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Carrots and Sticks: A Comprehensive Business Model for the Successful Achievement of Energy Efficiency Resource Standards

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Abstract

U.S. utilities face significant financial disincentives under traditional regulation in aggressively pursuing cost-effective energy efficiency. Regulators are considering some combination of mandated goals and alternative utility business model components to align the utility's business and financial interests with state and federal energy efficiency public policy goals. We analyze the financial impacts of an Energy Efficiency Resource Standard on an Arizona electric utility using a pro-forma utility financial model, including impacts on utility earnings, ROE, customer bills and rates. We demonstrate how a viable business model can be designed to improve the business case while retaining sizable benefits for utility customers.

Keywords: Utility Regulation; Decoupling; Energy efficiency

1. Introduction

U.S. regulators and legislators are utilizing energy savings goals in the form of energy efficiency resource standards (EERS) as a means to mandate aggressive energy efficiency (EE)

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Abbreviations: ACC=Arizona Corporation Commission; APS=Arizona Public Service; BAU=Business-As-Usual; DSM=Demand Side Management; EE=Energy Efficiency; EERS=Energy Efficiency Resource Standard; EES=Energy Efficiency Standard; FERC=Federal Energy Regulatory Commission; MOU=Memorandum of Understanding; O&M=Operations and Maintenance; ROE=Return on Equity; RPC=Revenue-Per-Customer; RPS=Renewable Portfolio Standard

savings (Barbose et al. 2009). As of December 2010, twenty-six U.S. states had some form of an EERS. Policy drivers for such mandates include offsetting potentially higher costs and environmental impacts associated with the construction of new generation resources and providing additional options for customers to control their energy costs. In the U.S., energy efficiency programs funded by utility customers are a common means of delivering these savings.

U.S. utilities face significant financial disincentives under traditional regulation in pursuing aggressive energy efficiency goals which limits the interest of shareholders and managers. Both are concerned that the pursuit of aggressive EE savings will result in reduced utility revenues, affecting the utility's ability to fully recover its fixed costs and ultimately increasing the likelihood that the utility under-achieves its authorized return on equity (ROE), and limited opportunities to expand rate base thereby foregoing earnings-generating investments. Regulators and policymakers are considering or have adopted more comprehensive business models (e.g., shareholder incentives, and/or lost revenue recovery mechanisms) to align the utility's business and financial interests with a state's public policy goals for the electricity sector (e.g., increased efficiency, reduced emissions).[1]

In establishing energy efficiency goals and targets, policymakers and legislators in the U.S. can utilize varying combinations of "sticks" and "carrots". At one extreme is a "stick-only" approach, whereby utilities must meet mandated energy savings targets or face financial penalties. This approach is common in many U.S. states that have adopted a Renewable Portfolio Standards (RPS) with an alternative compliance payment provision if a utility does not

[1] The National Association of Regulatory Utility Commissions (NARUC) resolved in July 2004 "to address regulatory incentives to address inefficient use of gas and electricity" in a resolution supporting efficiency.

achieve renewable energy goals.[2] However, this "stick-only" approach (i.e., mandate with penalties) is much less common in the U.S. for energy efficiency.[3] As a practical matter though, because of financial disincentives, some U.S. utilities would characterize an energy savings mandate (i.e., EERS) absent the ability to recover fixed costs as a "sticks only" approach. In the U.S., utility energy efficiency programs have been most successful in those states that utilize a "sticks-and-carrots" approach, combining a mandated savings goal or target with a comprehensive business model (see Croucher 2011).

This study examines (1) the customer bill and rate impacts, and (2) the shareholder earnings and return on equity impacts when a utility achieves aggressive energy savings due to the existence of an EERS. Our analysis will compare a "stick-only" approach of mandated energy savings goals to a "sticks-and-carrots" approach that includes a comprehensive business model. We model our analysis based on the Arizona Energy Efficiency Standard (EES), which directs Arizona investor-owned utilities to achieve 22% cumulative energy savings by 2020.[4] We provide a long-term assessment of impacts on ratepayers and shareholders from energy efficiency programs that achieve these savings reduction targets (about 2% per year) through 2020 with impacts over a 20-year time-horizon (2011-2030) to fully capture the benefits over the economic lifetime of the installed EE measures.

We characterize and model Arizona Public Service (APS), which is the largest investor-owned utility in Arizona, and analyze two EE portfolios: (1) a "business-as-usual" (BAU) EE scenario as if the EES was **not** enacted and APS continues on its pre-existing EE savings path of approximately 1% annual savings; and (2) an EES scenario as if APS meets the EES savings

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[2] A Renewable Portfolio Standard (RPS) is a regulation requiring a certain percentage of energy come from renewable energy sources.
[3] Pennsylvania is an example of a state with an EERS with a financial penalty provision; currently utilities do not have an opportunity to earn an incentive for successful achievement of energy efficiency targets or to recover lost revenues.
[4] Arizona Corporation Commission. *In the Matter of the Notice of Proposed Rulemaking on Electric Energy Efficiency*. Decision No. 71819. Docket No. RE-09-0427. August 10, 2010. An Energy Efficiency Standard (EES) is the same as an Energy Efficiency Resource Standard (EERS).

targets of about 2% annual savings.[5] We examine issues from a customer perspective – impacts of the EES on aggregate customer bills and rates compared to the "business as usual" case. We also analyze issues from the perspective of utility shareholders and managers and assess the effects on earnings and ROE of the EES compared to the "business as usual" case with and without a comprehensive business model (e.g., a revenue-per-customer decoupling mechanism and a shareholder incentive mechanism).

The remainder of the paper describes the comprehensive business model, discusses the study approach (including the utility financial characterization, EE portfolios, and ratepayer and shareholder impact scenarios), presents analysis results, and concludes with key findings and policy discussion.

2. Comprehensive Business Model

The traditional electric utility business model in the U.S. provides a financial incentive for increasing electricity sales and making investment in supply-side generation. The traditional approach to utility regulation, also known as "rate-of-return" regulation, is predicated on the notion that regulated monopolies, who are the sole provider of retail electric service in a geographic area, should charge a price to customers that would prevail in a competitive market where multiple firms would provide such a service. Regulators in the U.S. establish a utility's tariff (i.e., rates), based on forecasted sales and its existing and forecasted costs, including a return on investment, in a rate case proceeding. Once rates are established, the utility may improve its financial performance between rate cases by either increasing sales above those forecasted and/or managing its costs. This financial incentive comes in the form of increased revenues and/or lower costs, respectively, and hence larger profits (if revenues grow faster than

[5] The specific provisions of the Arizona EES allow utilities to take some credit for energy efficiency measures installed prior to 2011 (starting in 2016), demand response programs, and the effects of improved building codes as part of complying with their savings target.

costs), as well as a guaranteed return on supply-side investments that are utilized to serve increasing demand.

Conversely, a utility may experience financial harm when sales decrease between rate cases. Because a utility's revenues are a function of the regulated price for energy and its sales to customers, any downward change in sales from the forecasted level results in reduced utility revenues. The pursuit of energy savings exists then as a disincentive to the investor-owned utility as it directly impacts and reduces the utility's collected revenue and hence profitability between rate cases (again only if revenue reductions outpace cost savings) through decreased sales while deferring investment in supply-side generation. Despite the clear benefits of EE to ratepayers and society as a whole, there is a bias among U.S. investor-owned utilities against the pursuit of energy savings under the traditional regulatory model (Jensen 2007).

A regulatory or legislative energy savings mandate (e.g., EERS) may adversely affect utility earnings opportunities under traditional regulation; thus a viable business model is needed to encourage utilities to capture the societal benefits of energy efficiency, delivering benefits to customers, while ensuring that profitability can in fact come from EE investment (see Moskovitz, 1989; Hirst et al., 1991; Hirst and Black, 1994; Harrington et al., 1994; Golove and Eto, 1996).

There are three components of a comprehensive EE business model, from the utility perspective: recovery of prudently-incurred program costs, collection of lost revenues associated with EE savings (the portion of lost revenues that would be used to recover authorized fixed costs), and the development of a shareholder incentive. If a regulator approves only a subset of the three components, the effectiveness of any component may be undermined (Hayes et al. 2011). To whit:

1. ***Ensure cost recovery***. The recovery of program costs is intended to allow the utility to fully offset the costs of implementing and administering EE programs. When U.S. utilities initially offered energy efficiency programs in the late 1970s and early 1980s, some state regulatory commissions did not have statutory authority to grant energy efficiency program cost recovery.[6] From the late 1980s to the early 1990s, some utilities did not recover all of their energy efficiency program costs because commissions disallowed expenses for a variety of reasons. Since then, utilities request and regulatory authorities often provide guidance on the cost recovery mechanism that utilities can use to contemporaneously recover program costs associated with administering energy efficiency programs. In many cases, regulatory authorities allow and authorize utilities to expense their program costs incurred in situations where the regulatory authority has reviewed and approved an EE plan; this approach is designed to mitigate the risk that the utility will not fully recover prudently incurred EE program expenses in a timely fashion.

2. ***Reduce the disincentive***. The utility must have sufficient revenues to cover its system costs. A utility's past investments in their generation, transmission, and distribution systems are recovered through current and, to some degree, future retail rates based on a forecast of energy sales, among other things. As discussed earlier, any decrease in forecasted sales between rate cases, because of, for example, energy savings from energy efficiency programs, may result in a reduction in utility revenues. Regulators may approve the collection of those revenues lost due to the decline in sales in order to

[6] For example, Washington State had to secure an amendment to the State Constitution to grant public utilities the authority to invest money in private residences and businesses for the purposes of improving efficiency.

insulate the company from being unable to recover its fixed, non-fuel costs, thereby making the utility financially indifferent to a change in sales from EE. Decoupling is a common form of lost revenue recovery mechanism and is designed to remove the link between sales and revenues by establishing a determined amount of revenues the utility may collect for a set period of time, regardless of sales levels (Eto et al. 1997).

3. ***Provide a shareholder incentive***. The intent of a shareholder incentive is to provide a utility with an opportunity for additional earnings if it is successful in achieving aggressive savings goals and to make energy efficiency a potential business "profit center" for the utility. Supply-side investments are often much larger than dollars spent on EE and utilities can account for such investments in its rate base, or value of utility property, and earn a return on the investment. This presents a potential bias towards such investments, as utilities may find the supply-side investment more attractive when compared to energy efficiency investments that typically are not part of ratebase. If a utility does not receive regulatory approval to implement a shareholder incentive but has a pre-existing incentive to make investments in supply-side generation, the utility will tend to prefer supply-side investments that provide greater earnings opportunities.

Shareholder incentives and lost revenue recovery mechanisms have seen increased attention in recent years at the federal and state levels. The American Recovery and Reinvestment Act of 2009, passed in February 2009, included additional state energy grant opportunities if the state regulator has sought to implement a policy that aligns financial incentives for electric utilities to vigorously pursue cost-effective energy efficiency opportunities. At the state-level, 31 states have currently enacted some sort of lost revenue recovery and/or shareholder incentive mechanism. Of those states who lead the U.S. in energy efficiency program spending, eight of the top ten have implemented a combined shareholder incentive and lost revenue recovery mechanism (Molina et al 2010).

3. Approach

We used a pro-forma, spreadsheet-based financial model adapted from a tool (Benefits Calculator) constructed to support the National Action Plan for Energy Efficiency (Cappers et al. 2009a). This model builds on previous Lawrence Berkeley National Laboratory work on shareholder incentives (Cappers et al. 2009b, 2009c, 2010) by characterizing the effects of an EERS. The major steps in our analysis are depicted in Figure 1.

The first step is to identify the main inputs ("Model Inputs"): (1) a characterization of the utility which includes its initial financial and physical market position, a forecast of the utility's future sales, peak demand, and resource strategy and estimated costs to meet projected growth; and (2) a characterization of the demand side management (DSM) portfolio – projected electricity and demand savings, costs and useful lifetime of a portfolio of energy efficiency and demand response programs that the utility is planning or considering implementing during the analysis period.

The second step is to identify the scenarios of interest for the analysis ("Scenario Analysis"). These scenarios include a base case that maintains the current portfolio of DSM programs ("Business-As-Usual (BAU)") as well as alternative scenarios that include different energy efficiency and demand response resource savings levels and alternative business models ("With DSM").

The third step is to define the characteristics of the DSM business model of interest ("DSM Business Model"), determining what components will be included (e.g., DSM program cost recovery, lost fixed cost recovery and/or shareholder incentives).

The model provides outputs in the form of common stakeholder metrics ("Model Outputs"): (1) shareholder metrics include ROE and total earnings; and (2) ratepayer metrics include estimated retail rates and total customer bills for each year of the study period. Model outputs from various scenarios that differ by the level of achieved DSM savings and costs, application of alternative DSM business models, etc. can be compared to assess changes in utility earnings, ROE, average retail rates, and customer bills. The Benefits Calculator model also estimates total DSM resource costs and benefits of the DSM portfolio ("DSM Resource Costs & Benefits") using a forecast of avoided capacity and energy costs.

4. Modeling Characteristics

4.1 Utility characterization

We developed a long-range load and cost forecast to 2030 for Arizona Public Service (APS) using historic information from the US Federal Energy Regulatory Commission (FERC) Form 1 and the utility's 2009 general rate case data. This information was used to construct an expected relationship between growth in peak demand and growth in costs, which was reviewed by APS staff and served as the basis for our analysis.[7]

According to our utility characterization, APS has retail sales of ~30,000 GWh and a peak demand of ~6,470 MW in 2011, which are forecasted to grow at a compound annual rate of 2.9% and 3.1% per year, respectively over a 20-year time horizon (excluding energy efficiency programs). The utility has ~1.1 million customers in 2011 and expects significant customer

[7] These assumptions and results were presented twice to the ACC and were verified on the record with the utility.

account growth of 2.7% per year. With such fast growing electricity requirements, our utility characterization projects that the utility's non-fuel expenses, inclusive of return of and on capital expenditures and operations and maintenance (O&M)[8] expenses associated with new generation assets, will increase in excess of 5% per year. Increases in non-fuel expenses are reflected in retail rates after the Arizona Corporation Commission (ACC) has issued an order in a general rate case or other regulatory filing.[9] However, revenue growth between rate cases is not anticipated to keep pace with the ~5% annual growth in non-fuel expenses.[10] Thus, our characterization of APS implies that the utility would be unable to achieve its authorized ROE of 11%. This is a case of significant utility under-earning prior to the achievement of aggressive EE savings. Without a decoupling mechanism to mitigate the revenue erosion between rate cases, we assume that the utility would file a rate case triennially (i.e., every third year) to reduce the detrimental impact on shareholder returns.[11]

4.2 Demand side management portfolio characterization

Arizona utilities reported electricity savings of ~0.53% of retail sales in 2008, which places Arizona near the national average among U.S. utilities in pursuing energy efficiency (Molina et al. 2010). However, in 2010, the state's policymakers established energy savings goals that are currently among the most ambitious in the United States. In July 2010, the ACC established an EES which required electric utilities to achieve 22% cumulative savings in 2020.[12]

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[8] Operations and maintenance (O&M) costs are those necessary to operate and provide ongoing maintenance of a utility power system which may be fixed or variable in nature. They do not, however, include fuel-related expenses to generate or purchase electricity, costs associated with investment in plant upgrades or new plant, or local, state and federal taxes.

[9] Fuel and purchased power costs are passed through to APS customers annually through a fuel adjustment clause (FAC) and so are modeled as if they are completely collected in the year they are incurred.

[10] APS receives additional base revenues as the number of customer accounts increase each year (2.7% per year) and/or as customers increase their electricity usage; although revenues from retail rates increase at a slower rate than expected non-fuel costs.

[11] APS is assumed to use a historic test year in their rate case filings. Generally there is a two-year lag between the time a general rate case is filed and the time the ACC issues an order setting retail rates.

[12] Arizona Corporation Commission. In the Matter of the Notice of Proposed Rulemaking on Electric Energy Efficiency. Decision No. 71819. Docket No. RE-09-0427. August 10, 2010.

Annual savings targets are set at 1.25% in 2011 and accelerate to 2.5% per year in 2016-2020.[13] We have constructed two EE portfolios; the first captures the pre-existing level of energy efficiency activity and savings (i.e., BAU with EE) and a second scenario that includes the required energy efficiency program savings goals under the new EES (see Figure 2).

The first energy efficiency portfolio represents a BAU with EE case as if Arizona had not passed the EES but simply continued on its pre-existing path of capturing energy efficiency savings of ~1% annually on a nominal 2010 budget of $43M.[14] In this BAU scenario, the utility achieves 43,581GWh of electricity savings between 2011 and 2030.[15] We estimate that this EE portfolio provides ~$946M[16] in net resource benefits between 2011 and 2030 (see Table 1).[17] Program administration and measure costs are assumed to grow at a nominal annual rate of 4.3% for residential EE programs and 4.8% for non-residential programs.

The EES portfolio represents savings and expenditure levels based on utility compliance with the Arizona EES. Under this aggressive scenario, cumulative annual electricity savings exceed 7,000 GWh in the year 2020 when accounting for EES requirements and credits (see Figure 3). The utility achieves 95,002 GWh of electricity savings between 2011 and 2030. The EES portfolio has a total resource cost of ~$2.2B and produces $3.6B in resource benefits, thus providing $1.4B in net resource benefits (see Table 1).

We constructed the portfolios based on typical program costs to achieve the established savings levels. In the BAU with EE portfolio, average EE costs were estimated at ~1.9

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[13] There are several provisions in the regulation that allow credits for pre-standard energy savings beginning in 2016, a credit for improvements in building codes, and a credit for demand response savings.
[14] APS had an existing level of EE savings determined as part of a settlement agreement in its most recent rate case, which established an annual savings goal of 1.0%, 1.25%, and 1.5% in 2010, 2011, and 2012, respectively. We assumed APS returned to 1.0% annual savings level in 2013-2020.
[15] A decision was made to implement energy efficiency programs for a ten year period (2011-2020) but allow the analysis period to extend out twenty years (2011-2030). This was done so the benefits derived from expenditures on energy efficiency measures implemented could be fully captured in the model time horizon.
[16] All dollar figures are reported on a present value basis using a societal discount rate of 4.0%.
[17] In the calculation of resource benefits, we include the avoided cost of energy, avoided cost of generation capacity, and avoided cost of transmission and distribution capacity and exclude non-electric benefits (e.g., water savings, avoided alternative fuel savings). We also do not include the shareholder incentive or the lost fixed cost recovery mechanism in estimating resource costs.

cents/lifetime-kWh. Given the increase in savings levels in the EES portfolio, we estimated that average EE costs would increase to ~2.8 cents/lifetime-kWh.[18] The costs associated with the EES portfolio is quite attractive compared to supply-side alternatives. In both portfolios, 50% of electric savings comes from residential programs in 2011 and the share decreases as we assume more savings will have to come from commercial and industrial EE programs over time. In Arizona, savings from residential lighting programs are projected to decrease due in large part to federal lighting standards set to change in 2012.[19]

4.3 Utility business model for energy efficiency

Historically, utilities in Arizona have been allowed to recover prudently incurred EE program costs; thus, program costs were modeled as a component of the utility revenue requirement. The ACC has also previously approved a shareholder incentive for APS for the successful achievement of target EE savings. The incentive is capped at 14% of program costs, on a pre-tax basis. We modeled the shareholder incentive at the approved amount and assumed the utility would achieve 100% of its targeted energy savings. We included both the program cost recovery and shareholder incentive business model components in the initial analysis of the BAU with EE and EES portfolios.

Given the magnitude of the mandated energy efficiency savings in Arizona, revenue erosion will likely become a major concern for the state's utilities if they achieve the EES savings goals. At the time of our analysis, the ACC was considering allowing utilities to implement a decoupling mechanism to support recovery of authorized fixed costs. Based on discussions with the ACC, we decided to apply a revenue-per-customer (RPC) decoupling

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[18] The estimated program cost per lifetime kWh saved is averaged over the 2011-2020 period. EE program costs increase from ~1.5 cents/lifetime-kWh in 2011 to 4.0 cents/lifetime-kWh in 2020 in nominal terms.
[19] Our EE portfolio savings and costs were reviewed and vetted by APS and are consistent with the utility's typical program offerings.

mechanism. An RPC decoupling mechanism is designed to recover the utility's required revenues on a per-customer basis. The decoupling mechanism was applied only in the EES case to make the utility financially indifferent between the pursuit of the EES goals or lack thereof (relative to the BAU with EE).[20] When paired with a shareholder incentive mechanism, this comprehensive business model may provide an opportunity for the utility to realize additional earnings and/or a higher ROE from the successful achievement of the aggressive energy efficiency savings goals.

5. Results

Our analysis suggests that the EES portfolio provides substantial ratepayer bill savings at relatively modest rate increases.[21] If APS achieves the savings targets in the EES, then ratepayers would realize about $4.6B of customer bill savings between 2011 and 2030 (see Figure 4). These incremental bill savings are in addition to the bill savings that customers realize from participating in the existing energy efficiency programs offered by the utility in the BAU case (~$4.3B) and are also net of the costs of energy efficiency programs (e.g., costs of administering the program, incentives to customers). It is important to note that ratepayers, as a whole, begin to see bill savings starting in 2016 as new generation plants begin to be deferred and fuel costs are reduced (see Figure 4). This trend in aggregate bill savings occurs for two reasons. First, the utility cost savings associated with these energy efficiency portfolios (e.g. reduced fuel costs and lower capital and O&M requirements for new generation) take time to develop and inure to ratepayers (based on the timing of general rate case filings) sufficient to offset the annual EE program expenditures. Second, the costs of the energy efficiency programs

[20] We did not include a decoupling or lost revenue recovery mechanism in the BAU with EE case based on discussions with ACC and Arizona utilities.

[21] The Benefits Calculator model used to perform this analysis only provides aggregate ratepayer effects; thus rate and bill impacts can not be broken out separately for participants in the EE program or non-participating customers.

are expensed during each program year, while the energy savings and other benefits accrue over the lifetimes of the measures.[22] Thus, in this situation, a short-term analysis might not fully capture the bill reductions that would occur over time and inure to consumers as a whole, depending upon the time horizon chosen.

Customer rate impacts from energy efficiency increase as savings levels rise. This is primarily a function of the decline in sales being higher than the reduction in revenue requirement from the achieved EE savings.[23] In the EES portfolio, annual rates are ~1.0 cents/kWh higher, on average, than in the BAU with EE portfolio (see Figure 5). There is an observed increase in retail rates while DSM programs are being offered (2011-2020) and a decrease in retail rates when DSM programs costs are no longer incurred and the savings from EE accrue to ratepayers.

If the regulators adopt a "stick-only" approach, they would establish energy savings goals that the utility must achieve and only provide for recovery of energy efficiency program costs. The utility's base earnings and base ROE for each scenario in Figure 6 and Figure 7 reflect this "stick only" approach in which the utility is only allowed to recover the costs of energy efficiency programs, but is not allowed to recover "lost revenues" associated with energy efficiency or provided an opportunity for additional earnings if they achieve energy efficiency savings targets. In the "business as usual" case (which includes the current level of energy efficiency programs), utility base earnings are about $2.52B between 2010 and 2030 (see Figure 6). In the EES scenario, the utility achieves base earnings of $2.23B, which is ~$290M lower than the BAU with EE case. This illustrates the point that a utility which achieves aggressive

[22] Bill savings also increase after 2020 because DSM program costs are no longer incurred while savings from measures installed continue to yield savings over their economic lifetime (assumed to be 10 years for the entire portfolio of measures) and reduce customer bills.

[23] All-in retail rates are a function of the utility's revenue requirement in the numerator and sales in the denominator. Mathematically, a unit decrease in the numerator will decrease the fraction while a unit decrease in the denominator will increase the fraction, ceteris paribus. In this case, both the numerator and denominator are being reduced. In percentage terms, electricity sales (denominator) are dropping much faster than the revenue requirement (numerator), so retail rates (the fraction) will increase.

EES goals will end up with lower earnings compared to a BAU case. A similar trend is observed with respect to the impacts on the utility's return on equity (ROE). The achieved ROE for APS is much lower (~7%) than its authorized ROE (11%); APS is under-earning the authorized ROE by ~400 basis points based on our analysis.[24] The utility is experiencing significant under-earnings as a result of the lag in years between when a request for rate change is filed with regulators and when the regulators approve the rate increase (i.e., regulatory lag), as well as non-fuel costs are increasing at a much faster rate than revenue collections. In addition to these pre-existing impacts on utility earnings, aggressive EES goals exacerbate the impact on the utility's ROE in the absence of a comprehensive business model. The utility's base ROE is 75 basis points lower if it achieves the EES savings goals compared to the BAU case, 6.73% vs. 7.48% (see Figure 7).

Utility shareholders are concerned about the impact of aggressive EE programs on their earnings and ROE, especially considering the degree to which the utility is already under-earning relative to authorized levels. We consider a "stick-and-carrots" approach by implementing a comprehensive business model to address shareholder concerns. Under the EES portfolio, the utility's returns are reduced even further, by 75 basis points and $290M in earnings, but the shareholder incentive mechanism only adds back 34 basis points and $110M in earnings. Without the introduction of some sort of decoupling or lost revenue recovery mechanism as part of a more comprehensive utility EE business model, it is unlikely the utility would voluntarily attempt to achieve the EES savings goals.

The implementation of an RPC decoupling mechanism would allow the utility to achieve nearly comparable shareholder returns under an EES compared to the BAU with EE case. The decoupling mechanism would increase earnings by ~$150M and ROE by 45 basis points, which

[24] Basis points are used to denote the change in a financial metric. For example, a 100 basis points drop in ROE is equal to a 1% reduction in return on equity.

becomes a more lucrative component of the comprehensive business model than the performance incentive.

The incremental cost of the RPC decoupling mechanism to ratepayers would be ~$320M, or a 0.9% increase in customer bills, between 2011 and 2020, and would raise all-in retail rates on average by ~1.5 mills/kWh (or 1.0%). Even with this additional recovery by the utility, ratepayers as a whole would still realize significant incremental bill savings under the EES portfolio of $4.6B in aggregate.

6. Discussion

This study provides some insights for policymakers and regulators interested in pursuing aggressive EE goals. While this analysis was specific to a U.S. regulatory context, utilities that operate under a similar regulatory structure in which earnings (and the utility's profitability) increases as energy sales increase would have a bias against energy efficiency (because of the impact of energy savings on revenues from sales). As nations around the world begin to consider and/or mandate aggressive EE policy goals, it becomes vitally important for policymakers to consider comprehensive business models in order to mitigate potential utility financial impacts. Our case study of a large Arizona utility suggests that an aggressive EE portfolio can provide significant benefits to ratepayers and also demonstrates that regulators, utilities, and other stakeholders can align the financial interests of utilities with broader governmental energy policy goals.[25]

Our analysis shows significant under-earning by a large utility, prior to the implementation of very aggressive energy savings goals. This under-earning is due to two important factors: significant regulatory lag and high projected growth in non-fuel costs.

[25] The ACC unanimously approved a decoupling policy statement on December 15, 2010 establishing guidelines for an electric utility's decoupling mechanism based in large part on the results of this analysis. See ACC Docket No. E-J-08-0314.

Regulatory lag creates long periods of time in which the utility sees costs grow, but cannot increase rates outside of rate cases to cover the increasing costs. Projections of significant increases in non-fuel costs is not unique to the Arizona context; many U.S. utilities report substantial cost pressure (e.g., large increases in health care costs for employees, “stickiness” of wages, and difficulties in reducing workforce due to union contract terms and conditions). It is important to note, therefore, that the utility must address factors contributing to under-earning even in the pursuit of energy savings goals.

Our results further demonstrate that the implementation of an appropriately designed RPC decoupling mechanism may allow a utility to achieve nearly comparable shareholder returns under an EES compared to its “business-as-usual” pursuit of energy efficiency, yet the utility still faces significant under-earning. Consumer advocates posit that decoupling reduces the utility incentive to manage its costs between rate cases. Our analysis, however, suggests that a utility with an aggressive EE savings target and a decoupling mechanism applied as designed herein still has a significant financial incentive to become more efficient by better managing its non-fuel costs.

We presented a comprehensive business model to achieve aggressive energy savings that assumes that utilities administer energy efficiency programs funded by their customers. It is important to note that a number of U.S. states, and other countries, have chosen other types of entities and organizations besides utilities to administer ratepayer-funded energy efficiency programs. There are two other types of administrative models that have emerged. First, some states have chosen an existing governmental agency to act as the program administrator (e.g., New York Energy Research and Development Authority) or have created a new agency or non-profit corporation (e.g., Energy Trust of Oregon). In these states, the state agency administering the energy efficiency programs has signed a Memorandum of Understanding (MOU) with the state regulatory commission which establishes a multi-year contract and performance period. If the state agency fails to effectively administer and deliver ratepayer-funded EE programs, the regulatory commission has the option of terminating and/or not renewing the MOU with the state agency. Second, other states have selected and signed multi-year contracts with third-parties, either non-profit or for-profit companies, which have been selected through competitive solicitations to administer ratepayer-funded EE programs. In the states that have utilized this approach (e.g., Vermont, Hawaii, Wisconsin, New Jersey), the third party program administrator typically has the opportunity to earn a performance incentive included as part of their contract (typically at levels that are between 1-4% of program costs) for successfully meeting program goals or targets It should be noted, however, that non-utility administration does not address the financial impacts of energy efficiency on the utility from declining sales between rate cases.[26] It is vital, therefore, that a successful business model for energy efficiency must take into account and balance the interests of all stakeholders.

7. Conclusion

This analysis quantifies the impacts on ratepayers and shareholders when a state like Arizona mandates aggressive energy efficiency goals: ~2.0% savings as percent of annual retail sales through ratepayer-funded programs offered by its electric utilities. We focus on the ability of a comprehensive business model, including program cost recovery, decoupling to support fixed cost recovery, and a shareholder incentive, to align the interests of utility shareholders and managers with the state's public policy goals (i.e., achieving aggressive EE savings targets).

[26] See Blumstein (2010) and Cappers et al. (2009a) for a further discussion of the conceptual framework of the energy efficiency business model.

The portfolio of energy efficiency programs included in the EES is an attractive, relatively low-cost resource for Arizona utility customers. We estimate that the portfolio of EE programs that meets EES goals would provide ~$1.4B in net resource benefits over the analysis period (2011-2030). Customer bills would be about $4.6B lower (or 5.9%) over the lifetime of installed measures (2011-2030) compared to the "business as usual" case that includes the pre-existing path of EE savings.[27] These bill savings account for and are net of any rate increases necessary to fund the increased energy efficiency efforts. Rates are modestly increased by ~1.0 cents/kWh higher, on average, than in the pre-existing case.

Our analysis also suggests that the utility faces significant erosion in earnings and a lower ROE as more aggressive energy efficiency programs are implemented. Without the effect of an RPC decoupling mechanism, utility earnings are ~$220M lower under the EES scenario compared to the BAU with EE scenario. Our analysis, however, shows that it is possible to design an RPC decoupling mechanism that allows the utility to effectively remove the impacts on the utility's achieved ROE from the lower sales and thus reduced recovery of fixed costs. With the implementation of an RPC decoupling mechanism designed in this fashion along with a shareholder incentive that provides the Arizona utility with 14% of program costs on a pre-tax basis, shareholder returns (i.e., ROE) would be comparable to the BAU with EE scenario. The implementation of this type of decoupling mechanism would only slightly increase average all-in retail rates by ~1.0%.

Acknowledgements

[27] Net resource benefits are a metric of societal benefits from the DSM portfolio. The BC model calculates net resource benefits as the administratively determined avoided energy and avoided capacity benefits minus the utility program costs and installed costs of the energy efficiency measures. Customer bill savings are a metric for the impact on customers when a utility achieves aggressive energy savings. The BC model calculates customer bill savings as the actual benefits of avoided energy and capacity expenditures net of any rate increases to customers to pay for the increased energy efficiency.

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Table 1

Lifetime savings, resource costs and benefits of alternative energy efficiency portfolios (2011-2020)

Case	Portfolio Lifetime Savings				Total Resource ($M, PV)		
	Peak Energy (GWh)	Off-Peak Energy (GWh)	Total Energy (GWh)	Peak Demand (MW)	Benefits	Costs	Net Benefits
BAU w/EE	30,507	13,074	43,581	602	1,675	729	946
EES	75,664	19,338	95,002	1,520	3,616	2,208	1,408

Figure 1

Flowchart for analyzing impacts of portfolio of energy efficiency programs on stakeholders

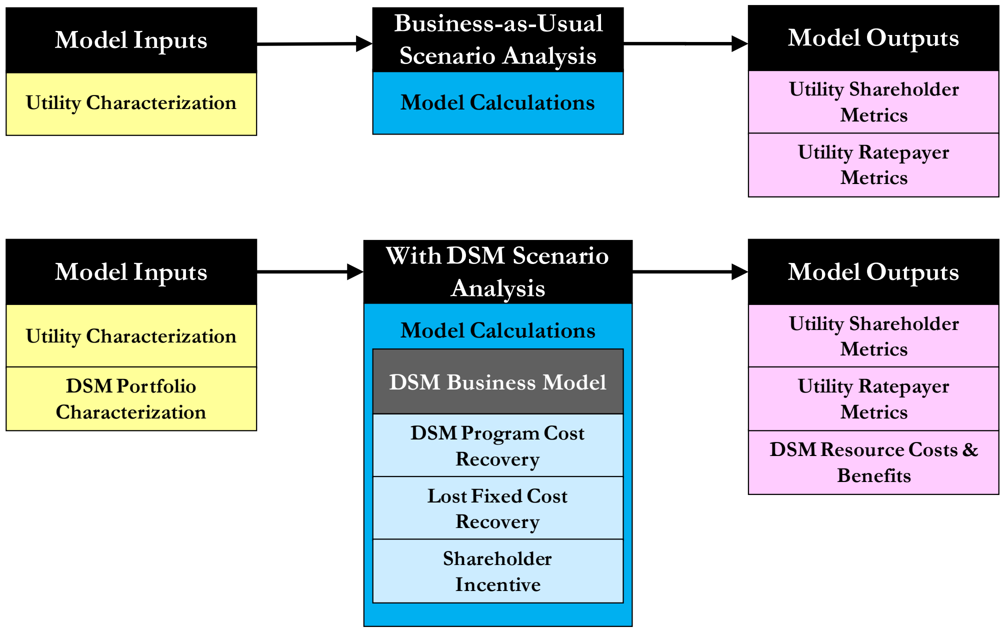


Figure 2

Effect of energy efficiency portfolios on Arizona utility load forecast

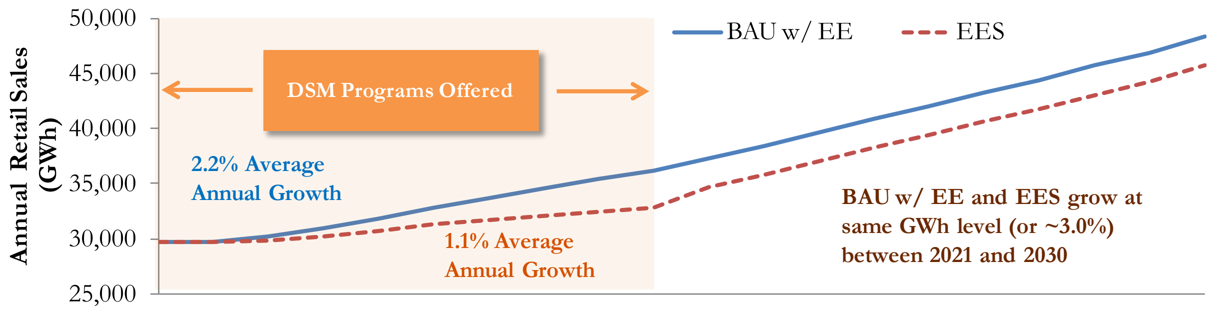
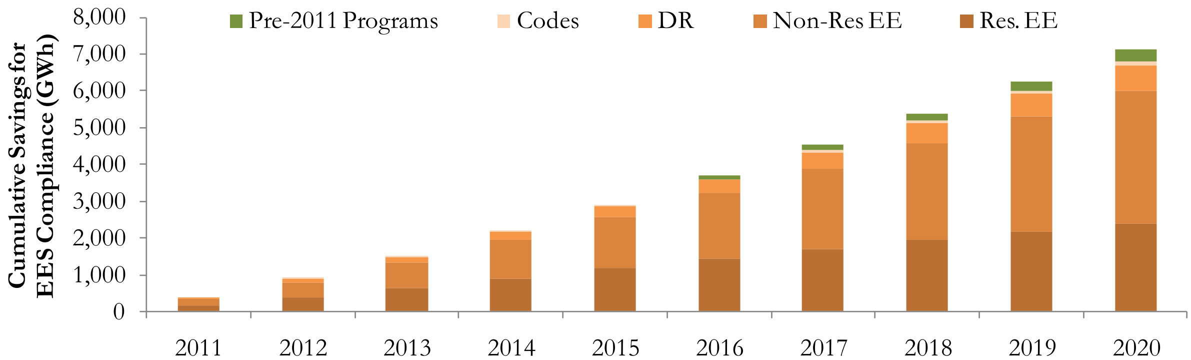


Figure 3

Cumulative savings from Energy Efficiency Standard for Arizona Public Service Company



EES *(% of Prior Years Sales)*	**1.25%**	**3.00%**	**5.00%**	**7.25%**	**9.50%**	**12.00%**	**14.50%**	**17.00%**	**19.50%**	**22.00%**

Figure 4

Ratepayer bills and bill savings of Arizona Public Service Company customers

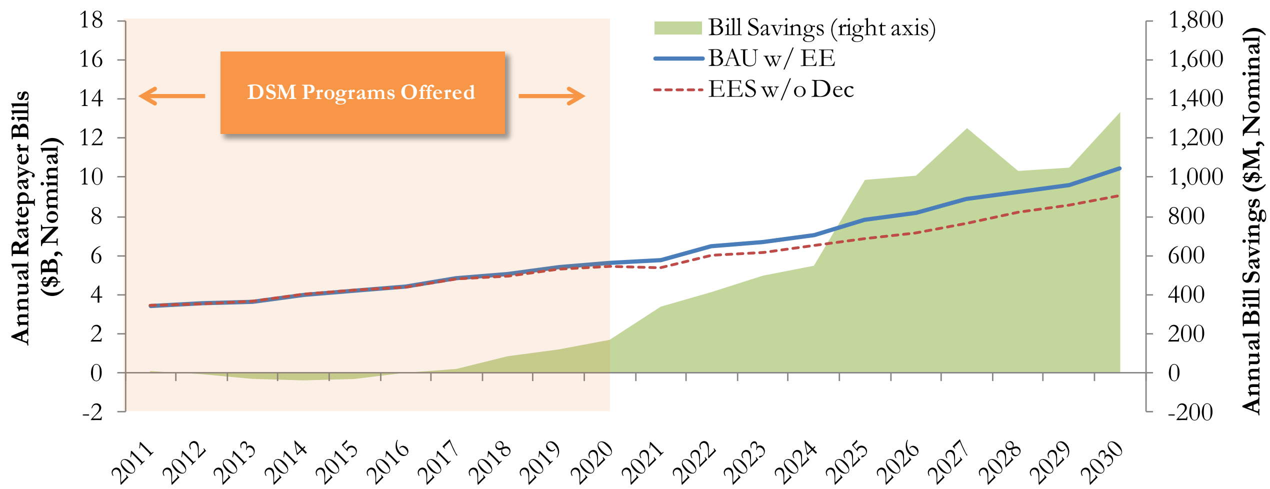


Figure 5

Impact of EES portfolio on all-in retail rates of Arizona Public Service Company customers

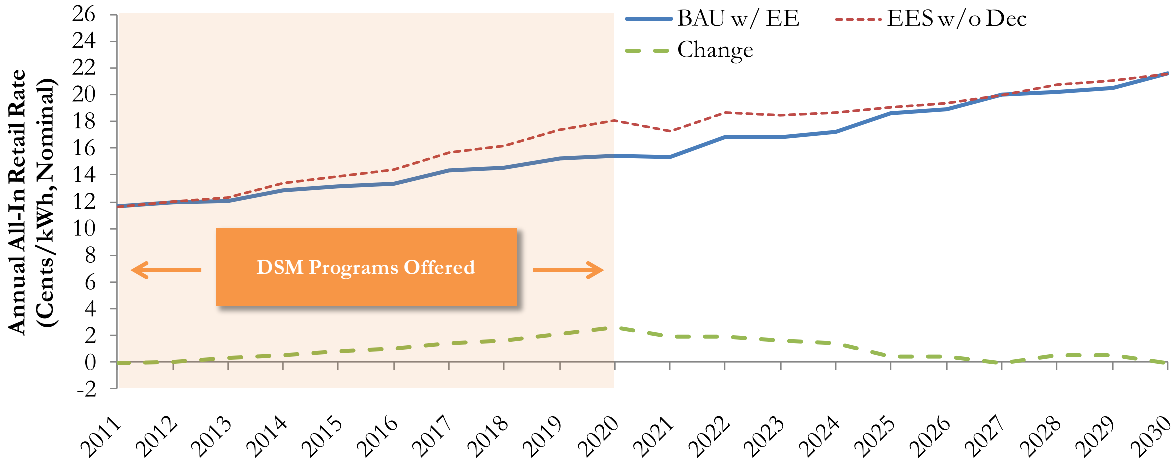


Figure 6

Impact of a comprehensive energy efficiency business model on utility earnings

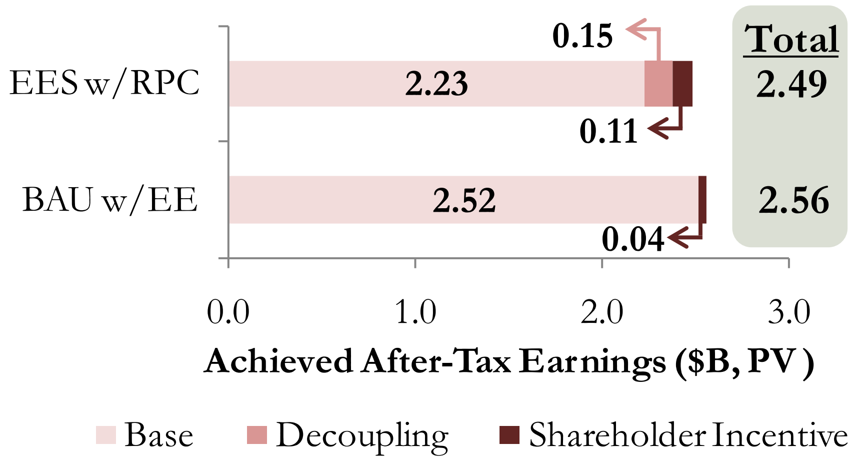


Figure 7

Impact of a comprehensive energy efficiency business model on utility ROE