Policies Matter: Creating a Foundation for an Energy-Efficient Utility of the Future

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Abstract

In September 2011, ACEEE published a white paper about utilities' conflicting objectives under traditional regulation between helping their customers save energy and earning profits, and state policy options to resolve this conflict (York and Kushler 2011). Since then, many more states have adopted regulatory tools to better align the utility business model with energy efficiency. Meanwhile, several evolving trends in the electric utility industry are shaping discussions regarding the utility of the future. Energy efficiency has an important and large potential role to play in the utility of the future, but that outcome is highly dependent on a mix of policies that align utility business models with energy efficiency.

This white paper updates our 2011 paper and draws together our findings regarding several regulatory tools that many states have used to encourage utility energy efficiency efforts. These include utility performance incentives, decoupling, lost revenue adjustment mechanisms (LRAM), energy efficiency targets for utilities (energy efficiency resource standards [EERS]), and integrated resource planning (IRP). Our analysis shows that regulatory tools intended to affect the utility business model play a critical role in elevating the interest in efficiency within utility companies, but that these alone have not been as successful as specific energy efficiency targets at driving high levels of energy efficiency. A comprehensive strategy—getting the business model right and setting specific efficiency targets—is most closely associated with achieving high savings. Such a strategy is essential to sustaining long-term utility interest in capturing cost-effective energy efficiency resources.

Introduction

In September 2011, ACEEE published a paper, *The Old Model Isn't Working: Creating the Energy Utility for the 21st Century*, about utilities' conflicting objectives under traditional regulation between helping their customers save energy and earning profits (York and Kushler 2011). We recommended that more states adopt three types of regulatory tools to better align the utility business model with energy efficiency. These included energy efficiency program direct cost recovery, decoupling or related mechanisms that allow recovery of lost contributions to fixed costs, and earnings opportunities for efficiency investments and performance. Since 2011, many more states have adopted some or all of these tools, and ACEEE and others have examined state experience with such tools for both electric and natural gas utilities (Hayes et al. 2011a; Hayes et al. 2011b; Satchwell, Cappers, and Goldman 2011; Morgan 2012; York et al. 2013). Most recently ACEEE examined state experiences, successes, and challenges with two regulatory tools in particular: utility performance incentives for energy efficiency (Nowak et al. 2015) and lost revenue adjustment mechanisms (Gilleo et al. 2015).

This white paper assesses recent developments and draws together our qualitative and quantitative findings regarding the full range of regulatory tools that states have used to encourage utility energy efficiency efforts. It evaluates overall progress with these regulatory tools and examines ways in which, together, they can provide a foundation for aligning the utility of the future with an energy-efficient future.

The Utility of the Future

The challenge of aligning utility business models with energy efficiency is one element of a much broader discussion concerning the utility of the future. In order to fully appreciate the context in which utilities are currently considering energy efficiency, it is useful to briefly review several trends that are shaping these discussions in the electric utility industry. These trends are as follows:

- *Increasing penetration of distributed energy resources.* Declining costs and increasing penetration of distributed energy generation, especially solar photovoltaics (PVs), and energy storage are seen by some as a threat to the centralized utility model. However, at the same time, some utilities acknowledge this trend as an opportunity for revenue by owning and leasing distributed assets or by partnering with established distributed generation companies (Utility Dive 2014).
- *Flattening energy sales.* In the long term, energy sales are expected to flatten relative to past growth rates, in part due to energy efficiency but also due to other trends (Nadel and Herndon 2014).[1] In the short term, most electric utilities expect sales growth, although at lower levels than in the past: in a recent survey of electric utilities, 76% of respondents stated that they expect minimal (55%) or significant (21%) sales growth over the next five years (Utility Dive 2014).

[1] In its Annual Energy Outlook (AEO) reference case scenario, the US Energy Information Administration (EIA) projects 0.7% national average electricity sales growth per year over the 2014–2040 period, which is about half of the 1.3% compound annual growth rate that occurred over the 1990–2014 period (EIA 2015).

- *Increasing penetration of plug-in electric vehicles (PEVs)*. Increasing penetration of PEVs can take advantage of available generation capacity during off-peak periods. At the utility distribution system level, three critical factors influence the potential effects of PEVs on the grid: the timing, the location, and the power level of PEV charging (see Khan and Kushler 2013).
- *Emissions reductions.* New environmental and climate regulations will require reductions in power-sector emissions. For example, the US Environmental Protection Agency's (EPA's) proposed Clean Power Plan under Section 111(d) of the Clean Air Act will require carbon dioxide emissions reductions in existing power plants (EPA 2014).
- *Growing need for transmission and distribution (T&D) investments and grid resilience.* An aging electric infrastructure was cited as the top challenge by utility respondents to a recent survey (Utility Dive 2014). This suggests the need for new investments in T&D, strategically located distributed energy resources, and grid resilience in the face of extreme weather events.

Some have suggested that these trends as a whole are a "disruptive threat" to the utility business model (EEI 2013)—i.e., that sales will fall drastically and many more customers will disconnect from the grid, thus leaving fewer customers to pay for it. But ACEEE's research finds that even under aggressive penetrations of distributed generation and energy efficiency, there will be no death spiral with falling sales (Nadel and Herndon 2014).[2] More likely, we will see long-term changes with sales gradually flattening, more distributed generation on the system, and increased penetration of EVs. Electric utilities have ample capacity to adapt their business model to these trends. The gas utility industry has also faced some of the trends listed above (e.g., flattened or declining sales per household), but not others.

Regulation must evolve along with this transformation, and industry stakeholders are examining (and some are beginning to adopt) ways to address the many challenges and opportunities involved. Some jurisdictions have broad plans already under way to tackle these challenges as a whole, while others are addressing the issues incrementally.

Although there are numerous pathways toward a cleaner and more sustainable utility of the future, as ACEEE recently examined (Nadel and Herndon 2014), no matter the approach, end-use energy efficiency should play a large role in the utility of the future as a distributed resource that lowers system costs, risks, and emissions and provides other benefits. We discuss these benefits in the next section. As states, utilities, and other stakeholders begin to

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[2] Nadel and Herndon 2014 analyzed alternative electricity sales forecasts. Under the authors' medium-change scenario (national penetration of energy efficiency to 1.5% electricity savings per year by 2018 and beyond, PV growth of 10% per year, and EV penetrations three times higher than EIA's forecast), electricity sales would grow at 0.04% per year—essentially flat consumption. The authors note that in their medium- and high-change scenarios, efficiency would be the largest contributor to sales reductions. To put this into perspective, a 1.5% national average electricity savings would more than double the current levels of national utility-sector energy efficiency savings.

lay the groundwork for the utility of the future, they should prioritize energy efficiency as a low-cost option that should be treated as a critical utility system resource.

The Role of Energy Efficiency as a Utility Resource

Before examining recent experiences with utility business models and efficiency, it is helpful to look back at the foundation of the regulated utility industry in the United States and how utility-sector energy efficiency fits into this construct.[3] As explained by the Regulatory Assistance Project (RAP), the general objective of industry regulation is "to ensure the provision of safe, adequate, and reliable service at prices (or revenues) that are sufficient, but no more than sufficient, to compensate the regulated firm for the costs (including return on investment) that it incurs to fulfill its obligation to serve" (RAP 2011a, 6). The utility industry provides essential services for society, and therefore there is a need to balance the interests of both society and shareholders. In this context, energy efficiency as a utility resource has an important and large role to play.

By "energy efficiency as a utility resource," we mean that energy efficiency is defined and treated by regulators and utilities as a resource the same way that energy supply resources are treated.[4] When deployed on a significant scale, the energy savings from energy efficiency can defer or displace the need for new generation from supply-side resources, replace retiring generation, and in some cases offset the need for transmission and distribution (T&D) investments. To deploy energy efficiency, utilities (or other program administrators) manage energy efficiency programs, services, and market transformation activities to help their customers lower energy usage (kWh or therms) and reduce demand (kW). These energy efficiency programs and activities are paid for by customers, just as customers pay for supply-side resources. Through these actions, energy and demand savings are procured, measured, verified, and relied upon as a strategic energy system resource and are quantified in both short- and long-term utility system planning and acquisition.

Efficiency as a resource is valuable for utility system planning and is in the public interest because it accomplishes the following:

- *Lowers costs.* Energy efficiency is the lowest-cost resource option compared with new electric generation (Molina 2014; Ceres 2014; Lazard 2014; LBNL 2014). As a low-cost option, energy efficiency therefore lowers the cost for all customers because it can displace new supply builds and replace retiring generation.
- *Lowers risks.* Energy efficiency has a lower risk profile than any other new electricity resource option (Ceres 2014). For example, efficiency investments have no or low

[3] This paper generally covers regulated utilities. However many of the tools and principles could also be applied to cooperative, municipal, and other public power utilities. ACEEE is currently researching energy efficiency in public power through several utility cases studies (forthcoming 2015).

[4] For a more complete discussion of how to achieve efficiency as a resource, see Eckman 2011, which lists three principles that must hold true for energy efficiency to be truly treated as a resource: (1) parity in resource planning, (2) equality in cost-effectiveness analysis, and (3) symmetry in resource acquisition payments.

risks in terms of fuel and operation and maintenance (O&M) costs, new regulations, carbon pricing, and water constraints.

- *Reduces emissions.* The US EPA's proposed Clean Power Plan, regulating carbon dioxide emissions for existing power plants and to be finalized in the summer of 2015, includes energy efficiency as one of four building blocks for potential compliance options (EPA 2014). ACEEE has found that if all states adopted three energy efficiency policies, they could achieve 69% of the national emissions reductions proposed under the Clean Power Plan.[5]
- *Promotes local economic development.* By reducing customer energy bills, efficiency enables consumers to put more of their dollars into the local economy and create jobs.[6] Also, businesses that invest in efficiency directly support the local economy by spending locally on products and services, and the energy efficiency programs themselves create direct local jobs.
- *Promotes economic growth.* Investments in commercial and industrial efficiency lower the costs of doing business, thus making firms more competitive and efficient and increasing overall economic productivity, which is a critical engine for economic growth.
- *Increases electric system reliability and resilience.* Energy efficiency can reduce electric system peaks. This in turn reduces the amount needed for reserve margin and increases the reliability, resilience, and energy security of the system (Lazar and Baldwin 2011; Kushler, Vine, and York 2002).

In addition to these system benefits, utilities have another reason to invest in efficiency as a resource: customer engagement and satisfaction. Customers like energy efficiency and want to do more to lower their bills, improve the comfort of their homes and businesses, and help manage their energy use.[7] Utilities, in turn, see efficiency as a key way to improve customer engagement and relations. Evidence suggests that energy efficiency programs and services contribute significantly to higher customer satisfaction (SEE Action 2011).

Energy efficiency as a utility resource has a history dating back to the energy crisis of the 1970s, when energy consumption was rapidly growing and creating concerns about rising costs (for a historical review of electric utility energy efficiency activity, see York et al. 2012). Efficiency was seen as a resource to meet growing energy demands. A seminal policy of efficiency as a resource was the 1980 Pacific Northwest Electric Power Planning and Conservation Act, which defined energy efficiency as an energy resource and made it the region's priority resource (see Eckman 2011). According to the Northwest Power

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[5] The three policies include a 1.5% annual electricity savings target, national model building energy codes, and economically competitive combined heat and power. This estimate is based on ACEEE calculations using our State and Utility Pollution Reduction (SUPR) calculator (Young and Hayes 2015) and our analysis in Hayes et al. 2014.

[6] See http://aceee.org/fact-sheet/ee-and-economic-opportunity

[7] A recent national survey found that most households value energy efficiency but that few describe their homes as energy-efficient (Demand Institute 2014). Increased energy efficiency was the top-ranked unmet housing need.

Conservation Council, the past 34 years of energy efficiency improvements in the region have resulted in electricity ratepayer savings of about $3.5 billion per year and have made energy efficiency the second-largest resource in the Pacific Northwest, behind hydropower (NW Council 2014).

More recently, numerous states have adopted energy efficiency targets for utilities—often referred to as energy efficiency resource standards (EERS)—and similar policy commitments, such as all cost-effective efficiency requirements or resource loading-order requirements that prioritize efficiency.[8] This wave of policy adoption has significantly contributed to recent increases in energy efficiency investments, which tripled from $2.5 billion in 2006 to $7.7 billion in 2013 (Gilleo et al. 2014) (see figure 1). In addition to EERS policies, the increased investment and savings have also been associated with regulatory changes to help address utilities' economic concerns regarding the provisioning of energy efficiency programs, as discussed in more detail later.

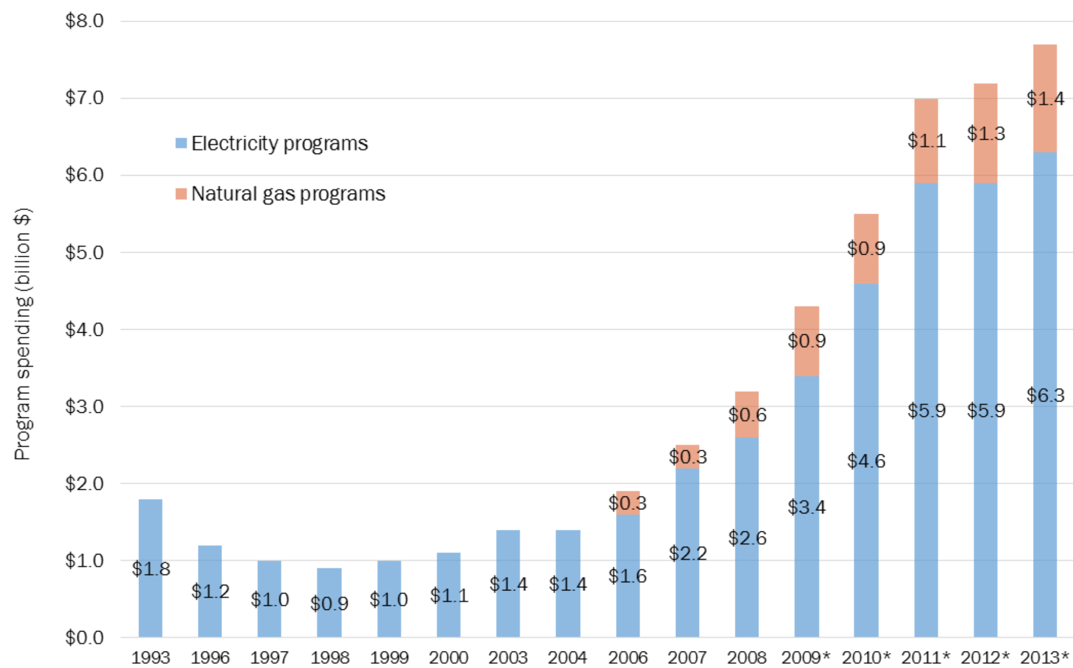

Figure 1. Annual investments in utility-sector electric and natural gas energy efficiency. *From 1993 to 2008, values represent actual program spending; from 2009 on, they represent program budgets. Data for some years were not collected. Natural gas efficiency spending data are not available for 1993–2004. *Source:* Gilleo et al. 2014.

States have made tremendous progress leveraging energy efficiency as a resource over the past 10 years. The short-term outlook for utility-sector efficiency is generally positive (e.g., 83% of electric utility survey respondents expect energy efficiency programs to grow over the next five years [Utility Dive 2014]). However there is still wide disparity among states on

[8] While these more recent policy commitments embrace some elements of efficiency as a resource, as discussed in Eckman 2011, many if not most of them do not fully embrace the treatment of efficiency as a resource, nor do regulators, utilities, and others fully internalize the concept in their decision making.

utility-sector efficiency investments, and much more cost-effective energy efficiency is available (Hayes et al. 2014; Neubauer 2014). Given the full range of the utility system and public interest benefits of energy efficiency, utilities of the future should embrace efficiency as a priority resource. That outcome, however, is highly dependent upon an optimal mix of state and regulatory policies, as we examine in this paper.

BARRIERS TO ADOPTION OF EFFICIENCY AS A RESOURCE

While efficiency as a resource has made significant gains, some jurisdictions have been reluctant to embrace and implement efficiency as a resource in a significant way and instead favor traditional supply-side investments. We see three primary reasons for this: financial, practical, and political or cultural.

Arguably the main historical reason utilities have not embraced efficiency as a resource (without a requirement to do so) has been financial in nature, as we laid out in our 2011 white paper. Utilities face three primary financial concerns relative to customer energy efficiency programs: (1) recovery of program costs, (2) removal of the throughput incentive (profits linked to increased energy sales), and (3) provision of earnings opportunities for shareholders comparable to alternative utility investments. ACEEE and others have identified the need to get the business model right for efficiency outcomes, and recent progress on utility business model tools are discussed in more detail later in this paper.

The second reason is more practical in nature: efficiency as a resource is fundamentally different from supply-side options, which means there are unique needs for analytical modeling, planning, and implementation. For example, efficiency is on the customer side of the meter, is a non-dispatchable and highly disaggregated resource, and requires a program delivery and services infrastructure as well as robust evaluation, measurement, and verification (EM&V). These needs raise new challenges for utilities, even when their business model motivates them to deliver energy efficiency for their customers.

The third reason is political or cultural. Without a history of embracing efficiency as a resource in the state or region, the advantages of doing so may seem politically or culturally obscure for regulators, policymakers, utilities, and other stakeholders. This may be seen, for example, within the corporate culture of a utility in which supply-side approaches are upper management's dominant interest. Having executive-level champions within utilities has been important to overcome this barrier (York et al. 2013). Without cultural or political acceptance by regulators, policymakers, and utility management, efficiency as a resource does not get appropriate attention or, even worse, may be seen as uncertain or unreliable. Even with the financial motivation and wherewithal to implement energy efficiency, the need for political will is, therefore, paramount.

POLICIES TO ENCOURAGE EFFICIENCY AS A RESOURCE

Given these financial, practical, and cultural barriers, state policies are needed to establish a vision for the future that values energy efficiency as a resource. Many states have used a comprehensive set of policies and practices to encourage efficiency resources. In addition to utility business model tools, which are discussed in the next section, policies and practices include clear, stable, and long-term regulatory support; utility energy efficiency targets; requirements to procure all cost-effective energy efficiency; robust EM&V; proper cost-effectiveness tests for screening efficiency programs; accurate estimation of avoided costs; sound integrated resource planning (IRP); and stakeholder engagement. Here we discuss two of these policies, which we evaluate later in the paper: EERS and IRP.

An EERS establishes energy efficiency savings targets that a utility (or other program administrator) must meet over multiple years (annual and longer-term targets) through cost-effective customer efficiency programs and market transformation activities. In some states, the targets are determined through requirements for all cost-effective energy efficiency and the associated stakeholder processes (see Gilleo 2014); in other states, targets are established by legislation or by other regulatory processes. Twenty-four states currently have an EERS, and state experience has been very successful, with the vast majority of states meeting or exceeding their targets (Downs and Cui 2014).[9] States have gained valuable experience with best practices and lessons learned when establishing energy efficiency targets (see Downs and Cui 2014; Satchwell, Cappers, and Goldman 2011). For example, establishing financial performance incentives for utilities that are aligned with energy efficiency targets has been effective. The majority of states with efficiency targets also have performance incentives.

Many states have adopted IRP as a means to give equal value to demand- and supply-side resources in long-term planning. While IRP itself is generally intended as a guide for resource planning rather than a policy that drives energy efficiency as a resource, some states have specifically referenced IRP as a way to encourage energy efficiency resources. Given this, it is helpful to review IRP practices and outcomes specifically around energy efficiency achievements. As a low-cost resource, energy efficiency in theory should be a large, priority resource under IRP analyses, which typically emphasize least-cost planning. However, in practice there have been several analytical shortcomings in how energy efficiency resources have been modeled. As discussed in more detail later, IRP has not facilitated as much energy efficiency achievement as EERS policies.

There are several reasons why IRP processes to date have not led to higher energy efficiency achievements. First, most analysts do not truly model demand-side resources as a selectable resource among supply resource options, which can lead to suboptimal results. In their modeling, utilities in most states subtract efficiency gains as a decrement off load forecasts (a static amount) rather than truly optimizing the amount of energy efficiency as a resource at various potential levels.[10] Some states do optimize energy efficiency among other supply options but place artificial constraints on energy efficiency resources. Moreover, energy efficiency assumptions in IRPs are often based on studies that measure the achievable and cost-effective energy efficiency potential, and such studies have been fraught with analytical

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[9] See http://aceee.org/policy-brief/state-energy-efficiency-resource-standard-activity and http://database.aceee.org/ for more information on state's EERS policies and recent trends.

[10] Some states have made headway on this front toward optimization of efficiency as a resource; see RAP 2013. And as discussed in Ceres 2014, new analytical methods will be needed more than ever as utilities of the future have more distributed resources in their system, calling for an integrated distribution planning (IDP) approach.

shortcomings and lack of transparency. (These shortcomings are not unique to IRPs but are found across energy efficiency potential studies; see Neubauer 2014.)

Second, regulators do not typically require implementation of energy efficiency results from an IRP. In a few cases, energy efficiency targets based on IRP processes have become binding requirements; more often, however, IRP serves as a general informative or guiding document rather than an obligation. IRP can be a useful guiding tool if efficiency is appropriately characterized and modeled as a resource, but to date it has not by itself served as a particularly effective vehicle for achieving efficiency as a resource. An IRP process can be most effective when it fairly values energy efficiency as a resource and when it is paired with clear energy efficiency targets.

Aligning Utility Business Models with Energy Efficiency

Qualitative Assessment of Recent Progress

In our 2011 paper we recommended that more states adopt the three-legged stool—three types of regulatory tools to better align the utility business model with energy efficiency:

1. Recovery of energy efficiency program direct costs
2. Removal of the throughput incentive (profits linked to increased energy sales) through decoupling or similar mechanisms that allow recovery of lost contributions to fixed costs
3. Creation of earnings opportunities for efficiency investments and performance

The first policy, direct dollar-for-dollar recovery of energy efficiency program costs, is already in use in nearly every state (IEI 2014). Therefore, this has not typically been an impediment to efficiency investments. The second and third policies are becoming more common but are not yet universally adopted.

In 2011, 21 states had decoupling mechanisms in place for gas utilities and 15 states had policies for electric utilities (Morgan 2012); 13 states had existing or pending lost revenue mechanisms (Hayes et al. 2011a), and 18 states had utility performance incentives (Hayes et al. 2011b). A large body of research has found that these policies, along with complementary energy efficiency targets for utilities, elevated the role of energy efficiency within utility companies and set the stage for a large increase in utility efficiency investments and savings results (Hayes et al. 2011a; Hayes et al. 2011b; Satchwell, Cappers, and Goldman 2011; Morgan 2012; York et al. 2013). These policies have become even more prevalent over the past few years as states have sought tools that encourage energy efficiency as a low-cost strategy while also reducing emissions, among other benefits. Next we discuss more recent progress and the number of states with these policies as of 2014.

Addressing the Throughput Incentive

Utilities have historically had a throughput incentive, because traditional regulation directly linked revenues to energy sales. From a financial standpoint, a utility's primary concern regarding energy efficiency has been the potential impact on utility revenues due to decreased sales. The throughput incentive can be addressed through decoupling, which ensures full cost recovery of authorized revenue requirements no matter the level of sales. It involves making small upward or downward adjustments to rates so that authorized revenue requirements are fully recovered but not over- or under-recovered. Decoupling removes the throughput incentive, thus making a utility indifferent to pursuing efficiency as a resource (creating an earnings opportunity would further align utilities' financial motivations with efficiency). For information on decoupling theory and application, see RAP 2011b; for how it has worked in practice, see Morgan 2012.

Lost revenue adjustment mechanisms (LRAM) or lost contributions to fixed costs (LCFC) are a type of rate adjustment mechanism that allows a utility to recover authorized revenues that are reduced specifically as a result of energy efficiency programs. Unlike decoupling, LRAM does not reduce a utility's motivation to increase sales because additional revenues from increasing sales outside of the energy efficiency programs can still be retained by the utility. Some states, however, do have mechanisms in place to help address concerns regarding the potential for over-collection of fixed costs (see Gilleo et al. 2015).

Our recent research, which examined high-level results for all states with LRAM policies as well as several more in-depth case studies, shows that LRAM policies are generally very complex to manage and typically face a number of implementation challenges (Gilleo et al. 2015). For example, it is important to have good EM&V of energy efficiency programs to prevent overcharging customers or undervaluing a utility's lost revenues. However, with LRAM, evaluation of savings can become very controversial. Also, the timing of energy efficiency program development, LRAM determinations, and rate-making decisions are not always aligned, which becomes a major challenge to implementation. While an LRAM may bring parties to the table in circumstances where decoupling is not feasible, we recommend that LRAM policies be viewed as a temporary way to deal with utilities' concerns about fixed cost recovery—i.e., a step toward full revenue decoupling.

Like decoupling, temporary LRAM policies can make utilities indifferent to pursuing energy efficiency programs. [11]

Earnings Opportunities through Performance Incentives

Addressing direct cost recovery and fixed cost recovery through the first two policies, at the very least, makes utilities indifferent to investments in energy efficiency (e.g., they do not view them as financial losses). However they are not sufficient to encourage investment in efficiency as an earnings opportunity the same way that investment in new generation capacity does. Performance incentives for energy efficiency create this opportunity by allowing energy efficiency activity to be a source of earnings, rather than just a pass-through expense. Performance incentives offer utilities a financial reward and motivation directly

[11] Sometimes a third approach is characterized as an option for addressing the throughput incentive: straight-fixed variable (SFV) rate design. Under SFV, a utility would allocate all fixed costs to a non-volumetric (i.e., fixed), per-customer flat charge and would reduce the charges that customers control based on their usage. This approach in theory addresses the utility's throughput incentive because reductions in customer sales would not affect its recovery of fixed costs. However SFV significantly adversely impacts energy efficiency because it reduces the price signal to save energy and lowers the monetary value that customers would realize if they made energy efficiency improvements. Because it is in direct conflict with the ultimate goal of greater energy efficiency, SFV is not recommended as a way to align the utility business model with energy efficiency.

tied to achieving measurable successes in saving energy through energy efficiency programs.[12]

Currently, 25 states have implemented a performance incentive for at least one major utility, and 2 additional states have authorized policies that have not yet been implemented. This is a significant increase over the 18 states with policies in place as of 2011 (Nowak et al. 2015). Our recent research, which examined high-level results for all states with performance incentives as well as several more in-depth case studies, finds these policies have generally been working well to facilitate utility investments in energy efficiency (Nowak et al. 2015).[13] Utility executives view them as money on the table that elevates the importance of energy efficiency programs and their impacts.

States have gained valuable experience with the design and implementation of performance incentive policies in recent years, and many have modified their policies over time to take into account lessons learned. Increasingly, these incentives are tied to specific energy-savings outcomes and to multiple criteria, such as annual targets and cumulative targets, and to other outcomes such as peak demand reductions. As utilities and regulators look to the future, energy efficiency performance incentives are one example of performance-based regulation (PBR) or rate making that can be used to align utility business models with preferred outcomes.

Obstacles to Large-Scale Energy Efficiency

While decoupling and earnings opportunities for energy efficiency investments have been shown to elevate the interest of utilities to invest in energy efficiency, they do not always remove the utility's interest in investing in large-capital supply-side assets. As demonstrated in Kihm 2009, utilities that earn a return on capital investments greater than the cost of capital still face the Averch–Johnson (A-J) effect, which is the incentive to acquire additional capital (Kihm 2009). This encourages investment in large, supply-side assets, such as power plants or transmission projects, whereas efficiency investments tend to be much smaller and therefore do not always generate similar earnings. This can be an impediment to large-scale energy efficiency in certain situations, thus allowing utilities to simultaneously pursue relatively small demand-side efficiency and large supply-side investments. When energy efficiency does begin to scale, it tends to be subject to excessive scrutiny by regulators and other stakeholders, which adds administrative costs and increases the perceived risk of stranded costs. After a period of learning, regulators and stakeholders do gain a familiarity with energy efficiency and are better able to focus their time and effort. Policies such as long-term utility energy efficiency targets for large-scale energy efficiency resources, coupled with efficiency incentives that allow a meaningful and fair return on those efficiency investments, can help overcome these challenges.

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[12] Only a few states with performance incentive mechanisms also assign penalties if certain target thresholds are not achieved; a couple of states that had penalties have since removed them (see Gold 2014 and Nowak et al. 2015).

[13] As reviewed in Nowak et al. 2015, performance incentive mechanisms vary from state to state but generally fall into one of four categories in terms of calculating incentives: shared net benefits, energy savings-based, multifactor, and rate of return.

Next, we explore quantitatively whether utility business model tools and other policies to encourage long-term energy efficiency resources tend to facilitate energy efficiency investments and savings results.

QUANTITATIVE ASSESSMENT OF RECENT PROGRESS

We conducted a comparative analysis of states with various energy efficiency policies for electricity and their level of utility-sector energy efficiency performance. We compared states that had utility business model policies (including performance incentives, decoupling, and LRAM), as well as two other policies (EERS and IRP), on these average statewide metrics. While this is not a complete set of the policies and practices that encourage energy efficiency (a more complete set was described earlier), these represent some of the most common policy actions taken, and their presence or absence is straightforward. Future work could explore a wider range of policy types.

We focused on two key indicator variables regarding electric energy efficiency performance: energy efficiency spending as a percentage of total revenues and energy efficiency kWh savings as a percentage of retail sales.[14] We examined the most recent year (2013) for which complete data were available. We plotted the data, examined the plots for trends, and then compared subgroups of states and their policies, including those with and without EERS.

It is important to acknowledge several caveats with this first-order analysis. First, we examine only one year's worth of performance data (2013). Program performance may have ups and downs from year to year. Also, the year in which an efficiency policy was implemented may be a driver of that state's 2013 efficiency commitments. For example, a state that has been implementing efficiency for decades may be more likely to have a robust set of programs and savings in 2013, whereas a state still new to efficiency may not have yet ramped up to a high level by 2013 but may plan to. On the other hand, several states have rapidly ramped up savings efforts in recent years, suggesting that this is not a significant issue for our analysis. For future work, a more robust examination should include multiple years of performance data impacts. Second, each unit of analysis is the statewide average performance data point, although some of these policies may apply to a subset of utilities or even one major utility. This may introduce additional variability in the data set. Third, we did not control for how aggressive each policy is—e.g., the specific EERS targets or performance incentive thresholds. Future work could examine more closely the association between energy efficiency performance and these additional policy details. Finally, the energy savings data are complicated by the fact that states have varying policies for

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[14] We recognize that some differences across jurisdictions, such as avoided costs and climate, have implications for the levels of cost-effective energy efficiency potential in a given state. However our research of energy efficiency potential studies clearly shows that there is high savings potential across the country, spanning all geographic regions (Neubauer 2014). Moreover, the avoided costs used to determine the cost effectiveness of efficiency often do not capture the full range of benefits of energy efficiency investments. More complete accounting of these benefits would have the effect of expanding the amount of cost-effective potential. Future work could explore the relationship between efficiency achievements and avoided-cost methodologies and assumptions.

measuring savings. However we have attempted to address this issue throughout our work on benchmarking energy efficiency performance.[15]

Despite the imperfect nature of this approach, it is still helpful for an examination of broad trends. This analysis represents a diverse data set of states with a mix of these policies in place since the mid-2000s, which provides a fair means of comparison.

Table 1 shows the number of states in this analysis with each policy type, listed in the order in which we examine them next. In some cases the number of states differed from the current actual number of states with the policy in place because we attempted to include only those policies that were in place in 2013, the year of the performance data.

Table 1. Number of states with each policy included in the analysis

Policy for electric utility sector	No. of states included in analysis	Notes
EERS	26	Two of these states recently rolled back their EERS policies, but we include them in this analysis of 2013 performance.
Utility performance incentives	25	Source: Nowak et al. 2015. Two additional states have incentives but had not implemented them as of 2013.
Decoupling	12	Sources: Morgan 2012; Gilleo et al. 2014
LRAM	14	Sources: Gilleo et al. 2015. Additional states have LRAM but had not implemented it as of 2013.
IRP	40	Source: Wilson and Biewald 2013, with additional review and updates by ACEEE

Energy Efficiency Resource Standards (EERS)

We begin this discussion of observed results by examining EERS policies, which we define as long-term energy efficiency targets (covering at least three years) for utilities or other program implementers.[16] As shown in table 2, a total of 26 states had an EERS policy in place for 2013, while 24 states did not. States with an EERS policy had average energy efficiency spending and savings levels more than three times as high as states without an EERS policy.

[15] See our *State Energy Efficiency Scorecard*, which is the source of this data set, for a more complete discussion and an explanation of how we address net versus gross savings in the data set (Gilleo et al. 2014).

[16] The policy itself must span multiple years, although there are often specific annual targets. For more information on state EERS policies, see http://aceee.org/policy-brief/state-energy-efficiency-resource-standard-activity.

Table 2. Presence of EERS versus average energy efficiency performance Indicators in 2013

Policy	No. of states	Average EE investments as % of revenues*	Average EE savings as % of sales*
No EERS	24	0.7	0.3
Yes EERS	26	2.6	1.1

* The figures in this and subsequent tables are reported as simple averages.

Figure 2 illustrates the distribution of states in each category (EERS versus no EERS) in terms of energy efficiency savings level. All states that achieved electricity savings greater than 1% of retail sales in 2013 had an EERS in place. Figure 2 also shows that states with an EERS have a wide range of savings levels, which is largely due to the actual thresholds of the efficiency targets. Details regarding EERS target levels and implementation vary across states (and we did not take this variation into account here), but in aggregate, there was a clear difference in energy efficiency spending and savings in states with and without EERS (table 2 and figure 2).

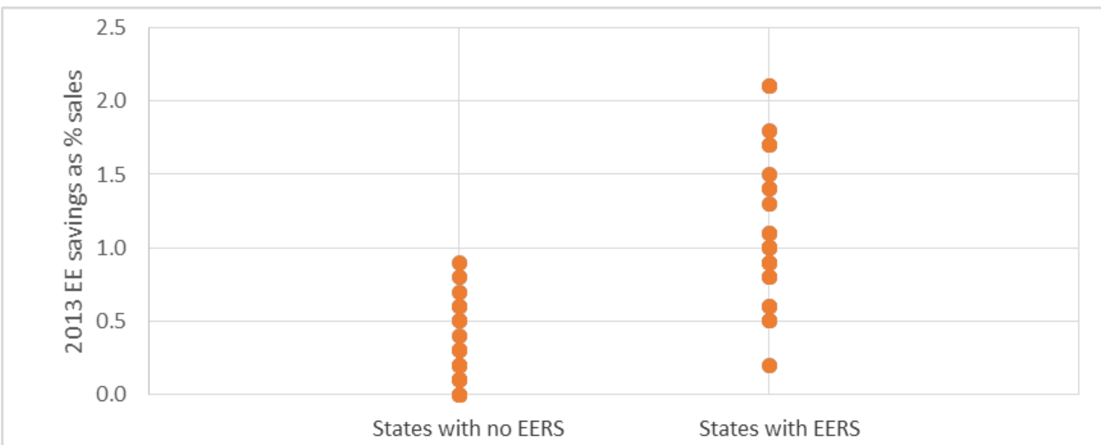

Figure 2. Electricity savings in states with EERS compared with states without EERS

Performance Incentives

States that have energy performance incentives for utilities tend to invest more in energy efficiency and have more energy savings that states without performance incentives, as shown in table 3 and figure 3, and as examined in Nowak et al. 2015. For example, states with utility performance incentives in 2013 saved on average 0.9% of sales compared with 0.5% for states without performance incentives, and they had investments equivalent to 2% of revenues compared with 1.4% of revenues. Knowing that the presence or absence of an EERS policy is an important factor, however, further inspection is needed.

Table 3. Presence of utility performance incentives versus average energy efficiency performance indicators in 2013

Policy	No. of states	Average EE investments as % of revenues	Average EE savings as % of sales
No utility performance incentives	25	1.4	0.5
Yes utility performance incentives	25	2.0	0.9
No EERS, no utility performance incentives	17	0.8	0.3
No EERS, yes utility performance incentives	7	0.8	0.4
Yes EERS, no utility performance incentives	8	2.9	1.1
Yes EERS, yes utility performance incentives	18	2.5	1.1

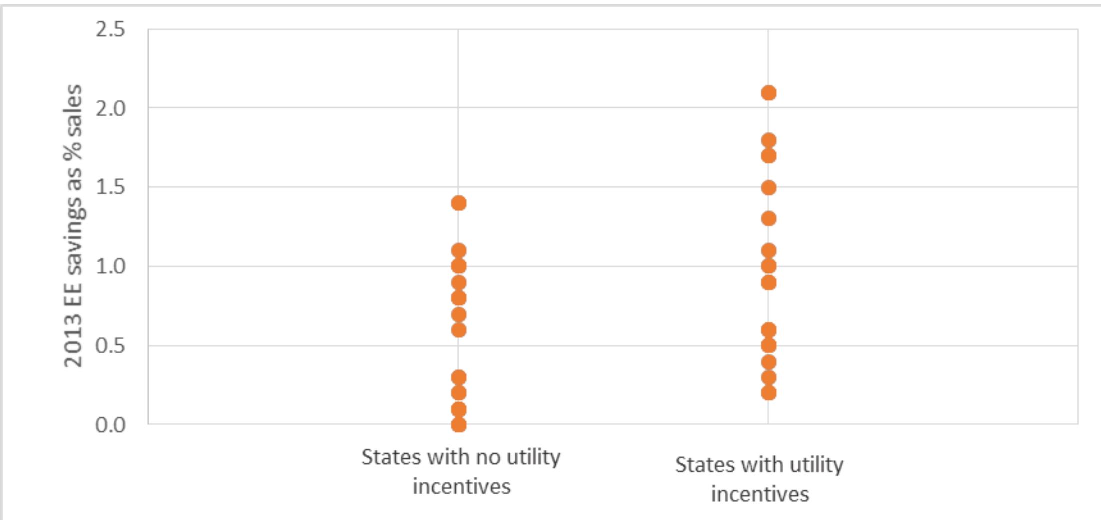

Figure 3. Electricity savings in 2013 for states with and without energy efficiency utility performance incentives

While it appears from the data in figure 3 that utility performance incentives are associated with higher savings, complementary EERS policies appear to be driving much of those differences. To isolate the impacts of an EERS, we examined separately the subset of states without an EERS and the subset of states with an EERS. In those subsets, as shown in table 3 and figure 4, the differences in average efficiency investments and savings for states with utility incentives were no longer apparent. For example, among states without an EERS, the statewide averages were almost the same with or without incentives: those with incentives saved on average 0.4% and invested 0.8% of revenues, and those without incentives saved on average 0.3% and invested 0.8% of revenues. The subset of states with an EERS shows a similar situation in the averages presented in table 3. However the range of performance across this subset of states, shown in figure 4, provides some further insight. States with both an EERS and incentives vary widely in savings results, due in part to the wide range of thresholds of states' actual targets (as mentioned earlier, we did not control for that in this analysis). Figure 4 also shows that the very top-achieving states (those saving 1.5% or more) all have performance incentives in place.

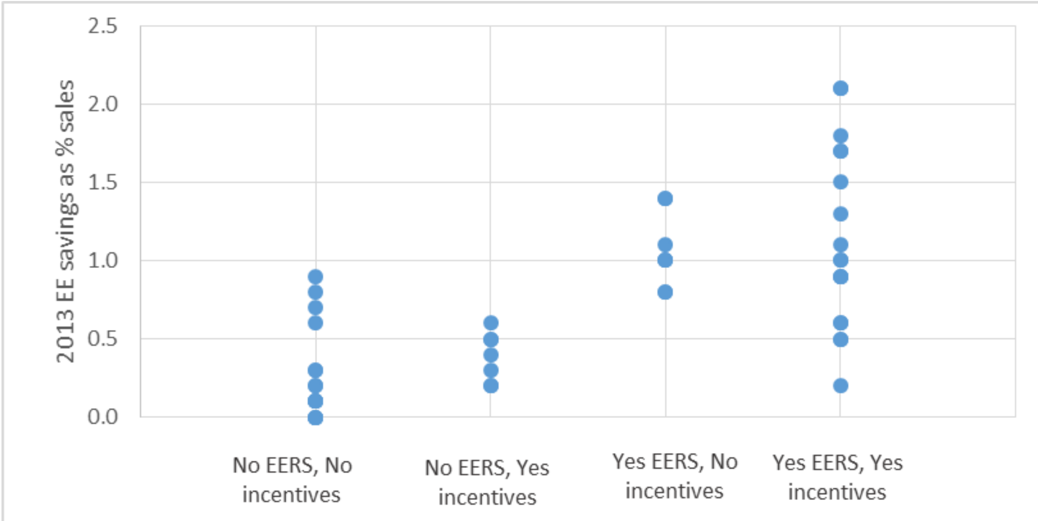

Figure 4. Energy efficiency savings in 2013 for subsets of states with and without energy efficiency utility performance incentives

The take-away from this analysis and from our research in Nowak et al. 2015 is that performance incentives are an important part of a comprehensive state policy strategy that includes both energy efficiency savings targets and utility business model tools. Performance incentives play an important role in elevating utility interest in energy efficiency outcomes and are increasingly being aligned with specific savings thresholds to encourage utilities to meet or exceed their targets. By themselves, however, performance incentives are not associated with as much energy efficiency achievement as are EERS. As noted, however, the very highest levels of energy efficiency achievements are in states with both an EERS and performance incentives.

Decoupling and LRAM

We also wanted to examine results for states using the two most common regulatory mechanisms addressing utility concern regarding the loss of revenues due to energy efficiency: decoupling and lost revenue adjustment mechanisms (LRAM). We first looked at states with and without decoupling and found that those with decoupling had much higher energy efficiency spending and savings (see table 4.)

Once again, knowing that the presence or absence of an EERS policy is an important factor, we also looked separately at the results for EERS states and non-EERS states. The data indicate not only that states with decoupling have higher energy efficiency spending and savings, but that this difference holds true for both subsets of states with and without EERS. (However, because only one state with decoupling lacks an EERS, we do not view this category as providing definitive data.) Among states with EERS, states with decoupling saved on average 1.4% of sales and invested 4.0% of revenues, compared with savings of 0.9% and investments of 1.6% for states with EERS but without decoupling.

Table 4. Presence of decoupling versus average energy efficiency performance indicators in 2013

Policy	No. of states	Average EE investments as % of revenues	Average EE savings as % of sales
No decoupling	38	1.1	0.5
Yes decoupling	12	3.8	1.4
No EERS, no decoupling	23	0.7	0.3
No EERS, yes decoupling*	1*	2.1*	0.8*
Yes EERS, no decoupling	15	1.6	0.9
Yes EERS, yes decoupling	11	4.0	1.4

* Since only one state falls into this category, we do not view these data as providing a definitive comparison. We present them here for information purposes only.

We then did a similar analysis for states with and without an LRAM policy (see table 5). In addition, because decoupling is intended to address the same problem as LRAM, we added a comparison of states with LRAM versus states without LRAM or decoupling. This provides a better comparison of states with LRAM versus states with no policy to address the lost revenues problem. Last, to again control for the effects of EERS, we made the LRAM versus no LRAM or decoupling comparison separately for EERS states and non-EERS states. As the results in table 5 and figure 5 show, we found no indication that the use of LRAM is associated with higher energy efficiency spending or savings. In both subsets of states (EERS and no EERS), the presence of an LRAM policy is not associated with higher or lower savings compared with states without an LRAM or decoupling policy.

Table 5. Presence of LRAM versus average energy efficiency performance indicators in 2013

Policy	No. of states	Average EE investments as % of revenues	Average EE savings as % of sales
Yes LRAM	14	1.2	0.6
No LRAM	36	2.0	0.8
No LRAM or decoupling	26	1.1	0.5
No EERS, no LRAM or decoupling	16	0.7	0.2
No EERS, yes LRAM	7	0.6	0.4
Yes EERS, no LRAM or decoupling	10	1.8	0.9
Yes EERS, yes LRAM	7	1.7	0.9

Figure 5 compares states that have LRAM with states having neither LRAM nor decoupling on energy efficiency savings. Again, these data show that the presence of LRAM is not associated with higher savings compared with states lacking a policy to address fixed cost recovery.

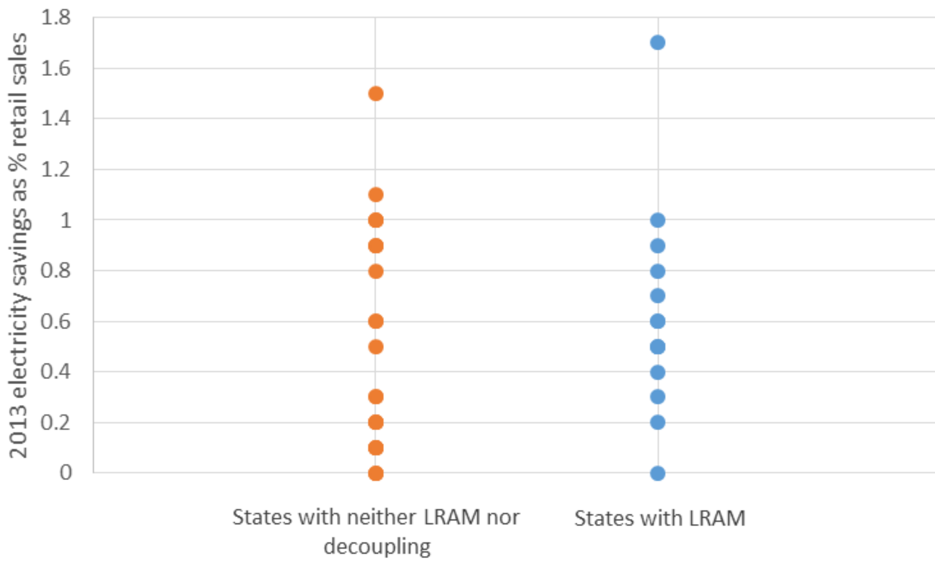

Figure 5. Electricity savings in states with LRAM compared with states having no LRAM or decoupling.
Source: Gilleo et al. 2015.

Integrated Resource Planning (IRP)

Another set of comparisons involves states with and without IRP requirements for utilities, which we review here because some states have specifically characterized IRP as a policy that replaces the need for other energy efficiency policies such as an EERS.[17] Forty states currently have IRP requirements for utilities. Details regarding how IRP is implemented and enforced vary considerably across states, but in aggregate, we found very little difference in average energy efficiency spending or savings in states with or without IRP (table 6). This same lack of difference in average values appears in both EERS and non-EERS states, as shown in table 6.

[17] For example, this has recently been the case in policy discussions in Arizona, Indiana, and Michigan. Although IRP is intended to integrate demand-side resources into resource planning, we would characterize it as a general guide for resource planning rather than a specific tool for advancing the use of energy efficiency.

Table 6. Presence of IRP versus average energy efficiency performance indicators in 2013

Policy	No. of states	Average EE investments as % of revenues	Average EE savings as % of sales
No IRP	10	1.5	0.5
Yes IRP	40	1.8	0.8
No EERS, no IRP	6	0.8	0.2
No EERS, yes IRP	18	0.8	0.3
Yes EERS, no IRP	4	2.7	1.0
Yes EERS, yes IRP	22	2.6	1.1

Figure 6 shows the full range of savings data for states with and without IRP requirements in those states without an EERS (to isolate the impacts of IRP without factoring in the impact of an EERS).

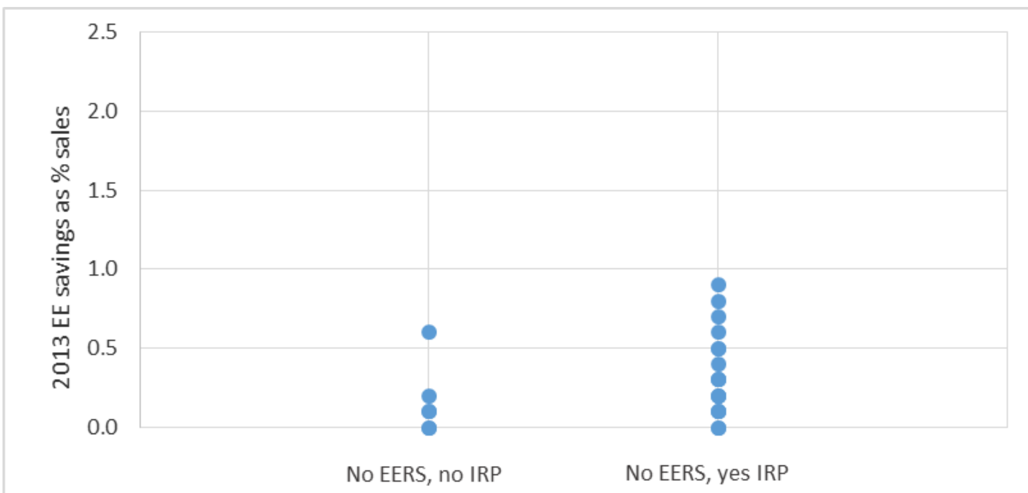

Figure 6. Electricity savings in states without EERS, comparing those having IRP with those lacking it

Among states without an EERS, those with IRP requirements in place have slightly higher average savings (0.3%) than those without them (0.2%). However figure 6 shows that there are some states in both categories—those with and without IRP requirements—that reported little to no energy savings in 2013. Moreover, no state with an IRP but without an EERS achieved savings of 1% or greater. Our take-away is that integrated resource planning is an important tool that can be a helpful part of a comprehensive state policy strategy that includes both energy efficiency savings targets and utility business model tools. By themselves, however, IRPs to date have not had the same impact on energy efficiency savings as we have seen from EERS policies.

Comprehensive Approach

As a final comparison, we reviewed states with a comprehensive set of policies, including EERS and all three utility business model tools (program cost recovery, decoupling, and performance incentives) and compared them with states using a partial approach (table 7 and figure 7). Eight states had this comprehensive set of tools in place in 2013; those states on average achieved 1.5% savings and had efficiency investments of 4.0% of revenues. Each of those states achieved savings of at least 0.9% and up to 2.1%. This set of states outperformed states with a partial set of policies by a factor of 3.1 on investments and a factor of 2.6 on savings. Our take-away is that a comprehensive set of strategies and tools is the approach most closely associated with high savings performance.

Table 7. Presence of comprehensive approach versus average energy efficiency performance indicators in 2013

Policy	No. of states	Average EE investments as % of revenues	Average EE savings as % of sales
EERS and all three utility business model tools (program cost recovery, decoupling and incentives)	8	4.0	1.5
Partial set of policies	42	1.3	0.6

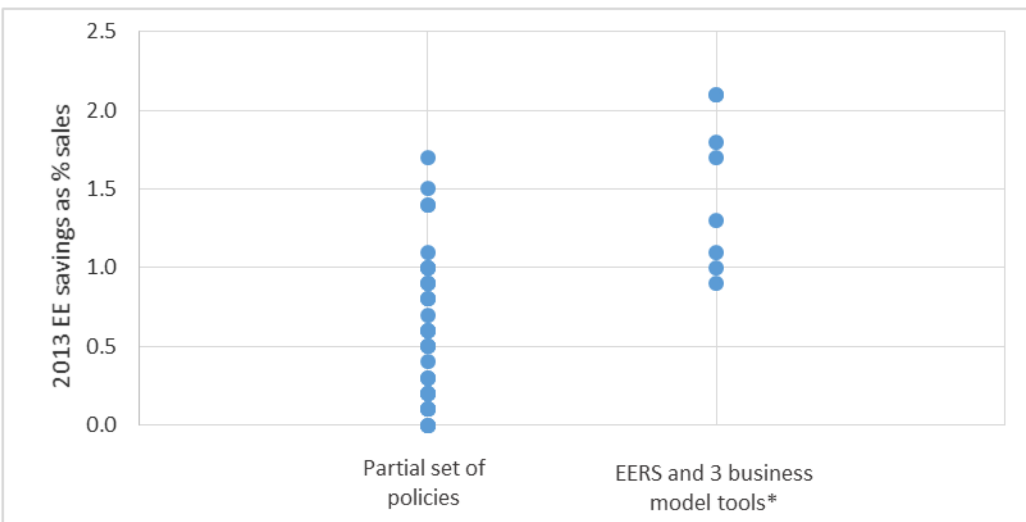

Figure 7. Electricity savings in states with a partial set of policies versus a comprehensive set of policies.
* The three business model tools include program cost recovery, decoupling, and incentives.

Discussion

Overall, there has been much progress in recent years to implement policy and regulatory reforms to advance energy efficiency achievements in the utility sector. Based on our review of the most recent energy efficiency performance data available, the policy most strongly associated with energy efficiency performance has been the establishment of an energy efficiency resource standard (EERS). On average, states with an EERS in place are achieving more than three times as much relative energy efficiency program investment and savings as those without an EERS. However most states with EERS have also adopted one or more regulatory tools to align the utility business model with energy efficiency. Our analysis finds that the approach producing the highest energy efficiency accomplishments is a comprehensive strategy that gets the utility business model right for efficiency (including program cost recovery, decoupling, and performance incentives) and aligns that business model with specific energy efficiency targets such as EERS.

Among strategies intended to better align utility business models with energy efficiency, financial incentives for energy efficiency performance (implemented for electricity in about half of the states) and revenue decoupling (implemented for electricity in about a quarter of the states) both play an important and increasing role in the expansion of energy efficiency programs in the utility sector. Our recent research indicates that performance incentives elevate a utility's interest in meeting and exceeding energy efficiency goals. The design and implementation of performance incentives have evolved in recent years. They have become better aligned with targeted, cost-effective energy efficiency achievements (rather than with spending metrics) and increasingly rely on more comprehensive performance criteria that place value on long-term energy savings results.

Our research on LRAM policies has shown that they have become more prevalent but are complex to administer and susceptible to various practical problems, in part due to differences in regulatory oversight. Our findings suggest that addressing the throughput incentive is most effectively done through full revenue decoupling, although LRAM policies can serve as a temporary tool to address lost contributions to fixed costs.

Overall, the various regulatory tools intended to affect the utility business model can play a critical role in elevating the interest in efficiency within utility companies. However our quantitative analyses suggest that utility business model tools alone have not been as successful as EERS policies in driving high levels of energy efficiency. Based on our overall experience, we believe that an important but less quantifiable effect of regulatory reforms (such as performance incentives and decoupling) may be in influencing utility management to cooperate with state policies to require cost-effective energy efficiency achievements (such as an EERS), rather than seeking to block their enactment or challenge them in legal proceedings. Therefore, these types of regulatory policies are helpful complements to EERS or similar policies that establish energy efficiency targets. These complementary policies are important for establishing a regulatory framework that addresses utility economic concerns about customer energy efficiency, which in turn is important to sustain utility efforts to capture energy efficiency resources over time.

Other policies intended in some states to facilitate efficiency as a resource include IRP. This is a long-standing, helpful analytic tool for examining efficiency as a resource. Recent progress on modeling efficiency as a resource in the IRP process highlights opportunities for further improvement. Overall, however, the enactment of an IRP policy itself has not been as successful as EERS at driving higher levels of energy savings. This is largely because IRP in most situations does not entail obligations and decisions based on the analysis results. Also, sometimes analyses have contained biases against energy efficiency resources. Similar to utility business model reforms, IRP can serve as a helpful complement or an initial step on the road to EERS or a similar policy that establishes long-term efficiency targets. The recommended use of IRP would be to examine the potential for cost-effective energy efficiency as a utility resource in an unbiased way, with the information it provides being used to help establish measurable energy efficiency targets in a framework that assures accountability for acquiring that resource.

Finally, although outside the scope of this paper, rate design is another complementary regulatory policy area that can have important implications for the long-term success of energy efficiency. The increasing prevalence of smart or advanced metering infrastructure (AMI) creates new opportunities for dynamic, time-dependent rate design, which can complement energy efficiency objectives by incentivizing customers to shift energy usage and to some extent reduce overall usage (see RAP 2012; King and Delurey 2005). On the other hand, recent proposals by utilities to increase customer fixed charges and decrease the variable usage-based charges would have the effect of reducing customer incentives to save energy. Higher fixed charges would therefore conflict with utility business model reforms and policies that encourage efficiency as a resource. Further work is needed in the area of rate design to explore the energy efficiency implications of various rate design options.

Conclusion

Our analysis of recent data shows that states achieving the highest energy savings are those with a comprehensive strategy based on the right business model and long-term energy efficiency targets aligned with that model. Energy savings targets are established through specific annual and longer-term targets for cost-effective energy efficiency (i.e., an EERS). Complementary performance incentives and decoupling policies play a critical role in elevating utilities' interest in achieving such targets. Furthermore, those complementary policies are likely essential for sustaining utility interest in capturing energy efficiency resources over time.

Energy efficiency as a resource will be paramount to a utility of the future that deploys low-carbon, distributed, and sustainable energy resources. If distributed efficiency resources increase in scale, utilities can avoid more expensive supply-side investments, reduce carbon emissions, and put more dollars into local economies. In order to achieve this vision, it is critical for states to establish regulatory policies that are proven to be effective at achieving large-scale efficiency. The results of this analysis demonstrate that policies matter for energy efficiency achievement. As states, utilities, and other stakeholders examine policy and regulatory options for utilities of the future, they should lay a strong policy foundation that gets the business model right and establishes long-term energy efficiency targets aligned with that business model.

References

Ceres. 2014. *Practicing Risk-Aware Electricity Regulation: 2014 Update.* Boston: Ceres. https://www.ceres.org/resources/reports/practicing-risk-aware-electricity-regulation-2014-update/view.

Demand Institute. 2014. *The Housing Satisfaction Gap: What People Want but Don't Have.* http://demandinstitute.org/housing-satisfaction-gap/.

Downs, A., and C. Cui. 2014. *Energy Efficiency Resource Standards: A New Progress Report on State Experience.* Washington, DC: American Council for an Energy-Efficient Economy.

Eckman, T. 2011. "Some Thoughts on Treating Energy Efficiency as a Resource." ElectricityPolicy.com. May 2. http://www.electricitypolicy.com/articles/3118-some-thoughts-on-treating-energy-efficiency-as-a-resource.

EEI (Edison Electric Institute). 2013. *Disruptive Challenges: Financial Implications and Strategic Responses to a Changing Retail Electric Business.* Washington, DC: EEI.

EIA (US Energy Information Administration). 2015. *Annual Energy Outlook 2015.* Washington, DC: EIA. http://www.eia.gov/forecasts/aeo/

EPA (U.S. Environmental Protection Agency). 2014. *Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units*. Federal Register. P. 34829 - 34958. June 18. https://www.federalregister.gov/articles/2014/06/18/2014-13726/carbon-pollution-emission-guidelines-for-existing-stationary-sources-electric-utility-generating.

Gilleo, A. 2014. "Picking All the Fruit: All Cost-Effective Energy Efficiency Mandates." In *Proceedings of the 2014 ACEEE Summer Study on Energy Efficiency in Buildings,* 8: 7-87. Washington, DC: ACEEE.

Gilleo, A., A. Chittum, K. Farley, M. Neubauer, S. Nowak, D. Ribeiro, and S. Vaidyanathan. 2014. *The 2014 State Energy Efficiency Scorecard.* Washington, DC: ACEEE.

Gilleo, A., M. Kushler, M. Molina, and D. York. 2015. *Valuing Efficiency: A Review of Lost Revenue Adjustment Mechanisms.* Washington, DC: ACEEE.

Gold, R. 2014. "Penalties in Utility Incentive Mechanisms: A Necessary 'Stick' to Encourage Utility Energy Efficiency?" Panel at the Energy Policy Institute's Fourth Annual Energy Policy Research Conference, Goldman School of Public Policy, University of California, Berkeley.

Hayes, S., S. Nadel, M. Kushler, and D. York. 2011a. *Balancing Interests: A Review of Lost Revenue Adjustment Mechanisms for Utility Energy Efficiency Programs.* Washington, DC: ACEEE. http://www.aceee.org/research-report/u111.

——. 2011b. *Carrots for Utilities: Providing Financial Returns for Utility Investments in Energy Efficiency*. Washington, DC: ACEEE. http://www.aceee.org/research-report/u114.

Hayes, S., G. Herndon, J. Barrett, J. Mauer, M. Molina, M. Neubauer, D. Trombley, and L. Ungar. 2014. *Change Is in the Air: How States Can Harness Energy Efficiency to Strengthen the Economy and Reduce Pollution.* Washington, DC: ACEEE. http://aceee.org/research-report/e1401.

IEI (Institute for Electric Innovation). 2014. *State Electric Efficiency Regulatory Frameworks.* http://www.edisonfoundation.net/iei/Documents/IEI_stateEEpolicyupdate_1214.pdf.

Khan, S., and M. Kushler. 2013. *Plug-In Electric Vehicles: Challenges and Opportunities.* Washington, DC: ACEEE.

Kihm, S. 2009. "When Revenue Decoupling Will Work . . . and When It Won't." *Electricity Journal* 22 (8): 19-28.

King, C., and D. Delurey. 2005. "Efficiency and Demand Response: Twins, Siblings, or Cousins? Analyzing the Conservation Effects of Demand Response Programs." *Public Utilities Fortnightly.* March. 54–61.

Kushler, M., E. Vine, and D. York. 2002. *Energy Efficiency and Electric System Reliability: A Look at Reliability-Focused Energy Efficiency Programs Used to Help Address the Electricity Crisis of 2001.* Washington, DC: ACEEE.

Lazar, J., and X. Baldwin. 2011. *Valuing the Contribution of Energy Efficiency to Avoided Marginal Line Losses and Reserve Requirements.* Montpelier, VT: Regulatory Assistance Project.

Lazard. 2014. *Levelized Cost of Energy Analysis: Version 8.0.* New York: Lazard. http://www.lazard.com/PDF/Levelized%20Cost%20of%20Energy%20-%20Version%208.0.pdf.

LBNL (Lawrence Berkeley National Laboratory). 2014. *The Program Administrator Cost of Saved Energy for Utility Customer–Funded Energy Efficiency Programs.* Berkeley, CA: Lawrence Berkeley National Laboratory.

Molina, M. 2014. *The Best Value for America's Energy Dollar: A National Review of the Cost of Utility Energy Efficiency Programs.* Washington, DC: ACEEE.

Morgan, P. 2012. *A Decade of Decoupling for US Energy Utilities: Rate Impacts, Designs, and Observations*. Lake Oswego, OR: Graceful Systems LLC.

Nadel, S., and G. Herndon. 2014. *The Future of the Utility Industry and the Role of Energy Efficiency.* Washington, DC: ACEEE.

Neubauer, M. 2014. *Cracking the TEAPOT: Technical, Economic, and Achievable Potential Studies.* Washington, DC: ACEEE.

Nowak, S., B. Baatz, A. Gilleo, M. Kushler, M. Molina, and D. York. 2015. *Beyond Carrots for Utilities: A National Review of Performance Incentives for Energy Efficiency*. Washington, DC: ACEEE.

NW Council. 2014. "Energy Efficiency Improvements in 2013 Add to Impressive Regional Savings." NWCouncil.org. October 7. http://www.nwcouncil.org/news/blog/energy-efficiency-saved-ratepayers-35-billion-in-2013.

RAP (Regulatory Assistance Project). 2011a. *Electricity Regulation in the US: A Guide.* Montpelier, VT: RAP.

——. 2011b. *Revenue Regulation and Decoupling: A Guide to Theory and Application.* Montpelier: RAP.

——. 2012. *Time-Varying and Dynamic Rate Design.* Montpelier: RAP.

——. 2013. *The Treatment of Energy Efficiency Integrated Resource Plans: A Review of Six State Practices.* Montpelier: RAP.

Satchwell, A., P. Cappers, and C. Goldman. 2011. *Carrots and Sticks: A Comprehensive Business Model for the Successful Achievement of Energy Efficiency Resource Standards.* LBNL-4399E. Berkeley, CA: Lawrence Berkeley National Laboratory.

SEE Action (State and Local Energy Efficiency Action Network). 2011. *Impacts of Energy Efficiency Programs on Customer Satisfaction Technical Brief.* https://www4.eere.energy.gov/seeaction/system/files/documents/ratepayer_efficiency_customersatisfaction.pdf.

Utility Dive. 2014. *2014 First Annual Report: The State of the Electric Utility.* http://www.utilitydive.com/library/2014-state-of-the-electric-utility/.

Wilson, R., and B. Biewald. 2013. *Best Practices in Electric Utility Integrated Resource Planning: Examples of State Regulations and Recent Utility Plans.* Montpelier, VT: Regulatory Assistance Project.

York, D., S. Kihm, M. Kushler, S. Hayes, S. Sienkowski, and C. Bell. 2013. *Making the Business Case for Energy Efficiency: Case Studies of Supportive Utility Regulation*. Washington, DC: ACEEE.

York, D., and M. Kushler. 2011. *The Old Model Isn't Working: Creating the Energy Utility for the 21st Century.* Washington, DC: ACEEE. http://aceee.org/white-paper/the-old-model-isnt-working.

York, D., P. Witte, S. Nowak, and M. Kushler. 2012. *Three Decades and Counting: A Historical Review and Current Assessment of Electric Utility Energy Efficiency Activity in the States.* Washington, DC: ACEEE.

Young, R., and S. Hayes. 2015. *The State and Utility Pollution Reduction (SUPR) Calculator.* Washington, DC: ACEEE.