase to \$13.6 billion in 2025, reflecting the impact of “all cost-effective efficiency” policies and sustained momentum from emerging programs in the Midwest.

In contrast, spending for gas efficiency programs is projected to stay relatively flat through 2025 in the low and medium scenarios, reaching \$1.3 billion in 2025. The low case projection reflects the unmitigated impact of new furnace standards and moderate gas prices, with total gas energy efficiency program spending dropping to \$0.9 billion in 2020 before recovering slightly in 2025. Under the high case, gas energy efficiency program spending roughly triples from 2010 levels, reaching \$3.2 billion in 2025. The flattened trajectory of natural gas efficiency program spending can be attributed to several factors: the increase in furnace efficiency standards in the middle of the decade, the dampening effect of moderate gas prices, and the disproportionate impact that these factors have on total portfolio spending because of the large share of program spending devoted to residential and low income programs.

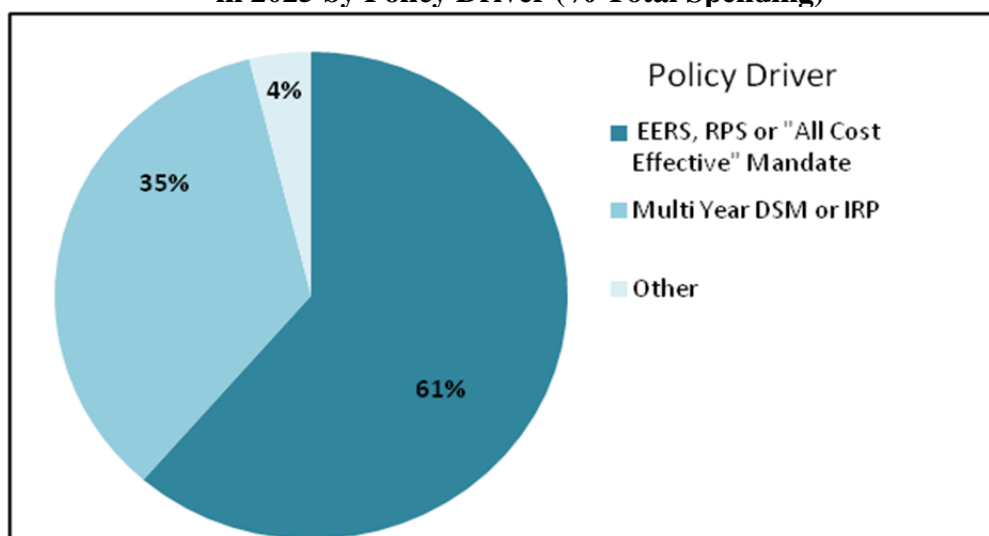
Figure 1. Range in Electric and Gas Energy Efficiency Program Spending Projections



Projected Spending on Electric Energy Efficiency Programs

Increases in electric program spending are driven primarily by regulatory or legislative savings targets or mandates for “all cost-effective” efficiency.¹¹ Under the medium scenario, we anticipate that most states with an Energy Efficiency Resource Standard (EERS) will meet, or come close to meeting, their savings targets. Fourteen states have an electric EERS, and an additional four states have a legislative mandate requiring utilities to acquire “all cost-effective” energy efficiency. These 19 states together account for \$6.6 billion (61%) of the \$10.8 billion projected to be spent under the medium scenario in 2025. An additional 18 states utilize either a demand-side management plan (DSM) or an integrated resource plan (IRP); these states are projected to spend \$3.7 billion in 2025 (see Figure 2).

Figure 2. Electric Energy Efficiency Spending (Medium Case) in 2025 by Policy Driver (% Total Spending)



State-specific assumptions have a significant impact on the final standings of the 10 highest-spending states under each scenario (see Table 5). While California and New York remain the top two states under all scenarios, 13 other states compete for the remaining eight positions in each of the scenarios. In contrast to 2010, when the top 10 are dominated by traditional leading states in the Northeast and West (CA, NY, MA, NJ, WA), in 2025 under all scenarios there is a surge in spending in midwestern (IL, IN, PA, MI, OH) states as programs ramp up to meet savings targets.

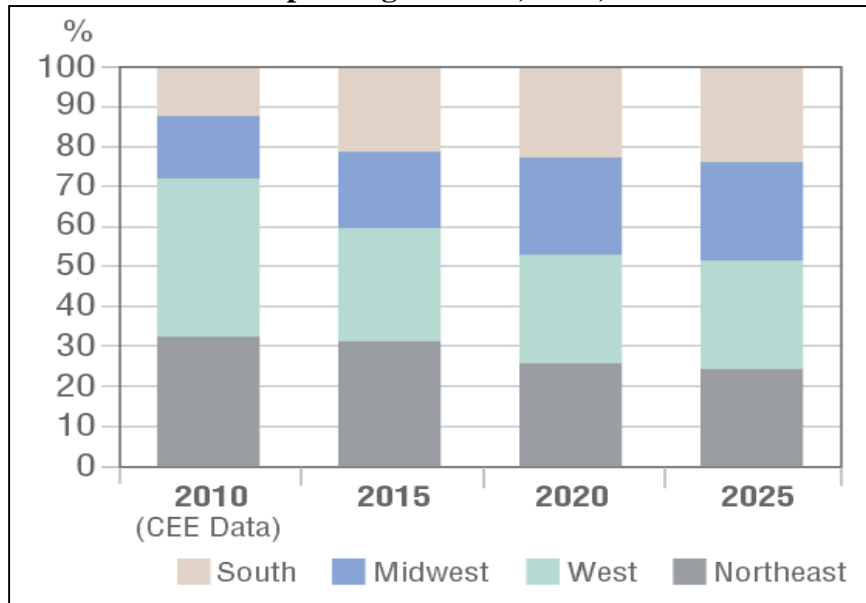
¹¹ Long term savings targets provide goals for regulators and utilities, in turn serving as a determinant of program portfolios and budgets to meet those goals. Because the cost of achieving the savings targets varies significantly based on the location and experience of the program administrator, these costs are calculated individually for each state based on past experience delivering efficiency programs.

Table 3. Electric Energy Efficiency Spending Top 10 and Remaining States in 2010 and 2025

Rank	Electric Program Budgets in 2010 (\$M)		Electric Program Spending in 2025 (\$M)	
	State	Amount	State	Amount
1	CA	\$1,158	CA	\$1,422
2	NY	\$584	NY	\$720
3	MA	\$281	MA	\$608
4	NJ	\$216	OH	\$558
5	WA	\$187	IN	\$488
6	OH	\$153	FL	\$458
7	FL	\$123	IL	\$402
8	OR	\$122	NJ	\$341
9	CT	\$115	AZ	\$309
10	TX	\$113	WA	\$262
Top 10 Total (\$M)	\$3,052		\$5,566	
% of U.S.	70%		58%	
Other States Total (\$M)	\$1,325		\$3,964	
% of U.S.	30%		42%	

This trend suggests that efficiency spending throughout the country is approaching a more even geographic distribution in terms of absolute dollars spent (see Figure 4). While the West and Northeast combine for more than 70% of efficiency program spending in 2010, by 2025, that percentage shrinks to slightly more than 50% with the South and Midwest almost evenly dividing the remaining spending.

Figure 3. Regional Distribution Chart: 2010 Program Budgets and Spending for 2015, 2020, 2025

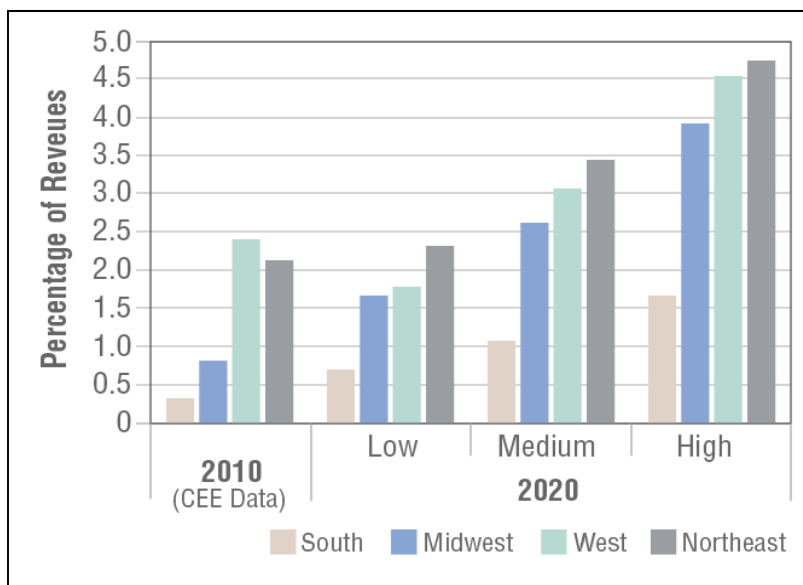


It is important to note, however, that most of the growth in program spending in the South comes from a few states (TX, FL, NC, MD, KY) with large retail sales relative to the rest

of the region and, in some cases, a state EERS or an RPS that allows energy efficiency as an eligible compliance resource.

It is also useful to calibrate energy efficiency program spending relative to retail revenues, which tends to normalize for size differences and the cost and rate structure of utilities (see Figure 4). We project that in 2020 program administrators from states in the Northeast (2.3% – 4.7% of retail sales) and the West (1.7% - 4.5%) will continue to spend a higher percentage of retail revenues on efficiency programs than states in the Midwest (1.6% - 3.9%) and the South (0.6-1.6%), even though the total absolute amounts in 2025 are relatively equal across the regions (see Figure 5.).

Figure 4. Projected Utility Customer Funding for Electric Energy Efficiency Programs (as Percent of Revenues)



Under the medium case, both the South (0.3%) and the Midwest (0.7%) could more than triple current spending as a percentage of revenue to arrive at 1.1% and 2.6% respectively by 2020. Program spending in the Northeast is projected to increase under all three scenarios; however, growth in program spending is largely dependent on the implementation of the all cost-effective efficiency statutes by utilities and regulatory bodies. The West is the only region where all three scenarios do not produce an increase in program spending, largely a result of declining achievable savings potential in California (Navigant 2012) and therefore a likelihood of declining program spending. As a traditional leader in energy efficiency with historically large budgets, California influences total regional and national spending. The low case for the West projects a decrease in program spending from 2.4% of revenues to 1.7% in 2020. The medium and high projections for the West closely follow trends in spending percentages in the Northeast, however the West is not projected to reclaim its current position as the leader in any scenario.

Projected Electricity Savings

In 2010, customer-funded electric energy efficiency programs yielded annual incremental savings equal of approximately 15.2 billion kWh, equivalent to 0.4% of total U.S. retail sales

(ACEEE 2011). Several states with years of experience in delivering energy efficiency programs achieved annual savings of more than 1% of retail sales in 2010 (ACEEE 2011).

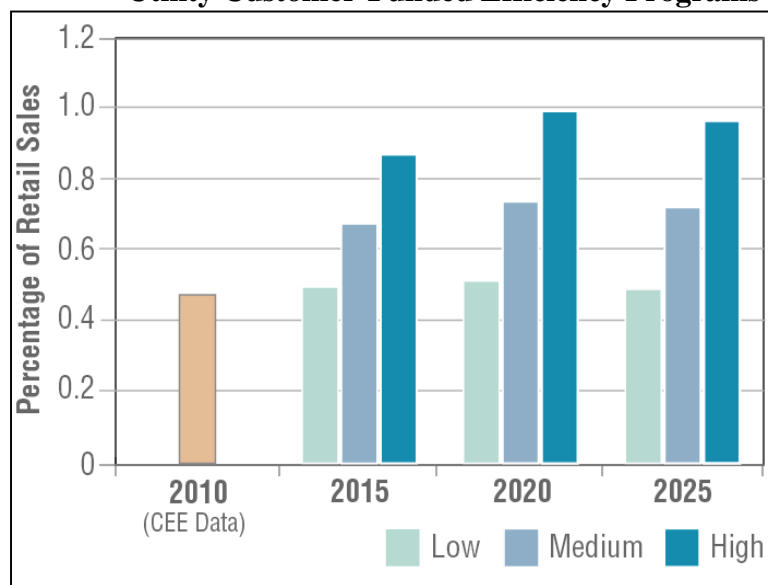
In this study, states are largely expected to achieve their savings targets in the medium scenario. However, depending on program administrators' histories in achieving savings, some states achieve their targets slightly after the target date. Where states have a legislated cap on program spending, the savings achieved at that cap - not the target - are projected for the medium case. For those states, it is assumed in the high case that the spending cap is removed, and savings targets are achieved. Based on this analysis, the annual savings are projected to be between 19.6 TWh and 37.8 TWh by 2020 (see Table 7).

Table 4. Incremental Annual Projected Electricity Savings from Utility Customer-Funded Programs (TWh)

Scenario	2010	2015	2020	2025
Low	15.2	18.2	19.6	19.6
Medium	15.2	25.1	27.8	27.8
High	15.2	31.9	37.8	37.8

For most states, the timeline for the primary policy drivers (EERS, DSM/IRP plans) does not extend savings targets beyond 2020. In these cases, the annual incremental savings (as a percentage of retail sales) achieved in the final year of the EERS or DSM/IRP plan are carried forward, resulting in the relatively flat annual incremental savings from 2020 to 2025. Based on our analysis, total U.S. annual incremental electricity savings as a percentage of retail sales would remain effectively flat in our low case (0.4%), would rise to 0.7% of retail sales by 2020 in the medium case and to almost 1% in the high case (see Figure 7).¹² Energy savings decrease from 2020 to 2025 largely as a function of rising costs to acquire those savings.

Figure 5. Projected Incremental Annual Electric Energy Savings from Utility Customer-Funded Efficiency Programs



¹² For many states, our projections stipulate constant savings percentages from 2020-2025; those assumptions are reflected in the national totals in Figure 5, which similarly shows a flat or slight decline in savings percentages from 2020-2025.

It is important to put these savings projections in perspective in order to assess their future implications for the U.S. electricity system.

The Energy Information Administration's January 2012 reference case (EIA 2012) projects that total U.S. retail electricity sales will grow at a compound annual growth rate (CAGR) of 0.67% over the 2010 to 2025 period. The EIA's modeling framework does not explicitly account for the impacts of future utility customer-supported efficiency programs. It does, however, *implicitly* incorporate assumptions about the impacts of future programs through the calibration of the model to historical data on end-use stock efficiency. The load forecasts produced by the model therefore effectively are premised on an assumption that historical trends in utility customer-funded efficiency programs will persist over the forecast period.

For the period 2000-2010, we estimate that utility customer-funded energy efficiency programs achieved national incremental savings of roughly 0.18% per year, on average. If the EIA reference load forecast is partly a product of the implicit assumption that savings from customer-funded energy efficiency programs will continue to accrue at this level and thereby "back out" this amount of savings from the EIA's reference case forecast, the resulting "no future customer-funded energy efficiency" load forecast would have a CAGR of 0.85% (i.e., 0.67% plus 0.18%). In the medium case, we project that savings from utility customer-funded programs also averages 0.67% over the 2010-2025 period. This savings projection is substantially higher than the historical average over the 2000-2010 period. At a national level, our analysis suggests that savings from energy efficiency programs in the medium scenario could offset about 80% of the projected growth in U.S. electric load in 2020 and offset load growth entirely in the high scenario.

It is important to highlight several analytical and data issues and caveats that lead us to interpret these findings on the relative impact of efficiency programs on future load growth with caution. First, EIA's forecast of relatively low growth rates in U.S. electric demand to 2025 is driven in part by the slow economic recovery projected by the EIA macroeconomic model.¹³ If economic activity were more robust and load growth was closer to historic levels (i.e., 1.6% CAGR from 1990-2010), then the relative impact and contribution of electric efficiency program savings to offsetting future load growth would be lower. Second, there is some uncertainty regarding the extent to which EIA's econometric load forecast accounts for the impacts of future efficiency programs and our approach to backing out the historic level of savings (i.e., 0.18% incremental savings for the 2000-2010 period) to define a reference load forecast that does not include utility efficiency program savings.

Major Uncertainties and Challenges

How likely are states to take these paths to a more than doubling, even tripling of utility-customer funding for energy efficiency? What impact will forces such as moderate gas prices, uncertainty over emissions regulations, tightened energy codes and end-use standards, and uncertain demand for energy and for energy efficiency have on program spending over time? Will energy efficiency programs scale up over the next decade to become a large-scale resource for electric and gas utilities in many states such that energy efficiency meets a significant share

¹³The preliminary 2012 Annual Energy Outlook projects compound annual GDP growth of 2.5% for the 2010-2020 period, compared to the 3.3% CAGR from 1929 to 2010.

of projected incremental load growth? This section explores some key uncertainties and challenges that may dominate the landscape for energy efficiency programs on the road ahead.

The Economy

A slow recovery may complicate and restrain efforts to scale-up energy efficiency spending and savings. First, households and businesses are more likely to hold onto capital for other priorities or as buffers against the unforeseen. Declining home values mean households have less equity available for financing efficiency improvements. A lengthy economic recovery may engender higher costs per saved kWh if program administrators have to increase either financial incentives or marketing efforts to obtain desired market penetration rates.

Second, economic torpor reduces the rate of stock turnover and new housing starts, thereby reducing the energy savings that programs may capture. Third, the short-term rate impacts associated with attaining very aggressive levels of savings could pose a political challenge for state regulators. Meeting more aggressive targets in some states will mean exceeding rate or spending caps, which may be feasible only in a robust, growing economy.

Emissions Regulations

The import of these regulations for energy efficiency program spending depends on several factors:

- The timing and stringency of the final rules
- The price of natural gas, as gas-fired generation is expected to offset the majority of the retired coal-fired generation
- The capital cost profile for other replacement generation.
- The regulatory and business models in place that govern the balance between supply- and demand-side investments
- The degree to which utility resource plans are integrated with state and tribal Clean Air Act implementation plans

Moderate Natural Gas Prices

Since 2008, average U.S. wellhead prices have fallen nearly 60% (EIA 2011a), and prices to the electric power sector have fallen to 54% (EIA 2011b). As of April 2012, the month-ahead futures contract for natural gas was trading at less than \$2 per million British thermal units, the lowest level in 10 years and nearing a record low. Prices to all sectors are projected to stabilize and rise steadily over the next 20 years (EIA 2012), but in real terms gas prices for the remainder of this decade are expected to remain lower than prices over the last decade,¹⁴ when most state energy savings targets were set. For electric and gas energy efficiency programs, lower gas prices translate into reduced program benefits, which in turn constrains total efficiency spending and flexibility in program design.

¹⁴ The trajectory for gas prices – and the implications for spending and performance of gas energy efficiency programs – could change, for example, in response to tighter regulation of hydraulic fracturing or a rapid increase in export demand for liquid natural gas.

State and Federal End-Use Standards

Even though several phases of new federal lighting standards will progressively reduce savings potential for lighting programs funded by utility customers, program administrators have higher efficiency lighting technologies that are likely to remain cost effective after the standards come into effect.

Gas program administrators have fewer options. Starting in 2013, the new furnace standards would raise the minimum heat-to-fuel efficiency of furnaces in northern states that coincidentally have some of the nation's more aggressive spending and savings targets. Programs can continue to provide incentives for higher efficiency gas furnaces, but the incremental savings will be lower.

Developing Innovative Program Designs to Reach Deeper and Broader Savings

The challenge for program administrators will be to design and implement programs that can achieve both deeper savings, on average, at customer facilities and have a broader reach in terms of market penetration. Program administrators will have to achieve savings levels of 25-40% of existing usage at customer facilities compared to current practice, which is typically in the 5-20% range. Achieving higher market penetration rates will require reaching under-served markets (e.g. small commercial, multi-family housing, moderate income households) to a greater extent than current practice.

Institutional and Policy Challenges

Several regulatory or structural barriers affect the likelihood that states or program administrators will meet or exceed their savings targets.

The majority of targets are short-term savings or spending mandates that, for regulatory purposes, are treated as annual targets. Longer term targets signal sustained budget and program commitments to the market and make achievement of targets more likely. Cumulative, longer term targets are less sensitive to program growing pains or year-to-year variations in the economy. They also can be used to compel program administrators to re-engage past participants and recapture energy savings from prior years that have been lost to measure decay.

Current practice in cost effectiveness screening for programs also may constrain the ability of program administrators to meet energy savings and spending mandates. Application of the Total Resource Cost (TRC) test at the measure and program level in particular limits opportunities for the acquisition of savings. Some states' recent return to use of the Ratepayer Impact Measure (RIM) test as a primary screening tool also can make it difficult to meet targets and leave substantial, system-wide energy savings unrealized.

In many states, energy savings in the large commercial and industrial markets are, in effect, beyond the reach of program administrators. Large electricity customers in many utility service areas may either "opt out" of paying charges for energy efficiency programs¹⁵ or direct most or all of their share of those charges into their own, "self-direct" energy efficiency investments. Self-direct projects typically are not subject to cost effectiveness testing or measurement and verification of savings, such that benefits to the energy system and other customers are uncertain (Chittum 2011).

¹⁵ Other than low-income programs, which generally are supported by charges to all customer classes.

Conclusions

Energy efficiency programs funded by utility customers are, according to our analysis, headed for dramatic growth through at least 2020. The rapid spread of state policies favors expansion and intensification of energy efficiency efforts, especially in the South and Midwest. Programs are becoming more evenly distributed nationwide. Program spending is projected to more than double to \$10.8 billion in 2025 and could well reach \$13.6 billion. Many states are headed for electricity savings between 1.5% and 2%, surpassing the achievements of most leading states today.

The horizon is clouded by uncertainties, however. The combined effects of economic torpor, moderate gas prices, and energy codes and standards pose challenges for electric and especially gas programs. These effects may be more pronounced in states with mature portfolios and large budgets such as California, where declines in program spending appear likely.

The degree to which other leading states and a new vanguard of fast-rising states can overcome these challenges and offset reduced efforts elsewhere is likely to govern the longer term path for national-level spending and savings. Our analysis suggests that growth in electric energy efficiency program spending in these states through 2020 is likely to counteract reductions in electric program spending elsewhere or in gas programs nationwide. Spending on all types of customer-funded energy efficiency programs is less certain beyond 2020, and our judgment is that a plateau or slight reduction is likely by 2025.

If forecasts for a slow economy recovery and modest load growth are borne out, the surge in electricity program spending and savings that we project could offset about 80% of aggregate annual U.S. load growth as early as 2020. Can utility customer-funded efficiency programs continue to nullify most load growth beyond 2020?

This analysis has shown that program spending and efficacy are governed by a great many influences. Some key determinants – the state of the economy, natural gas prices, technological advances, and the impacts of end-use standards for equipment and appliances – are beyond the control of program administrators and state policymakers. But we do find significant policy support from legislators and regulators – and years of program successes – in most of the states that are likely to determine the overall path for U.S. program spending and savings.

Offsetting most of national annual load growth may be achievable, even sustainable, therefore, even in the context of challenging economic and market conditions.

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