Quantitative Financial Analysis of Alternative Energy Efficiency Shareholder Incentive Mechanisms

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ABSTRACT

Rising energy prices and climate change are central issues in the debate about our nation's energy policy. Many are demanding increased energy efficiency as a way to help reduce greenhouse gas emissions and lower the total cost of electricity and energy services for consumers and businesses. Yet, as the National Action Plan on Energy Efficiency (NAPEE) pointed out, many utilities continue to shy away from seriously expanding their energy efficiency program offerings because they claim there is insufficient profit-motivation, or even a financial disincentive, when compared to supply-side investments.

With the recent introduction of Duke Energy's Save-a-Watt incentive mechanism and ongoing discussions about decoupling, regulators and policymakers are now faced with an expanded and diverse landscape of financial incentive mechanisms, Determining the "right" way forward to promote deep and sustainable demand side resource programs is challenging. Due to the renaissance that energy efficiency is currently experiencing, many want to better understand the tradeoffs in stakeholder benefits between these alternative incentive structures before aggressively embarking on a path for which course corrections can be time-consuming and costly.

Using a prototypical Southwest utility[1] and a publicly available financial model, we show how various stakeholders (e.g. shareholders, ratepayers, etc.) are affected by these different types of shareholder incentive mechanisms under varying assumptions about program portfolios. This quantitative analysis compares the financial consequences associated with a wide range of alternative incentive structures. The results will help regulators and policymakers better understand the financial implications of DSR program incentive regulation.

Introduction

Recent increases in fuel and capital construction costs as well as heightened awareness of the detrimental environmental and climate impacts from the energy sector are currently pushing many state commissions and policymakers towards aggressively pursuing energy efficiency as a way to mitigate demand and energy growth, diversify the resource mix with less future reliance on fossil fuels, and provide an alternative to building new, costly generation. Increasing energy efficiency is also being proposed as a way to reduce total energy and energy service costs for customers and to mitigate the effects of rising energy prices. Yet, as the National Action Plan

[1] The prototypical utility developed for this analysis has characteristics that approximate utilities located in the Southwest U.S., with higher than average growth rates in customers, energy sales, peak demand, and non-fuel O&M costs.

for Energy Efficiency (NAPEE 2007) pointed out, utilities continue to shy away from seriously expanding their program offerings because they claim there are insufficient opportunities for earnings and financial disincentives when compared to supply-side investments. Many states and utilities have already embarked on a path that would greatly increase the funding for energy efficiency programs over the next several years. Estimated energy efficiency spending in 2007 was $2.6 billion compared to less than $1 billion in 1998 (York and Kushler 2006; CEE 2007). Several states (e.g., CA, RI, CT, MN, MA) have passed legislation requiring the acquisition of all available cost-effective energy efficiency, and some states and utilities are proposing to increase the savings from already-effective existing programs by two to three times. Some of the leading states in energy efficiency, which generally achieved annual program energy savings equivalent to about 1% of retail energy sales, are proposing to increase annual energy savings to 2.5% to 3% of retail energy sales.

As the electric sector strives to increase customer energy efficiency, stakeholders are renegotiating their respective relationships. Some utilities seem willing to undertake a large and increasing commitment to energy efficiency, but are clearly seeking a profit-making business-regulatory model in return.[2] This invariably means some form of incentive or reward for the utilities, and consideration of a decoupling mechanism.

From the perspective of energy efficiency advocates, the quid pro quo for any incentive paid is the real obligation to acquire all, or nearly all, achievable cost-effective energy efficiency. At the same time, consumers and their advocates are concerned with issues of fairness, pricing, and total consumer costs. It boils down to two questions: who – utility shareholders or consumers – should receive the net economic benefits from increased energy efficiency programs; and, if the net benefits are shared between utilities and consumers, how much of a share should each receive?

Any incentive mechanism adopted should provide the framework for addressing the terms of this modified regulatory framework. Specifically, the mechanism should not impair the utility's ability to meet the fundamental goal of acquiring all cost-effective energy efficiency. Regulators may, for political or other reasons, limit rates of deployment of energy efficiency, but the business-regulatory framework should enable and not obstruct acquisition of all available cost-effective energy efficiency.

From the utility's viewpoint, incentives enable energy efficiency, and increased energy efficiency may mitigate other risks the utility faces. From the customer's viewpoint, energy efficiency enables reductions in bills, reductions in long-term costs of service and improvements in the environment. The ultimate question that the business and regulatory framework should answer is, "How much energy efficiency should be acquired, at what cost, and at what net benefit?"

Where states have taken up the challenge of obtaining more energy efficiency, regulators are likely considering, if not already using, some type of incentive structure that rewards utilities for delivering greater end-use energy efficiency. Some schooled in traditional regulation argue that utilities have a duty to acquire cost-effective energy efficiency and that regulators should not provide a financial incentive, and perhaps only impose penalties or exclude supply investments from rates for failure to do so. In our analysis, this viewpoint is represented by the "No Incentive" case.

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[2] Some states have opted for third-party non-utility administration of energy efficiency programs, as a preference or because of concerns about the ultimate effectiveness of energy efficiency programs administered by utilities. Although this is a viable alternative for some states, we do not integrate this administrative option into this analysis.

However, many stakeholders recognize that utilities lack a basic business model in which energy efficiency can compete financially with other earnings opportunities, including supply side resources. Regulators have employed a variety of incentive mechanisms intended to address this issue. In addition, the mechanisms are often used to provide a positive financial incentive for the utility to achieve aggressive portfolio and program goals.

From a regulatory viewpoint, an incentive is generally perceived to be an amount in excess of the "expense" of energy efficiency. Common incentives have rewarded utilities based on a share of energy efficiency expenditures or budgets, or have rewarded them as a function of achieved energy savings or net benefits – these are our "Performance Target" and "Shared Net Benefits" cases. Alternatively, the program expenditures have been capitalized and given traditional "ratebase" regulatory treatment – our "Cost Capitalization" case. At the same time, many states have used incentives in conjunction with the decoupling of profits from sales volume – a variation applied to each of the three common incentive approaches summarized above.

The recent introduction of Duke Energy's Save-a-Watt shareholder incentive mechanism provides regulators and policymakers with a markedly different regulatory incentive mechanism.[3] The Save-A-Watt mechanism provides utility shareholders with an earnings opportunity from energy efficiency that already accounts for "lost revenues," thus we do not include a decoupling option in analyzing the Save-a-Watt approach.

Many in a position to direct policy want to better understand the tradeoffs in stakeholder benefits between these alternative incentive structures before aggressively pursuing an approach that may be risky, and for which course corrections can be time-consuming and costly. What has been lacking is an analysis framework for comparing different incentive approaches to assess their combined financial impacts on utilities and consumers. Even for those financial incentive approaches which, to affected stakeholders, seem to be working just fine, states and stakeholders lack meaningful guideposts to measure whether utilities are being over- or under-compensated to acquire energy efficiency, or whether greater efficiency could be obtained at lower cost, or whether consumers are adequately protected. Specifically, they have not had the tools necessary to assess the relative strengths and weaknesses of different approaches in terms of earnings, return on equity (ROE), customer bills, ratepayer prices, and societal net benefits.

This paper provides a quantitative analysis of how stakeholders (e.g. shareholders, ratepayers, total resource system) are affected by different types of regulatory mechanisms for a prototypical utility offering a specific portfolio of energy efficiency programs over a ten-year time frame.[4] First we describe the key attributes of our prototypical Southwest utility, both from a physical as well as financial standpoint, and the energy efficiency savings goals it is expected

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[3] The Save-a-Watt mechanism allows the utility to earn a percentage (e.g., 90%) of their authorized rate of return on energy and capacity investment avoided due to the introduction of the demand side resource programs. Because the mechanism is all encompassing, it is intended to generate sufficient funds to cover the cost of program administration and customer incentives, lost earnings from a reduction in sales that a decoupling mechanism would normally recoup, and a financial incentive for undertaking demand side resource acquisition.

[4] This paper does not attempt to answer the questions of how or the degree to which each incentive mechanism would motivate a utility to increase energy efficiency programs or pursue all cost effective energy efficiency. Nor does the paper attempt to analyze potential non-financial motivators of utility behavior, such as orders from regulators, public perceptions and customer relations, or perceived competition from potential non-utility administrators (e.g., a utility may accept lower financial incentives if faced with the possibility or threat of some other entity administering the programs). Analysis of behavioral impacts of utility incentives and other motivators is quite limited, yet necessary for policymakers to better understand what may be required and the various tradeoffs involved in spurring utilities into viewing the promotion of deep and sustainable energy efficiency programs as a viable business model.

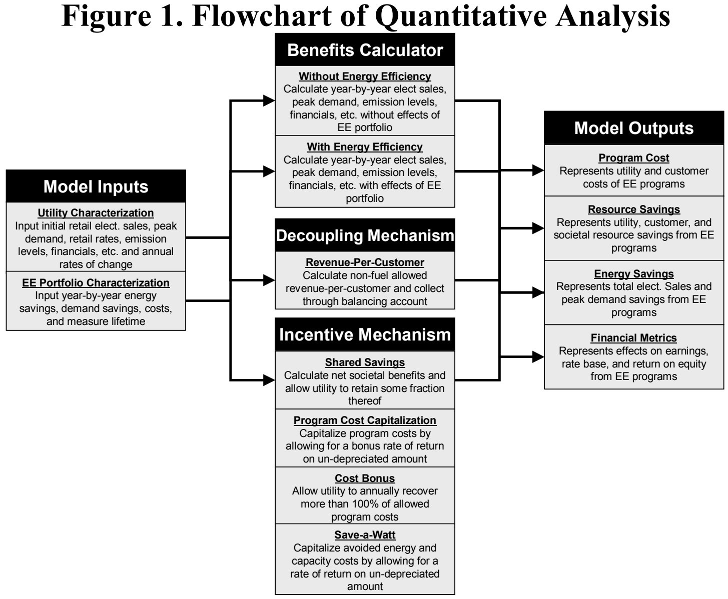
to achieve.[5] Next, we summarize the four different shareholder incentive mechanisms under review as well as the decoupling mechanism applied to our prototypical utility. Finally, we compare and analyze the financial consequences to each set of stakeholders associated with the implementation of these shareholder incentive structures and the introduction of a decoupling mechanism in order to show how a utility financial analysis model can be used by regulators and other stakeholders to assess thorny issues that arise in developing an incentive regulation approach for demand-side resources.

Overview of Prototypical Utility

To perform an analysis of this nature requires a financial model with sufficient detail to adequately capture the interaction between changes in sales and a utility's cost and revenue streams. One of the tools developed to support the NAPEE is a Benefits Calculator – a spreadsheet financial model – provided an excellent starting place for our analysis.[6]

The basic flow of our analysis is graphically displayed in Figure 1. Two main inputs are required: a characterization of the utility from the standpoint of its starting financial and physical market position as well as its forecast of future sales, peak demand, and its resource strategy to meet future growth and a characterization of the portfolio of energy efficiency programs the utility is considering or planning over the course of the analysis period.

Figure 1. Flowchart of Quantitative Analysis



For this analysis, we chose to characterize a prototypical southwest utility, experiencing a current high level of expansion which continues into the future and for which energy efficiency

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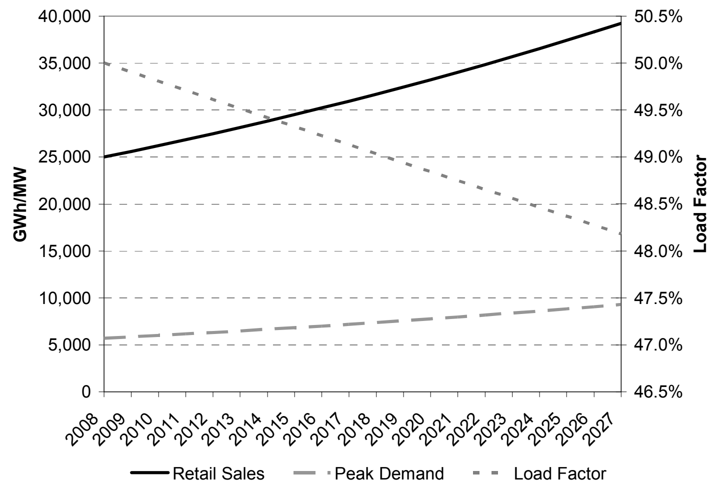
5 The specific findings of our analysis are limited to utilities with characteristics similar to those of our prototype utility. However, some of the broader findings may be applicable to utilities and regions with other characteristics.

6 LBNL made significant modifications to the Benefits Calculator to allow modeling of: the Cost Capitalization, Shared Net Benefits and Save-A-Watt shareholder incentive mechanisms; a revenue-per-customer decoupling mechanism; annual demand side resource program savings and cost levels; and the ability to capture changes in the utility cost structure (i.e., capital expenditure, O&M, fuel and purchased power, etc.) based on the size and type of major generation additions.

has the potential to become an increasingly important component in meeting this growth.[7] As portrayed in Figure 2, our utility had first-year (2008) annual retail sales of 25,000 GWh and an initial peak demand of 5,708 MW, which produced a load factor of 50%. Sales are forecasted to grow at a compound annual rate of 2.4% while peak demand was expected to expand at a slightly faster rate, 2.6%.

Figure 2. Base Case Forecasted Retail Sales, Peak Demand and Load Factor



Initially, the utility's generation fleet is assumed to be dominated by coal (45%), with 10% of its needs being met by its own renewable resources and 15% through its natural gas assets, leaving fully 30% to be met through purchased power. To serve customers' growing demand, the utility's base case resource plan includes additional base load generation (i.e., coal-fired generation), mid-merit plants (combined-cycle natural gas), peaking units (combustion turbines) as well as new investments in its transmission and distribution system. Figure 3 shows how the supply mix, and resulting fuel and purchased power costs, change over the analysis period.[8] Because of the significant growth in new plant and T&D assets, non-fuel O&M expenses are expected to grow at an annual rate of 7%. In aggregate, non-fuel utility costs are expected to expand by 6.4% annually, over our 20 year time horizon.

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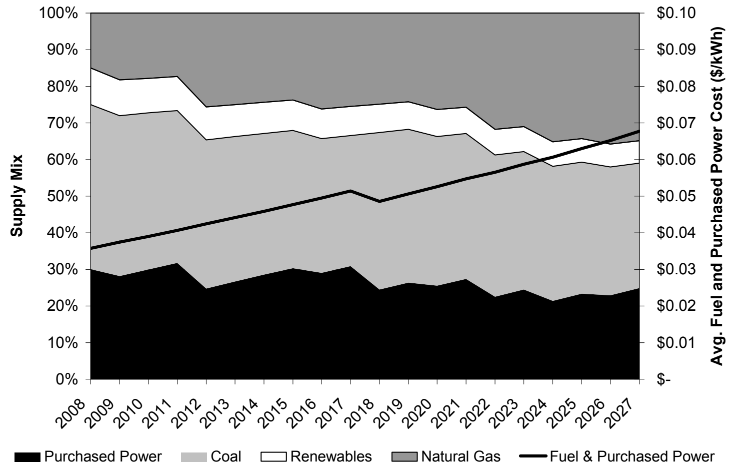
[7] We relied heavily upon publicly available data (e.g., annual reports, 10-K, FERC Form 1, integrated resource plans, etc.) from Arizona Public Service and Nevada Power to develop our prototypical southwest utility.

[8] The fuels explicitly indicated in Figure 3 represent the utility's owned and operated generation fleet. Purchased power can be comprised of any fuel source, but is assumed to become increasingly dominated by renewable resources as time goes on due to RPS requirements that are prevalent throughout the southwestern region.

Figure 3. Resource Requirements for Peak Demand and Average Fuel and Purchased Power Cost



This picture of the prototypical utility produces an all-in average retail rate of 8 cents/kWh in 2008. The avoided peak and off-peak costs of energy are determined to be 7.0 cents/kWh and 4.1 cents/kWh, respectively in 2008, but these values changes annually to reflect differences in the portfolio of assets providing energy. The avoided long-term cost of generation capacity is initially set equal to $75/kW-year, representing the annual carrying cost of a new natural gas combustion turbine, and is assumed to grow at an annual rate of 1.9% a year.[9] In addition, the avoided cost of transmission and distribution capacity has a first year value of $30/kW-year and escalates 1.9% a year thereafter.[10] The utility is assumed to have the ability to fully pass through all fuel expenses via a fuel adjustment charge, and files a rate case every other year using a current test year methodology. We further assume the utility's capital structure is split 50:50 to debt and equity, where the initial cost of debt is 6.6% and the utility's authorized return on equity is 11%.

The utility is directed to implement a series of energy efficiency programs starting in 2008 that ramp up over two years to produce a 0.5%/year incremental reduction in annual retail sales and maintain this level of incremental energy savings each year for the next 8 years. This portfolio of energy efficiency programs has a weighted measure lifetime of 11 years, and thus when implemented over a ten-year period produces a total lifetime savings of 14,647 GWh and a maximum reduction of peak demand equal to 222 MW.[11] The impacts of the program on retail

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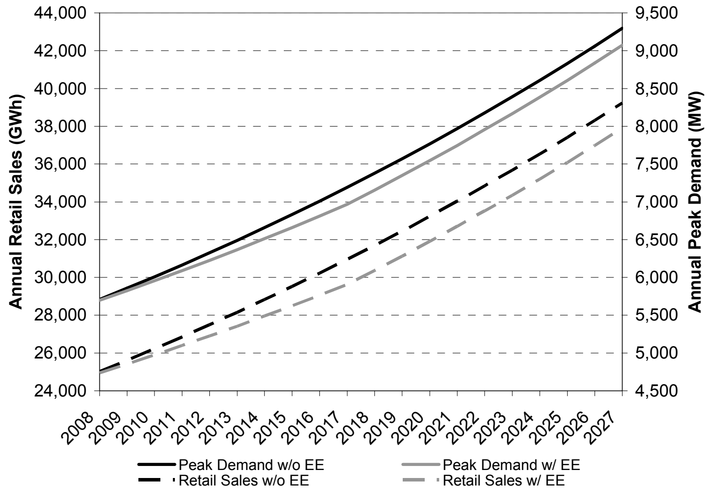
[9] In some jurisdictions, there is great debate as to the applicability of reducing the avoided cost of generation capacity by the net revenue earned through sales of energy produced by the plant. Given this controversy and the current treatment of the issue in the southwest, we opted to leave the cost at its full, unadjusted value.

[10] Although avoided energy and generation capacity are valued at 100% of the reduced energy and peak demand levels achieved as a result of implementing energy efficiency programs, the avoided cost of transmission and distribution capacity is very location-specific. The benefits of deferring T&D capacity are only achieved if the reduction from energy efficiency occurs in the same part of the electrical system where investment can be avoided. For this reason, we have chosen to derate the benefits from avoided T&D capacity by 50% as a proxy for representing the fact that not all implemented energy efficiency measures will benefit the T&D system.

[11] At the end of the measure's useful lifetime, it is assumed that the participant will replace the measure in order to maintain the level of savings they have become accustomed to. However; it is further assumed that 80% of the current portfolio is comprised of measures that will become the standard over the next 10-15 years. Thus, there is no incremental measure cost borne by the participant to maintain the same level of energy and demand savings for this 80%

sales forecasts and peak demand levels are graphically displayed in Figure 4. First year total resource costs for the portfolio of energy efficiency programs are assumed to be 2.6 cents/lifetime kWh in the first year, and grow at 1.9% a year annually.

Figure 4. Impact of Energy Efficiency Portfolio on Retail Sales and Peak Demand



Overview of Shareholder Incentive and Decoupling Mechanisms

Regulators have several tools at their disposal to help utilities overcome the hurdles they face in achieving energy efficiency savings goals. The first is to decouple the utility's sales from its revenue, thereby mitigating the potential for lost profit from any under-recovery of fixed costs through a reduction in retail sales between rate cases. We use a "revenue-per-customer" decoupling mechanism.

The second mechanism is a financial incentive that rewards the utility for successfully achieving or exceeding energy and/or demand reduction targets. We focus on four different shareholder incentives in order to compare and contrast their impacts on stakeholders when implemented. These are:

1. **Performance Target**: The utility receives an additional 10% of program administration and measure incentive costs for achieving program performance goals. Program costs are explicitly recovered in the period expended through a rider.
2. **Cost Capitalization**: The utility capitalizes program administration and measure incentive costs over the lifetime of the installed measures and is granted the authority to increase its authorized ROE (11%) for such investments by 500 basis points (similar to the incentive mechanism currently used in Nevada).
3. **Shared Net Benefits**: The utility retains 15% of the present value of the net benefits from the portfolio of programs it offers (similar to the incentive mechanism adopted in California). Program costs are explicitly recovered through a rider.
4. **Save-a-Watt**: The utility capitalizes 90% of the costs avoided over the lifetime of the installed measures. This mechanism serves as a financial incentive for the utility to

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of the portfolio. The remaining 20%, on the other hand, will be replaced by the participant at inflation adjusted total measure costs at the time such measures reach the end of their lifetime.

vigorously attain savings goals, but also covers program costs and any associated lost earnings from a reduced sales volume (similar to incentive mechanism proposed by Duke Energy).[12]

Impact of Energy Efficiency Program Portfolio on Stakeholders

In our analysis we assume that our prototypical utility achieves the energy efficiency savings goals proposed by state regulators. It is enlightening to assess the financial impact of the energy efficiency portfolio and the incentive and decoupling mechanisms on the utility's bottom line earnings, ratepayers' bills, and the total resource system as a whole compared to a "business as usual" situation for the utility which does not include the proposed energy efficiency programs. In order to assess the financial consequences of alternative approaches, we first assess the effect of decoupling, absent any shareholder incentives. Next, we see how different the results are when the utility is instead provided a shareholder incentive, but no decoupling mechanism. Finally, we present results when the two mechanisms are combined.

Impact of Decoupling on Stakeholders

By implementing a revenue-per-customer decoupling mechanism, the prototypical southwest utility is somewhat insulated from differences in cost growth relative to sales growth. The reduction in sales associated with energy efficiency programs produces a cumulative reduction in profits relative to a "business as usual" No EE situation worth $160 million on a nominal basis over twenty years (Figure 5). Implementing decoupling has a sizable impact on earnings for the utility, allowing profits to only erode by $59 million on a nominal basis (Figure 5), which translates into a $44 million increase in earnings due to introduction of a decoupling mechanism on a present value basis.[13]

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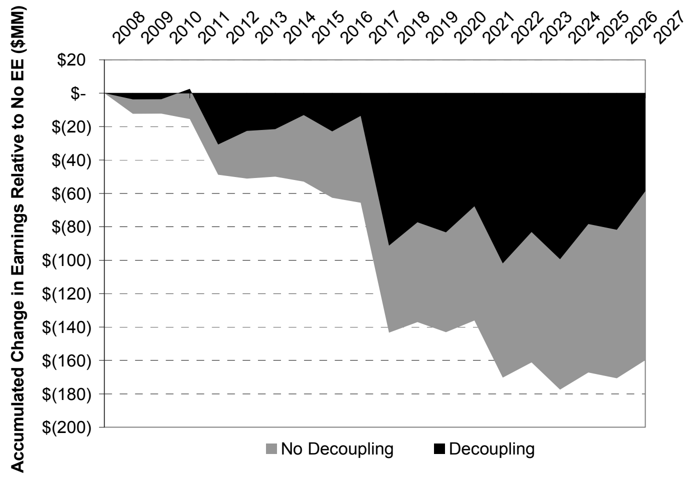
[12] Program costs are not explicitly recovered, but rather the Save-a-Watt incentive is intended to cover them.

[13] This prototypical southwest utility, even before implementing energy efficiency, is unable to achieve its 11% authorized ROE. Once an EE portfolio is introduced, the utility does experience cost savings but revenues fall as well. A decoupling mechanism seeks to provide the utility with more complete recovery of its authorized fixed (i.e., non-fuel) costs, which are lower due to EE. So although the utility is able to improve its achieved ROE, it still falls short of the earnings level realized when EE was not implemented simply because the rate base level is so much lower due to the deferral value of power plants.

Figure 5. Cumulative Change in Earnings from EE



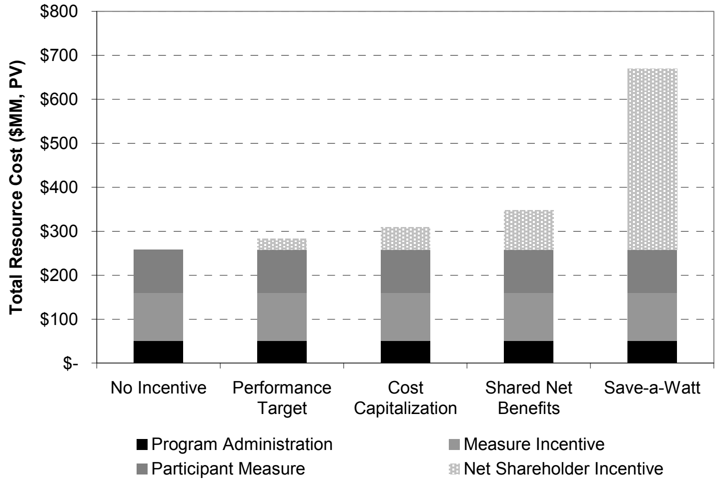
If the utility is allowed to collect more in revenue through its decoupling mechanism, customers are responsible for this stream of payments. However, the size of the decoupling mechanism is miniscule in comparison to the annual revenue requirement – on a present value basis, the decoupling mechanism increases the 20 year revenue requirement of $29.92 billion by $71 million, or two-tenths of one percent. The reduction in consumption from the energy efficiency portfolio produces sizable bill savings to the utility's customers as a whole over the analysis period: $908 million with decoupling and $978 million without on a present value basis.

Impact of Shareholder Incentives on Stakeholders

Given the differences in the structure of the four proposed shareholder incentives, it is illustrative to first understand how they differ from a cost perspective. Figure 6 shows how without any incentive mechanism in place, the ten years worth of energy efficiency programs costs ratepayers $159 million and program participants $99 million, on a present value basis.[14] If our Performance Target incentive mechanism is introduced, the total price tag increases by $26 million, or 10% of the total resource cost of the portfolio of energy efficiency programs. Cost Capitalization increases costs by $51 million (~20%), while our Shared Net Benefits mechanism causes costs to rise by $91 million (35%). Save-a-Watt represents the largest increase in costs equal to $412 million, a 160% increase in the total resource costs of the program.

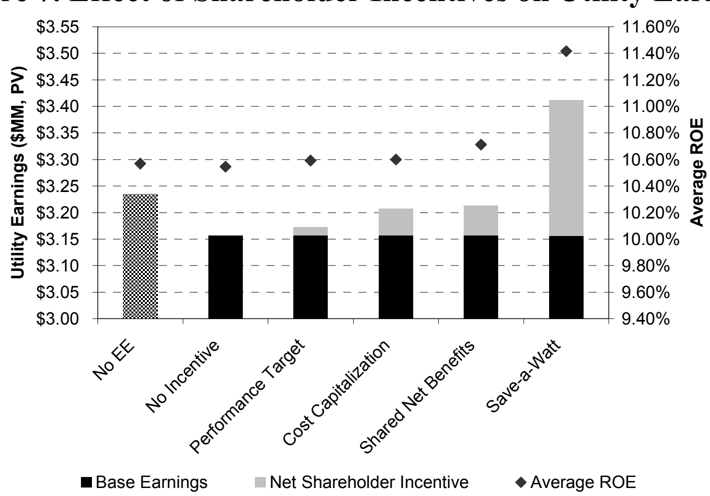
[14] Net shareholder incentive represents the additional money the utility earns as profit after covering its program administration and measure incentive expenses.

Figure 6. Total Resource Cost of Energy Efficiency with Shareholder Incentives



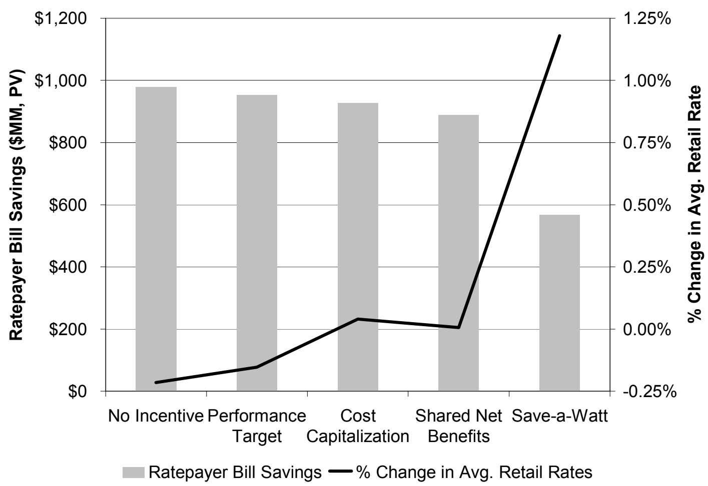
As Figure 7 shows, compared to a "business as usual" no energy efficiency case, utility earnings are adversely impacted by the lower sales volume due to energy efficiency without shareholder incentives ($79 million). The introduction of shareholder incentives allows an additional earnings opportunity for the utility. Save-a-Watt generates the largest increase in additional earnings from a shareholder incentive ($255 million), which represents a 8.1% increase in utility profits for implementing energy efficiency and allows the utility to achieve a ROE of 11.42% on average over the twenty-year time horizon (Figure 7). Recall that the utility is authorized to earn an 11% return on equity, but falls short of achieving this in the "business as usual" No EE case (10.57% ROE) because utility costs grow more rapidly than sales. The other incentive mechanisms clearly make the utility better off than if none is provided, achieving an average ROE that exceeds that observed in the No EE case by 2 to 14 basis points.

Figure 7. Effect of Shareholder Incentives on Utility Earnings



The shareholder incentives are paid by ratepayers; although it is useful to analyze their impact in the context of the overall reduction in utility costs that are produced by the portfolio of energy efficiency programs.[15] The size of the financial savings to ratepayers from these energy efficiency programs is inversely related to how expensive they are – the utility's costs are lower by simply implementing energy efficiency, which are passed through to ratepayers after each biennial rate case, but are then partially offset by the cost of each incentive mechanism. As illustrated in Figure 8, our Performance Target mechanism provides ratepayer bill savings that are very similar to those achieved without any shareholder incentive ($953 vs. $978 million), while the most expensive, Save-a-Watt, still saves ratepayers $567 million, all over a twenty year time period. Average retail rates actually go down over this time frame if either no shareholder incentive is provided or Performance Target is implemented, stays roughly the same with Cost Capitalization or Shared Net Benefits, and rises by 1.18% if Save-a-Watt is implemented.

Figure 8. Effect of Shareholder Incentives on Ratepayers



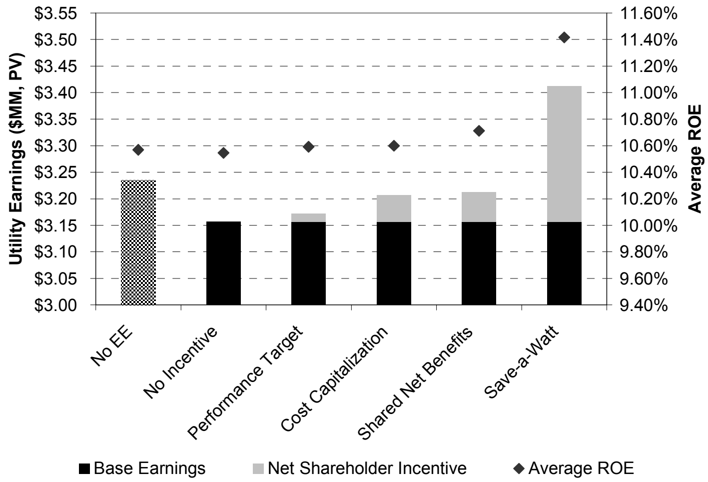
Impact of Decoupling and Shareholder Incentives on Stakeholders

The final comparison to be made is if the utility is granted both decoupling and a shareholder incentive as an inducement to undertake these programs and achieve savings goals. By combining these two mechanisms, the utility is able to recoup lost profit margin from a reduction in sales while being paid for exemplary performance. As illustrated in Figure 9, the combined effect of decoupling and a Performance Target shareholder incentive mechanism is not enough to push earnings above what it would have been had the utility eschewed energy efficiency, although ROE is higher (~17 basis points). Decoupling combined with Cost Capitalization or Shared Net Benefits provides the utility with a financial reward for implementing energy efficiency – an increase of $16 million or $22 million, respectively, in earnings and of 17 or 28 basis points, respectively, for ROE. Save-a-Watt still provides the largest earnings potential - $177 million, which raises ROE by 85 basis points.[16]

[15] The utility experiences savings from lower fuel and purchased power costs and deferring the construction of major generation plants as well as replacement of T&D infrastructure.

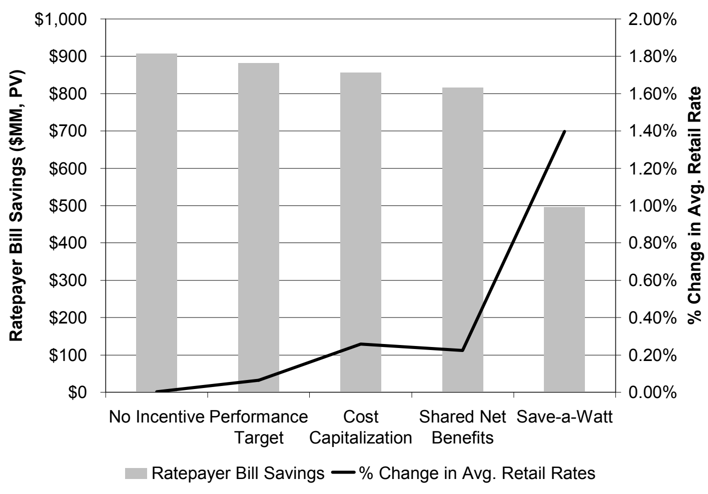
[16] Recall that the introduction of a decoupling mechanism is only applied if the incentive being implemented is not Save-a-Watt. Given that part of the Save-a-Watt incentive design covers any lost profit margin from reduced sales, it would be imprudent to allow the utility to decouple sales from revenues without reducing the size of the incentive, say through lowering the percentage of avoided cost that can be recovered from 90% to some lower number. In this section, it is only Performance Target, Cost Capitalization and Shared Net Benefits that have decoupling applied and thus can be directly compared with Save-a-Watt (as originally described without any decoupling mechanism).

Figure 9. Effect of Decoupling and Shareholder Incentives on Utility Earnings



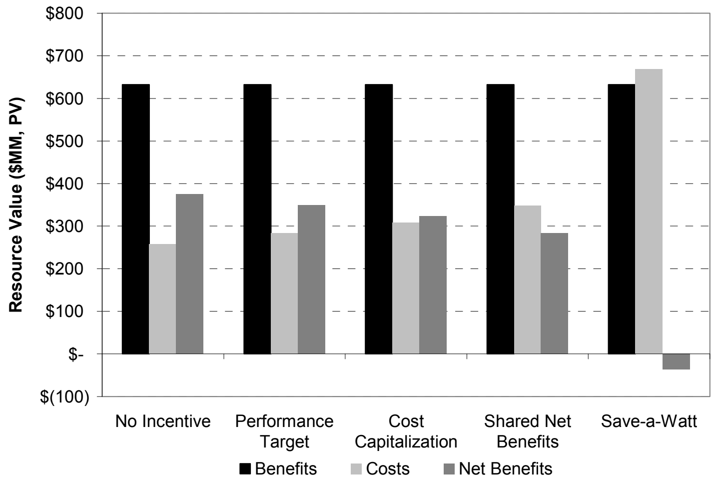
The additional costs associated with decoupling and shareholder incentives must be recovered from ratepayers. However, ratepayers still save a substantial amount of money over the analysis period under all incentive schemes because of the cost-effectiveness of the energy efficiency programs relative to supply-side alternatives. Ratepayers see between $496 to $882 million in utility bill savings for Save-a-Watt and Performance Target, respectively (Figure 10). The other two incentive mechanisms produce bill savings levels closer to the upper end of this range. Now with decoupling and a shareholder incentive mechanism, rates are slightly higher than they would have been if the utility eschewed EE.

Figure 10. Effect of Decoupling and Shareholder incentives on Ratepayers



It is also useful to assess financial impacts considering both utility and participant costs (i.e., a Total Resource Cost, or TRC, perspective). Reductions in sales due to energy efficiency are valued at the avoided cost of peak and off-peak energy, while any coincident peak demand reductions are valued at the avoided cost of generation capacity and 50% of the avoided cost of transmission and distribution capacity. Energy efficiency resource costs include the utility and participant costs incurred to achieve these benefits, as well as any shareholder incentives provided to the utility. Figure 11 shows how all cases but Save-a-Watt produce positive net resource benefits on a TRC net present value basis: $375 million, $349 million, $324 million, $284 million and -$37 million for No Shareholder Incentive, Performance Target, Cost Capitalization, Shared Net Benefits and Save-a-Watt, respectively.

Figure 11. Total Resource Cost Test



Discussion of Results

Our analysis indicates that increasing energy efficiency at our prototypical southwest utility in conjunction with various shareholder incentive mechanisms and decoupling benefits both utility shareholders and ratepayers and provides net resource benefits to the electric system. The results also suggest that there are significant differences in the financial effects of the various shareholder incentive mechanisms, either with or without decoupling. Some incentive mechanisms provide small to moderate earnings to utility shareholders (at lower costs to ratepayers), while others provide much larger earnings (at much higher costs to ratepayers). In our analysis, the Shared Net Benefits, Performance Target, and Cost Capitalization cases generally provide small to moderate opportunities for earnings. The specific earnings levels resulting from each of these mechanisms, however, will vary based on the design criteria implemented in each mechanism (e.g., sharing percentages, bonus levels, linkage to savings and net benefits goals, and earnings caps, etc.), the characteristics of the utility (including whether a decoupling mechanism is in place), and the size and nature of the energy efficiency portfolio.

In our analysis the Save-a-Watt case results in substantially higher earnings for the utility, with markedly less financial benefit to consumers. It is certainly a good deal for the utility. However, for consumers, Save-a-Watt results in the highest total energy bills and prices of all shareholder incentive designs analyzed. In addition to the relatively high impact on consumer costs, the Save-a-Watt approach, which is driven by the utility's supply-side avoided cost, has the effect of making energy efficiency almost as expensive as the supply-side resources it replaces.

We have attempted to characterize the basic structure of alternative shareholder incentive mechanisms for energy efficiency that are currently in place or proposed and have selected values that reflect current practice. However, it is important to recognize that different input parameter values for each incentive mechanism (e.g., sharing percentages for shared net benefits, the proportion of total program cost given for achieving goals, equity kicker for capitalization, etc.) can be utilized which may significantly affect shareholder earnings, customer bill savings, and rate impacts. Moreover, actual incentive mechanisms for energy efficiency that are currently in place tend to be more complex and multi-faceted than our stylized modeling representation and often include additional design features such as earning caps, minimum performance thresholds, penalty mechanisms for poor performance, and incentive mechanisms tailored to achieve specific goals. That being said, we believe that our analysis of alternative incentive mechanisms and decoupling accurately reflects the relative attractiveness of each mechanism for shareholders and ratepayers of a prototypical Southwest utility with high growth rates and low cost energy efficiency.

The quantitative financial modeling and the NAPEE modeling tool can be adapted to the circumstances facing individual utilities, which may increase the value of the approach for stakeholders attempting to work through issues involved in designing an incentive mechanism that is efficient and appropriately balances risk and rewards to shareholders and ratepayers. For example, it is relatively straight-forward to perform sensitivity analyses on the characteristics of the utility (e.g., future growth rates and cost structure) or the size and nature of the energy efficiency portfolio, types of incentive mechanisms, detailed design choices for each incentive mechanism, decoupling and the impact of decoupling design features, and the interactions between incentive mechanisms and decoupling. This would be a valuable step in helping to frame the discussion among stakeholders in a given state.

However, our modeling and analysis, and any modeling or analysis done by others using the NAPEE tool or other approaches, is limited by one fundamental fact: the modeling and analysis, by themselves, do not identify how utility management will respond to an incentive mechanism, or how utility management might respond differentially to different types of incentive mechanisms, with various design features. This paper does not provide insights on the degree to which each incentive mechanism would motivate a utility to increase energy efficiency programs or pursue all cost effective energy efficiency. The modeling and analysis can provide information that will be useful in framing the incentive options and the discussion among stakeholders, but they are limited when it comes to predicting the behavior of a utility.

There are other important and challenging questions to answer and policy issues to address regarding shareholder incentives, including:

- How much is necessary to motivate the utility to increase energy efficiency programs substantially, or to acquire all available cost-effective energy efficiency?[17]
- What are the other earnings opportunities for a utility, and the relative risks and rewards associated with other earnings opportunities?
- What are the other potential motivators of utility behavior, such as orders from and relationships with regulators, public perceptions and customer relations, and perceived competition from potential non-utility administrators (e.g., a utility may accept a lower financial incentive if faced with the possibility or threat of some other entity administering energy efficiency programs)?
- Are there viable options for non-utility administration of energy efficiency programs in a given state or service territory, and would the non-utility administrator be able to increase energy efficiency substantially or acquire all available cost-effective energy efficiency, at lower total costs to ratepayers?

[17] The answer to the "how much is necessary" question may also help inform the choice of an incentive mechanism, since the level of earnings varies significantly across the four mechanism cases we analyzed.

While these are crucial questions, they are not addressed in our analysis. Analysis of behavioral impacts of utility incentives and other motivators related to energy efficiency programs is quite limited. Yet it is necessary in order for policymakers to better understand what may be required and the various tradeoffs involved in spurring utilities into viewing the promotion of deep and sustainable energy efficiency programs as a viable business model.

The specific findings of our analysis are limited to utilities with characteristics similar to those of our prototype southwest utility. Performing sensitivity analysis surrounding the assumptions for the utility's growth rates, cost structure, and size of energy efficiency portfolio are an important next step to better understand how variable the results can be. We intend to pursue this course of action in the near future. However, some of the broader findings are applicable to utilities and regions with other characteristics.

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