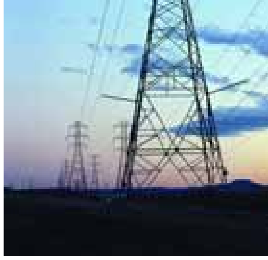
4: Business Case for Energy Efficiency



A well-designed approach to energy efficiency can benefit utilities, customers, and society by (1) fostering financially healthy utilities, (2) reducing customers' bills over time, and (3) contributing to positive societal net benefits overall. By establishing and communicating the business case for energy efficiency across utility, customer, and societal perspectives, cost-effective energy efficiency can be better integrated into the energy mix as an important low-cost resource.

Overview

Energy efficiency programs can save resources, lower utility costs, and reduce customer energy bills, but they also can reduce utility sales. Therefore, the effect on utility financial health must be carefully evaluated, and policies might need to be modified to keep utilities financially healthy (return on equity [ROE], earnings per share, debt coverage ratios unaffected) as they pursue efficiency. The extent of the potential economic and environmental benefits from energy efficiency, the impact on a utility's financial results, and the importance of modifying existing policies to support greater investment in these energy efficiency programs depend on a number of market conditions that can vary from one region of the country to another.

To explore the potential benefits from energy efficiency programs and the importance of modifying existing policies, a number of business cases have been developed. These business cases show the impact of energy efficiency investments on the utility's financial health and earnings, customer energy bills, and social resources such as net

Leadership Group Recommendation Applicable to the Business Case for Energy Efficiency

- Broadly communicate the benefits of and opportunities for energy efficiency.

A more detailed list of options specific to the objective of promoting the business case for energy efficiency is provided at the end of this chapter.

Key Findings From the Eight Business Cases Examined

- For both electric and gas utilities, energy efficiency investments consistently lower costs over time for both utilities and customers while providing positive net benefits to society. When enhanced by ratemaking policies to address utility financial barriers to energy efficiency, such as decoupling the utility's revenues from sales volumes, utility financial health can be maintained while comprehensive, cost-effective energy efficiency programs are implemented.

- The costs of energy efficiency and reduced sales volume might initially raise gas or electricity bills due to slightly higher rates from efficiency investment and reduced sales. However, as the efficiency gains help participating customers lower their energy consumption, the decreased energy use offsets higher rates to drive their total energy bills down. In the eight cases examined, average customer bills were reduced by 2 percent to 9 percent over a ten year period, compared to the no-efficiency scenario.

- Investment in cost-effective energy efficiency programs yield a net benefit to society—on the order of hundreds of millions of dollars in net present value (NPV) for the illustrative case studies (small- to medium-sized utilities).

efficiency costs and pollutant emissions. The business cases were developed using an Energy Efficiency Benefits Calculator (Calculator) that facilitates evaluation of the financial impact of energy efficiency on its major stakeholders—utilities, customers, and society. The Calculator allows users to examine efficiency investment scenarios across different types of utilities using transparent input assumptions (see Appendix B for detailed inputs and results).[1] Policies evaluated with the Calculator are discussed in more detail in Chapter 2: Utility Ratemaking & Revenue Requirements and Chapter 3: Energy Resource Planning Processes.

Eight business cases are presented to illustrate the impact of comprehensive energy efficiency programs on utilities, their customers, and society. The eight cases represent a range of utility types under different growth and investment situations. Each case compares the consequences of three scenarios—no energy efficiency programs without a decoupling mechanism, energy efficiency without decoupling, and energy efficiency with decoupling. Energy efficiency spending was assumed to be equal to 2 percent of electricity revenue and 0.5 percent of natural gas revenue across cases, regardless of the decoupling assumption; these assumptions are similar to many of the programs being managed in regions of the country today.[2] In practice, decoupling and shareholder incentives often lead to increased energy efficiency investments by utilities, increasing customer and societal benefits.

Business Cases Evaluated

Cases 1 and 2: Investor-Owned Electric and Natural Gas Utilities

- Case 1: Low-Growth
- Case 2: High-Growth

Cases 3 and 4: Electric Power Plant Deferral

- Case 3: Low-Growth
- Case 4: High-Growth

Cases 5 and 6: Investor-Owned Electric Utility Structure

- Case 5: Vertically Integrated Utility
- Case 6: Restructured Delivery-Only Utility

Cases 7 and 8: Publicly and Cooperatively Owned Electric Utilities

- Case 7: Minimum Debt Coverage Ratio
- Case 8: Minimum Cash Position

Table 4-1 provides a summary of main assumptions and results of the business cases.

Table 4-1 summarizes assumptions about the utility size, energy efficiency program, and each business case. All values shown compare the savings with and without energy efficiency over a 15-year horizon. The present value calculations are computed over 30 years, to account for the lifetime of the energy efficiency investments over 15 years.

1 The Calculator was designed to assess a wide variety of utility types using easily obtainable input data. It was not designed for applications requiring detailed data for specific applications such as rate setting, comparing different types of energy efficiency policies, cost-effectiveness testing, energy efficiency resource planning, and consumer behavior analysis.

2 See Chapter 6: Energy Efficiency Program Best Practices for more information on existing programs.

3 Cumulative and NPV business case results are calculated using a 5 percent discount rate over 30 years to include the project life term for energy efficiency investments of 15 years. All values are in nominal dollars with NPV reported in 2007 dollars (year 1 = 2007). Consistent rates are assumed in year 0 and then adjusted by the Calculator for case-specific assumptions. Reductions in utility revenue requirement do not change with decoupling in the Calculator, but might in practice if decoupling motivates the utility to deliver additional energy efficiency. In these cases, societal benefits conservatively equals only the savings from reduced wholesale electricity purchases and capital expenditures minus utility and participant costs of energy efficiency. Energy efficiency program costs given in $/megawatt-hour (MWh) for electric utilities and $/million British thermal units (MMBtu) for gas utilities.

Table 4-1. Summary of Main Assumptions and Results for Each Business Case Analyzed[3]

	Case 1: Low Growth Electric Utility	Case 2: Low Growth Electric Utility	Case 3: Low Growth with 2009 Power Plant	Case 4: Low Growth with 2009 Power Plant	Case 5: Vertical Utility	Case 6: Delivery Utility	Case 7: Electric Public/Coop Debt Coverage Ratio	Case 8: Electric Public/Coop No Debt	Case 1: High Growth Gas Utility	Case 2: Low Growth Gas Utility
Utility Size										
Annual Revenue ($MM) - Year 0	$284	$284	$284	$284	$284	$284	$237	$237	$344	$344
Peak Load (MW) or Sales (BcF) - Year 0	600 MW	600 MW	600 MW	600 MW	600 MW	600 MW	600 MW	600 MW	33 BcF	33 BcF
Parameter Tested	Load Growth	Load Growth	Load Growth	Load Growth	Vertical Utility	Delivery Utility	Debt Coverage Ratio	Cash Position	Load Growth	Load Growth
Assumptions That Differ Between Cases										
Load Growth Assumption	1%	5%	1%	5%	2%	2%	2%	2%	0%	2%
Average Rate - Year 1	$0.12/MWh	$0.12/MWh	$0.12/MWh	$0.12/MWh	$0.12/MWh	$0.12/MWh	$0.10/MWh	$0.10/MWh	$1/therm	$1/therm
EE Program	EE Program Results do not change when decoupling is activated									
Cumulative Savings (EE vs No EE case)	8,105 GWh	8,105 GWh	8,105 GWh	8,105 GWh	8,105 GWh	8,105 GWh	6,754 GWh	6,754 GWh	31 BcF	31 BcF
Utility Spending as Percent of Revenue (%)	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	0.5%	0.5%
Annual Utility Spending (NPV in $MM)	$70	$70	$70	$70	$70	$70	$58	$58	$21	$21
EE Project Life Term (years)	15	15	15	15	15	15	15	15	15	15
Percent of Growth Saved	142%	21%	142%	21%	66%	66%	55%	55%	410%	18%
Total Cost of EE in Year 0 ($/MWh or $/MMBtu)	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00	$3.00	$3.00
Utility Cost in Year 0 ($/MWh or $/MMBtu)	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$1.50	$1.50
Customer Cost in Year 0 ($/MWh or $/MMBtu)	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$1.50	$1.50
Business Case Results (NPV in $MM)	Revenue Requirement and Net Societal Savings do not change with decoupling. Business Case results are the difference between the No EE and EE cases.									
Reduction in Revenue Requirement ($MM)	$396	$318	$476	$338	$372	$348	$288	$270	$211	$142
% of Total Revenue Requirement	5.5%	3.0%	6.0%	3.0%	4.1%	4.4%	4.0%	4.3%	3.8%	2.2%
Net Customer Savings - no decoupling ($MM)	$504	$372	$608	$375	$447	$437	$459	$266	$258	$156
% of Total Customer Bills	7.0%	3.5%	7.7%	3.3%	6.4%	5.6%	6.4%	4.2%	4.6%	2.4%
Net Customer Savings - decoupling ($MM)	$344	$266	$424	$286	$320	$296	$245	$226	$158	$90
% of Total Customer Bills	4.8%	2.5%	5.4%	2.5%	4.5%	3.8%	43.4%	3.6%	2.8%	1.4%
Net Societal Savings ($MM)	$289	$258	$332	$269	$282	$271	$225	$225	$143	$119
% of Total Societal Cost	237.5%	211.9%	272.6%	221.0%	6.7%	222.2%	222.2%	222.2%	338.0%	282.6%
Air Emission Savings	Air Emission Savings are the difference between No EE and EE cases and do not change when decoupling is activated									
1000 Tons CO_2	311	311	311	311	311	311	259	259	128	128
Tons NO_X	61	61	61	61	61	61	51	51	107	107

BcF = billion cubic feet; CO_2 = carbon dioxide; EE = energy efficiency; GWh = gigawatt-hour; NO_X = nitrous oxides; $MM = million dollars; MMBtu = million British thermal units; MWh = megawatt-hour; NPV = net present value

While these eight business cases are not comprehensive, they allow some generalizations about the likely financial implications of energy efficiency investments. These generalizations depend upon the three different perspectives analyzed:

- *Utility Perspective.* The financial health of the utility is modestly impacted because the introduction of energy efficiency reduces sales. If energy efficiency is accompanied with mechanisms to protect shareholders—such as a decoupling mechanism to buffer revenues and profits from sales volumes—the utility's financial situation can remain neutral to the efficiency investments.[4] This effect holds true for both public and investor-owned utilities.

- *Customer Perspective.* Access to energy efficiency drives customer bills down over time. Across the eight case studies, energy bills are reduced by 2 percent to 9 percent over a 10 to 15-year period. Even though the efficiency investment and decreased sales drives *rates* slightly higher, this increase is more than offset in average customer bills due to a reduction in energy usage.

- *Societal Perspective.* The monetary benefits from energy efficiency exceed costs and are supplemented by other benefits such as lower air emissions.

Generalizations may also be made about the impact of policies to remove the throughput incentive, such as decoupling mechanisms, across these business cases.[5] These generalizations include:

- *Utility Perspective.* Policies that remove the throughput incentive can provide utilities with financial protection from changes in throughput due to energy efficiency, by smoothing the utility's financial performance while lowering customer bills. Generally, the business case results show that a decoupling mechanism benefits utilities more if the energy savings from efficiency are a greater percent of load growth. Also, because small reductions in throughput have a greater effect on the financial condition of distribution utilities, decoupling generally benefits distribution utilities more than vertically integrated utilities. A utility's actual results will depend on the structure of its efficiency program, as well as the specific decoupling and attrition mechanisms.

- *Customer Perspective.* Decoupling generates more frequent, but smaller, rate adjustments over time because variations in throughput require periodic rate "true-ups." Decoupling leads to modestly higher rates earlier for customers, when efficiency account for a high percent of load growth. In all cases, energy efficiency reduces average customer bills over time, with and without decoupling.

- *Societal Perspective.* The societal benefits of energy efficiency are tied to the amount of energy efficiency implemented. Therefore, to the extent that decoupling encourages investment in energy efficiency, it is a positive from a societal perspective. Decoupling itself does not change the societal benefits of energy efficiency.

While these cases are a good starting point, each utility will have some unique characteristics, such as differences in fuel and other costs, growth rates, regulatory structure, and required capital expenditures. These and other inputs can be customized in the Calculator so users can consider the possible impacts of energy efficiency on their unique situations. The Calculator was developed to aid users in promoting the adoption of energy efficiency programs, and the results are therefore geared for education and outreach purposes.[6]

4 Though not modeled in these business case scenarios, incentive mechanisms can also be used to let shareholders profit from achieving efficiency goals, further protecting shareholders. Such incentives can increase the utility and shareholder motivations for increased energy efficiency investment.

5 The decoupling mechanism assumed by the Calculator is a "generic" balancing account that adjusts rates annually to account for reduced sales volumes, thereby maintaining revenue at target projections. Differences in utility incentives that alternative decoupling mechanisms provide are discussed in Chapter 2: Utility Ratemaking & Revenue Requirements, but are not modeled. The decoupling mechanism does not protect the utility from cost variations.

6 The Calculator was designed to assess a wide variety of utility types using easily obtainable input data. It was not designed for applications requiring detailed data for specific applications such as rate setting, comparing different types of energy efficiency policies, cost effectiveness testing, energy efficiency resource planning, and consumer behavior analysis.

Business Case Results

The eight cases evaluated were designed to isolate the impact of energy efficiency investments and decoupling mechanisms in different utility contexts (e.g., low-growth and high-growth utilities, vertically integrated and restructured utility, or cash-only and debt-financed publicly and cooperatively owned utilities). For each case, three energy efficiency scenarios are evaluated (no efficiency without decoupling, efficiency without decoupling, and efficiency with decoupling), while holding all other utility conditions and assumptions constant. The eight scenarios are divided into four sets of two cases each with contrasting assumptions.

An explanation of the key results of the business cases is provided below, with further details provided for each case in Appendix B.

Cases 1 and 2: Low-Growth and High-Growth Utilities

In this first comparison, the results of implementing energy efficiency on two investor-owned electric and natural gas distribution utilities are contrasted. These utilities are spending the same percent of revenue on energy efficiency and vary only by load growth. The low-growth electric utility (Case 1) has a 1 percent sales growth rate and the low-growth gas utility has a 0 percent sales growth rate, while the high-growth electric utility (Case 2) has a 5 percent sales growth rate and the high-growth gas utility has a 2 percent sales growth rate. Table 4-2 compares the results for electric utilities, and Table 4-3 compares the results for the natural gas utilities. In both cases (and all other cases examined), the Calculator assumes a 'current year' test year for rate-setting. When rate adjustments are needed, the rates are set based on the costs and sales in that same year. Therefore, differences between forecasted and actual growth rates do not affect the results.

Both electric and natural gas utilities show similar trends. With low load growth, the same level of energy efficiency investment offsets a high percentage of load growth, and utility return on equity (ROE) falls below target until the next rate case unless decoupling is in place.[7] In contrast, the high-growth utility has an ROE that exceeds the target rate of return until the rates are decreased to account for the increasing sales. In both cases, energy efficiency reduces the utility return from what it would have been absent energy efficiency. Generally speaking, energy efficiency investments that account for a higher percentage of load growth expose an electric or natural gas utility to a greater negative financial effect unless decoupling is in place.

These cases also look at the difference between the two utilities with and without a decoupling mechanism. Both utilities earn their target ROE in rate case years, with and without the energy efficiency in place. (Note that in practice, decoupling does not guarantee achieving the target ROE.) For the low-growth utility, the decoupling mechanism drives a rate adjustment to reach the target ROE, and the utility has higher ROE than without decoupling (Case 1). In the high-growth case, decoupling decreases ROE relative to the case without decoupling (Case 2), and prevents the utility from earning slightly above its target ROE from increased sales in between rate cases, allowing customer rates to decline sooner in the high-growth electric case if decoupling is in place.

In both electric and natural gas Case 1 and Case 2, average customer bills decline over time. The average bill is lower beginning in year 3 in the electric utility with no decoupling comparison, and in year 5 with decoupling. A similar pattern is found for the gas utility example. Average bills decrease more when the efficiency is a higher percent of load growth, even though rates slightly increase due to efficiency investments and reduced sales. The average customer bill declines more smoothly when a decoupling mechanism is used due to more frequent rate adjustments.

For both electricity and natural gas energy efficiency, the net societal benefit is computed as the difference of the total benefits of energy efficiency, less the total costs. From a societal perspective, the benefits include the value of reduced expenditure on energy (including market price reductions—

7 In Cases 1 and 2, the electric utility invests 2 percent of revenue in energy efficiency and the gas utility invests 0.5 percent of revenue.

Table 4-2. High- and Low-Growth Results: Electric Utility

Case 1: Low-Growth (1%)

Return on Equity (ROE)

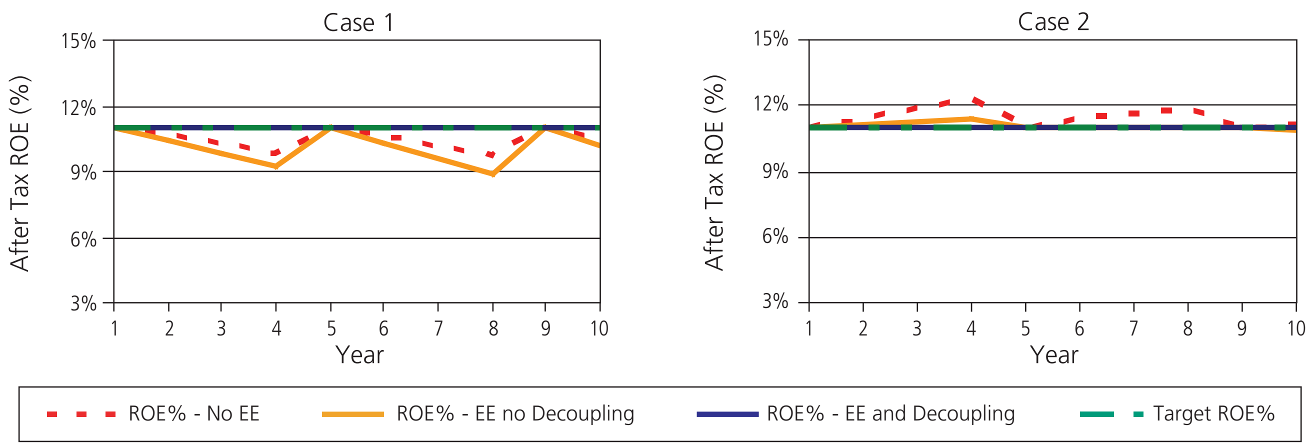
Without efficiency and decoupling, the low sales drive ROE below the target return. Target ROE is achieved with energy efficiency (EE) and decoupling. Increasing energy efficiency without decoupling decreases ROE.

Case 2: High-Growth (5%)

Return on Equity (ROE)

With high load growth, without decoupling, the utility achieves greater than the target ROE until rates are adjusted. With energy efficiency, sales and earnings are reduced, reducing ROE.

Investor-Owned Utility Comparison of Return on Equity



Case 1: Low-Growth (1%)

Rates

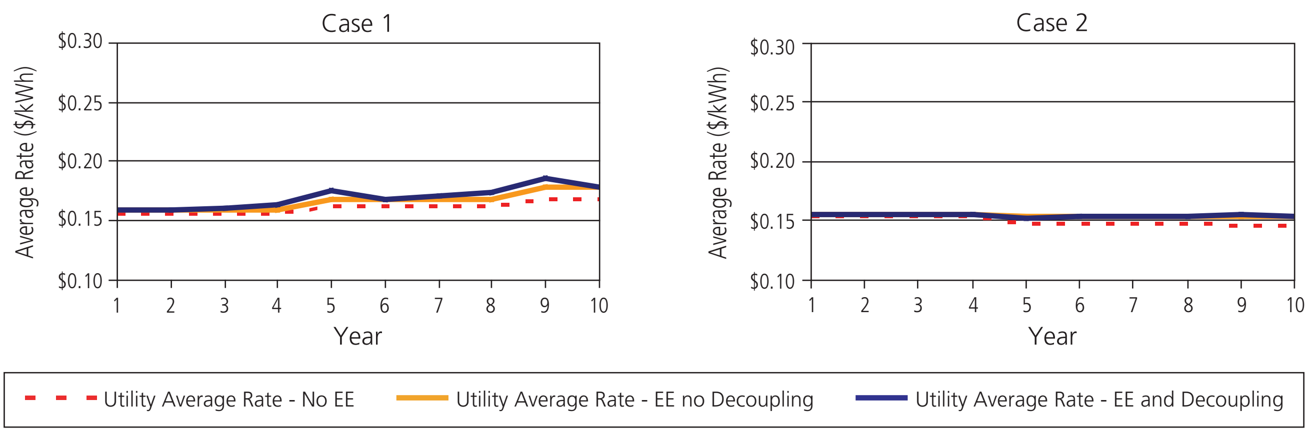
Without energy efficiency, the utility sells higher volumes than in the no efficiency scenarios and has slightly lower rates. Rates in the energy efficiency scenario increase primarily due to lower throughput; rates are slightly higher in the decoupling scenario due to increase earnings to the target ROE.

Case 2: High-Growth (5%)

Rates

In the high-growth case, rates are relatively flat. Without energy efficiency, the utility sells higher volumes and has slightly lower rates. Decoupling does not have a great impact in this case because the ROE is near target levels without any rate adjustments.

Comparison of Average Rate



if any), reduced losses, reduced capital expenditures, and reduced air emissions (if emissions are monetized).[8] The costs include both utility program and administration costs as well as the participant costs of energy efficiency. If the net societal benefits are positive, the energy efficiency is cost-effective from a societal perspective. In both Case 1 and Case 2 (and all other cases evaluated using the tool), the net societal benefits are positive for investments in energy

Table 4-2. High- and Low-Growth Results: Electric Utility (continued)

Case 1: Low-Growth (1%)

Bills

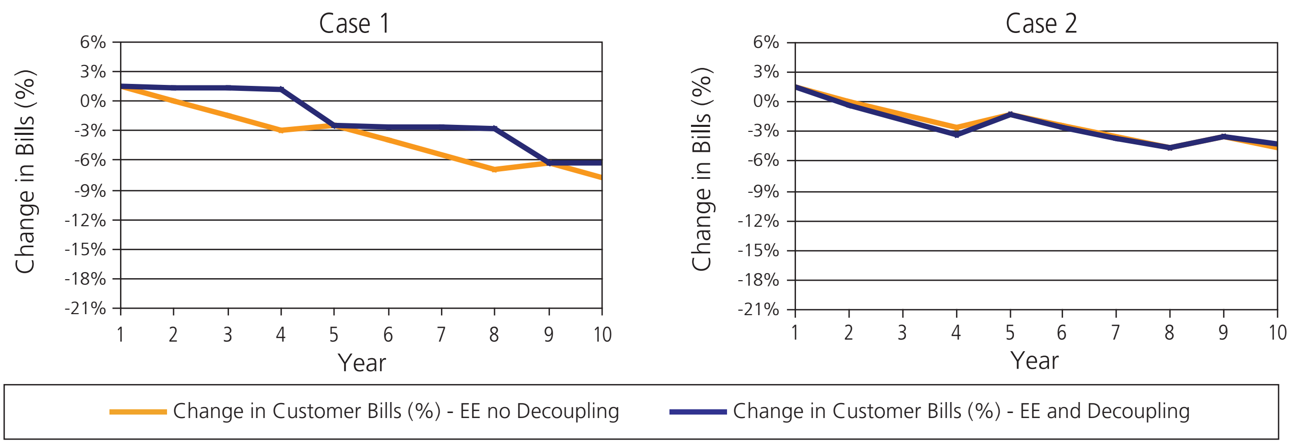
Total customer bills with energy efficiency programs decline over time, indicating customer savings resulting from lower energy consumption. Rate increases through the decoupling mechanism reduce the pace of bill savings in the decoupling case.

Case 2: High-Growth (5%)

Bills

Total customer bills with energy efficiency decline over time, indicating customer savings resulting from lower energy consumption. There is little difference between the decoupling and no decoupling cases in the high-growth scenario.

Percent Change in Customer Bills



Case 1: Low-Growth (1%)

Net Societal Benefits

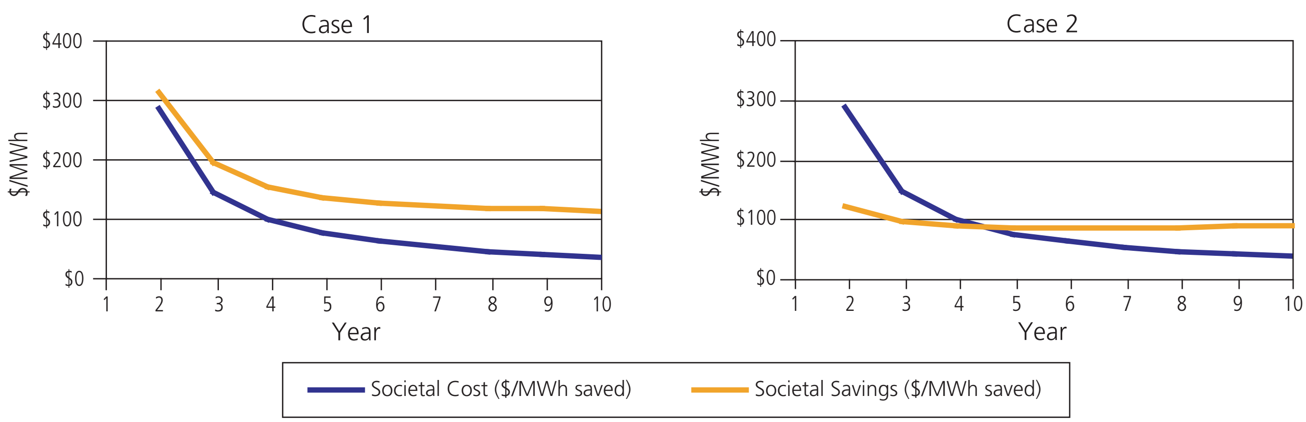
Over time, the savings from energy efficiency exceed the annual costs. The societal cost and societal savings are the same, with and without decoupling.

Case 2: High-Growth (5%)

Net Societal Benefits

Over time, the savings from energy efficiency exceed the annual costs. The societal cost and societal savings are the same, with and without decoupling.

Delivered Costs and Benefits of EE



8 The cases discussed in this document include conservative assumptions and do not include market price reductions or monetize air emissions in net societal benefits.

efficiency. In the low-growth case, the savings exceed costs within two years for both the electric and natural case cases. In the high-growth case, the savings exceed costs within five years for the electric utility cases and four years for the natural gas utility cases. Energy efficiency has a similar effect upon natural gas utilities, as shown in Table 4-3.

Table 4-3. High- and Low-Growth Results: Natural Gas Utility

Case 1: Low-Growth (0%)

Return on Equity (ROE)

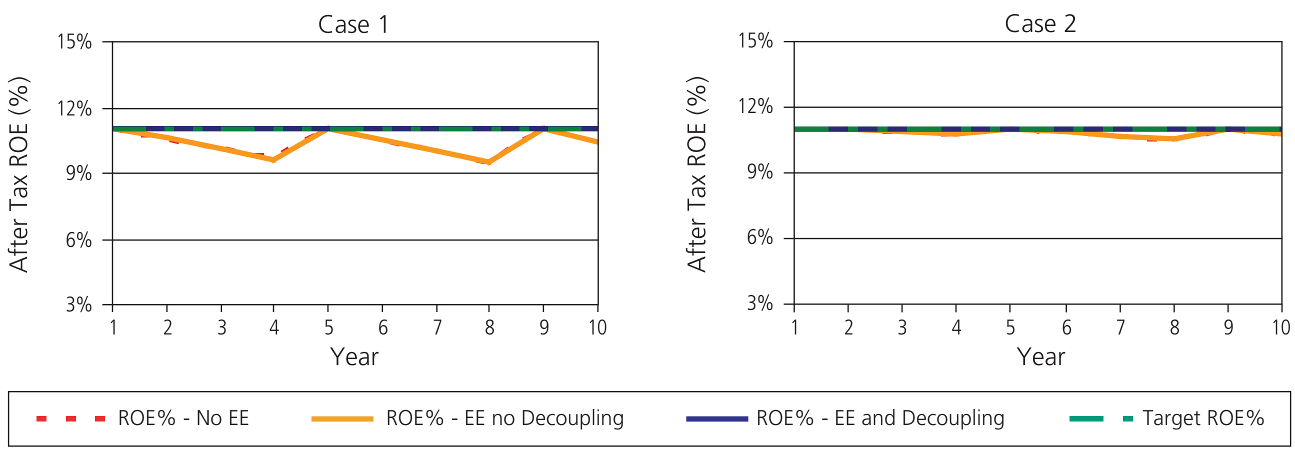
Without efficiency and decoupling, the low sales result in ROE falling below the target return. Similarly, energy efficiency without decoupling drops utility return below target ROE. Target ROE is achieved with decoupling.

Case 2: High-Growth (2%)

Return on Equity (ROE)

With high load growth, energy efficiency has less impact on total sales and earnings. Thus, the utility achieves close to its target ROE in the early years, although without decoupling, ROE falls slightly in later years as energy efficiency reduces sales over time.

Investor-Owned Utility Comparison of Return on Equity



Case 1: Low-Growth (0%)

Rates

Rates increase over time because of increasing rate base and low sales growth. Without energy efficiency, the utility sells higher volumes and has lower rates. Decoupling increases rates when sales volumes are below target.

Case 2: High-Growth (2%)

Rates

Without energy efficiency, the utility sells higher volumes and has lower rates. Energy efficiency increases rates slightly in later years by reducing sales volumes.

Comparison of Average Rate

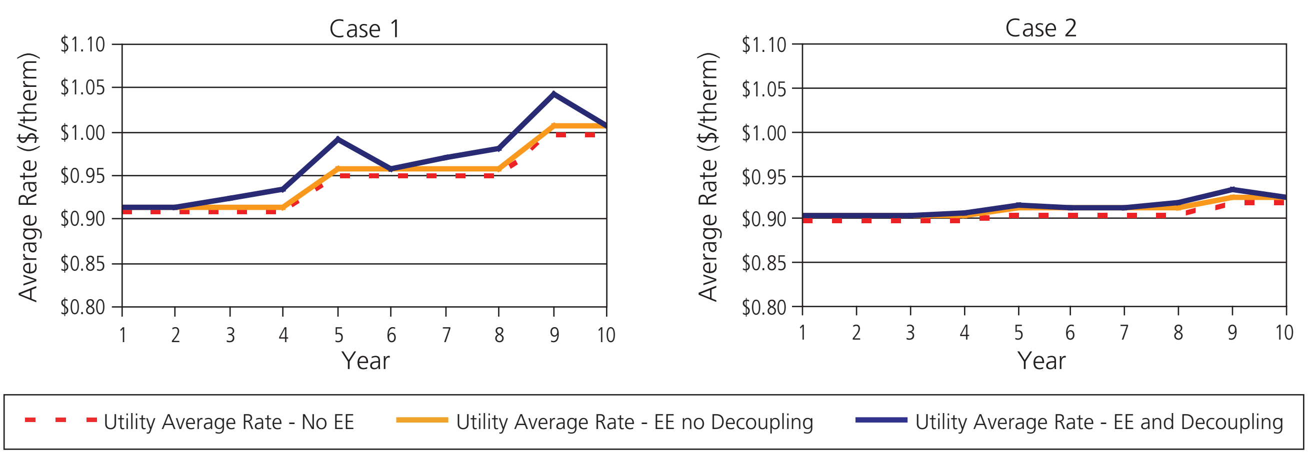


Table 4-3. High- and Low-Growth Results: Natural Gas Utility (continued)

Case 1: Low-Growth (0%)

Customer Bills

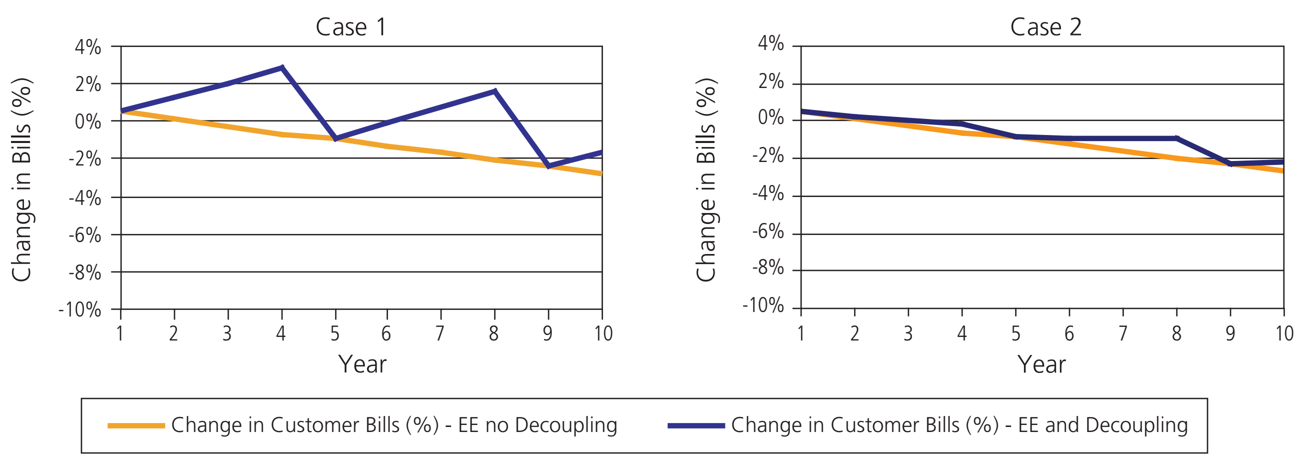
Total customer bills with energy efficiency decline over time, indicating customer savings resulting from lower energy consumption. Customer utility bills initially increase slightly with decoupling as rates are increased to hold ROE at the target level and spending increases on efficiency.

Case 2: High-Growth (2%)

Customer Bills

Customer utility bills with energy efficiency reflect the more limited impact of efficiency programs on rate profile. Total customer bills decline over time, indicating customer savings resulting from lower energy consumption.

Percent Change in Customer Bills



Case 1: Low-Growth (0%)

Net Societal Benefits

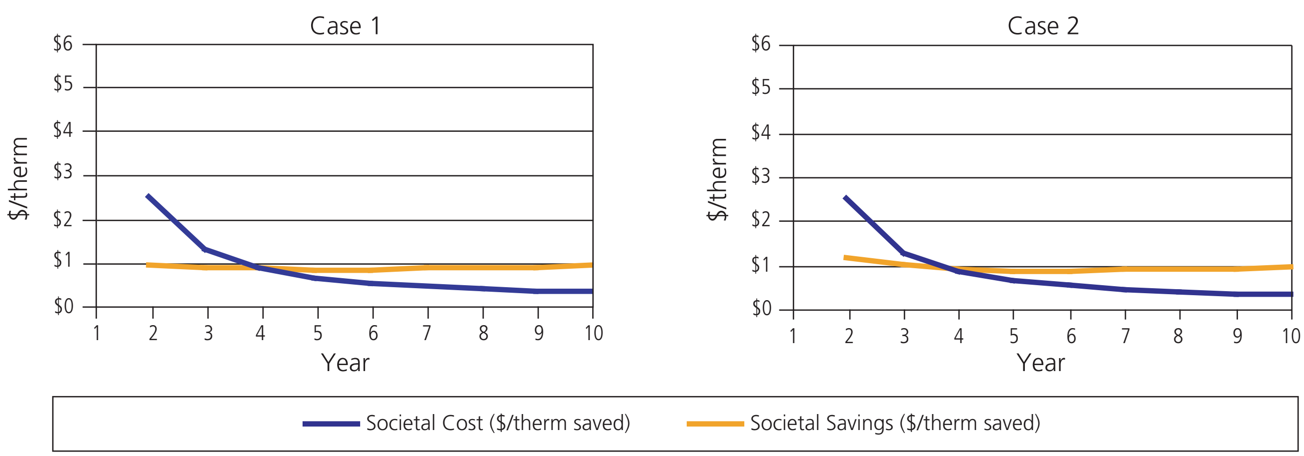
Over time, the savings from energy efficiency exceed the annual costs. The societal cost and societal savings are the same, with and without decoupling.

Case 2: High-Growth (2%)

Net Societal Benefits

Over time, the savings from energy efficiency exceed the annual costs. The societal cost and societal savings are the same, with and without decoupling.

Delivered Costs and Benefits of EE



Cases 3 and 4: Electric Power Plant Deferral

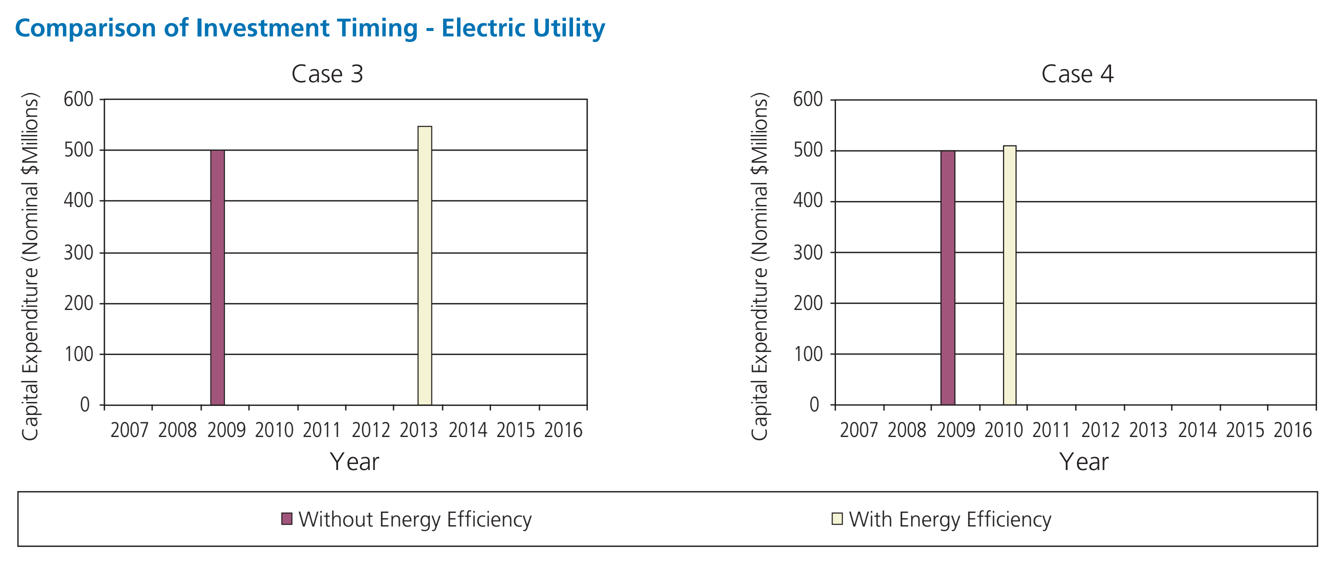
This case study examines an electric investor-owned utility with a large capital project (modeled here as a 500-MW combined-cycle power plant, although the conclusions are similar for other large capital projects), planned for construction in 2009.[9] Again the effect of a 1 percent growth rate (Case 3) is compared with a 5 percent growth rate (Case 4) with identical energy efficiency investments of 2 percent of electric utility revenues.

Figure 4-1 shows the capital expenditure for the project with and without an aggressive energy efficiency plan and a summary of the net benefits from each perspective. The length of investment deferral is based on the percent of peak load reduced due to energy efficiency investments. The vertical axis shows how the expenditure in nominal dollars starts at $500 million in 2009, or slightly higher (due to inflation) after deferral. With Case 3, energy efficiency investments account for a higher percentage of peak load growth, and can defer the project until 2013. With higher growth and the same level of efficiency savings (Case 4), the same efficiency investment only defers the project until 2010.

In Case 3, the energy efficiency program causes a greater reduction in revenue requirement—a 30-year reduction of $476 million rather than a Case 4 reduction of $338 million—providing benefits from a customer perspective. From a societal perspective, the low-growth case energy efficiency program yields higher net societal benefit as well: $332 million versus $269 million.

Figure 4-1. Comparison of Deferral Length with Low- and High-Growth

Case 3: Low-Growth Investment Timing **Case 4: High-Growth Investment Timing**



30-year savings impact from EE	Low-Growth Utility	High-Growth Utility
Decrease in Revenue Requirement (net present value [NPV], million dollars [$MM])	$476	$338
Net Customer Savings – decoupling (NPV, $MM)	$319	$275
Net Societal Benefit (NPV, $MM)	$332	$269

[9] This illustration demonstrates how energy efficiency can be used, including efforts to reduce peak capacity requirements, to defer a single 500 MW combined cycle power plant. Energy efficiency can also be used to defer other, smaller investments.

Table 4-4 compares the reduction in revenue requirement due to the deferral of the power plant investment between the two cases. In Case 3, the reduction in revenue requirement due to the deferral to 2013 results in present value savings of $36 million over the three years that the plant was deferred. In Case 4, the deferral provides present value savings of $11 million for the one-year deferral.

Although the project is deferred longer in the low-growth case, fewer sales overall and higher installed capital costs result in higher rates over time relative to the high-growth case. In both cases, the increase in rates from energy efficiency programs, starting in year 1, is significantly less than the rate increase that occurs after the new power plant investment is made, leading to lower customer bills. Customer bill savings are greatest during the years that the plant is deferred.[10]

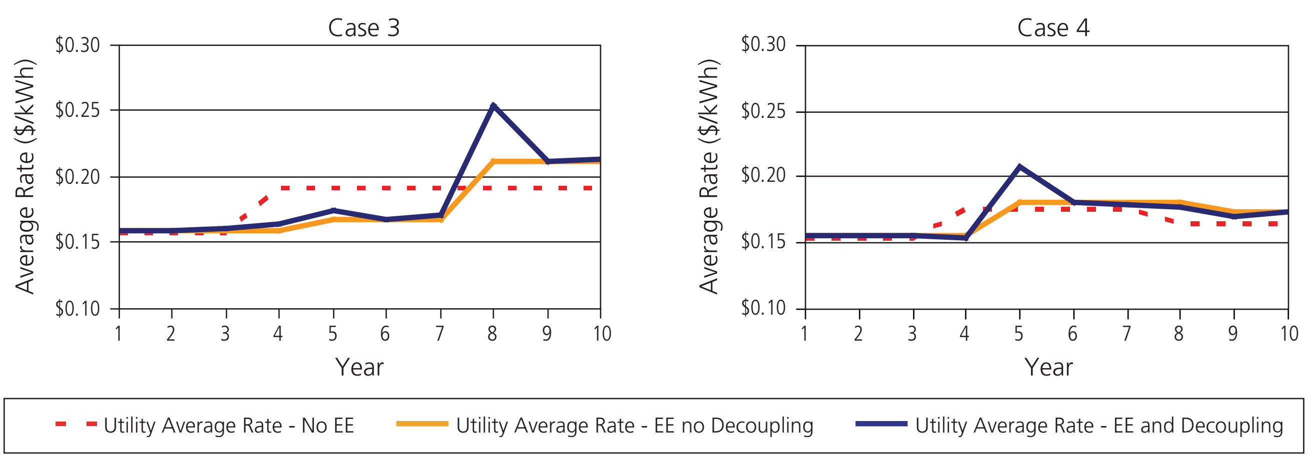
Cases 5 and 6: Vertically Integrated Utility vs. Restructured Delivery Company

In this example, a vertically integrated electric utility (Case 5) is compared with the restructured electric delivery

Table 4-4. Power Plant Deferral Results

Case 3: Low-Growth (1%)	Case 4: High-Growth (5%)
Revenue Requirement 2009 project deferred to 2013, resulting in a reduction in revenue requirement due to deferring the power plant over three years of PV$36 million.	**Revenue Requirement** 2009 project deferred to 2010, resulting in a reduction in revenue requirement from deferring the power plant over a year of PV$11 million.
Other Capital Expenditures The low-growth case leads to the savings of other capital expenditures compared to the high-growth case.	**Other Capital Expenditures** The low-growth case leads to the savings of other capital expenditures compared to the high-growth case.
Retail Rates With low load growth, a given amount of energy efficiency defers so much load growth that the new power plant can be deferred for three years, allowing the utility to conserve capital and postpone rate increases for several years.	**Retail Rates** With high load growth, energy efficiency reduces load growth enough to defer the new power plant investment by one year, slowing implementation of a relatively smaller rate increase.

Comparison of Average Rate



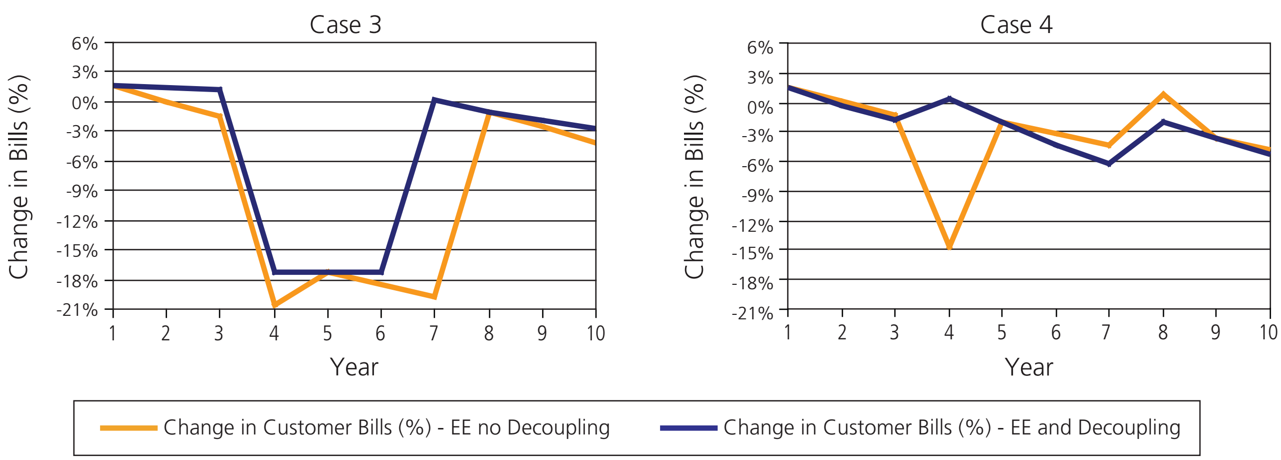
[10] The Calculator assumes that a rate case occurs in the year following a large capital investment. When a decoupling mechanism is used, a higher rate adjustment (and immediate decrease in bill savings) occurs once a new major infrastructure investment is brought online. This charge is due to the new level of capital expenditures at the same time a positive decoupling rate adjustment is making up for previous deficiencies.

company (Case 6); both experiencing a 2 percent growth rate and investing 2 percent of revenue in energy efficiency. These cases assume that the vertically integrated utility has more capital assets and larger annual capital expenditures than a restructured delivery utility. In general, the financial impact of energy efficiency on delivery utilities is more pronounced than on vertically integrated utilities with the same number of customers and

Table 4-4. Power Plant Deferral Results (continued)

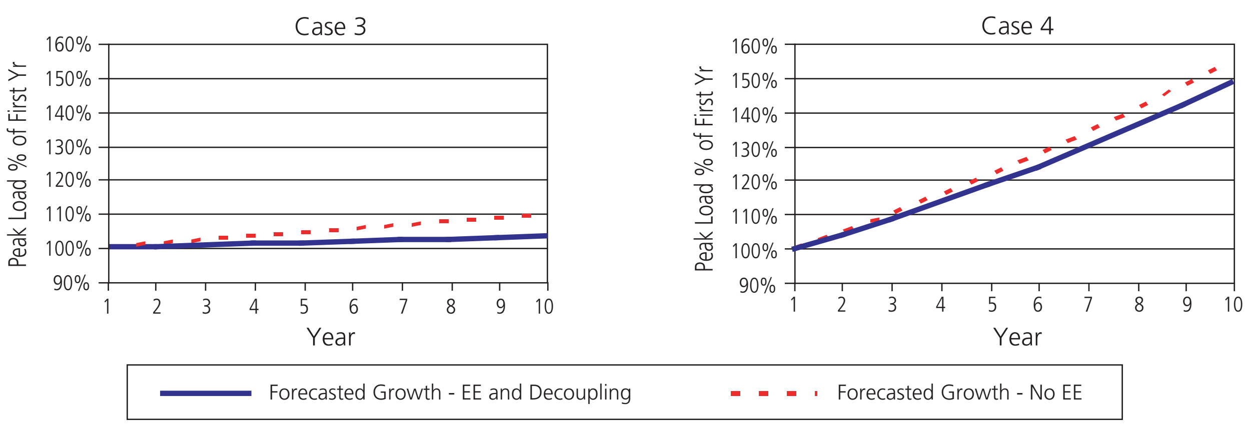
Case 3: Low-Growth (1%)	**Case 4: High-Growth (5%)**
Customer Bills Although rates rise with large capital expenditures, bills continue to fall over time as energy efficiency drives customer volume down to offset the higher rates.	**Customer Bills** Although rates rise with large capital expenditures, bills continue to fall over time as energy efficiency drives customer volume down to offset the higher rates.

Percent Change in Customer Bills



Case 3: Low-Growth (1%)	**Case 4: High-Growth (5%)**
Load Impact Energy efficiency significantly reduces load growth and reduces the need for new capital investment.	**Load Impact** With high growth, energy efficiency has a limited impact on peak load, and defers a modest amount of new capital investment.

Comparison of Peak Load Growth



sales. Once divested of a generation plant, the distribution utility is a smaller company (in terms of total rate base and capitalization), and fluctuations in throughput and earnings have a relatively larger impact on return.

Table 4-5 summarizes the comparison of ROE, rates, bills and societal benefits. Without implementing energy efficiency, both utilities are relatively financially healthy, achieving near their target rate of return in each year;

Table 4-5. Vertically Integrated and Delivery Company Results

Case 5: Vertically Integrated

Return on Equity (ROE)

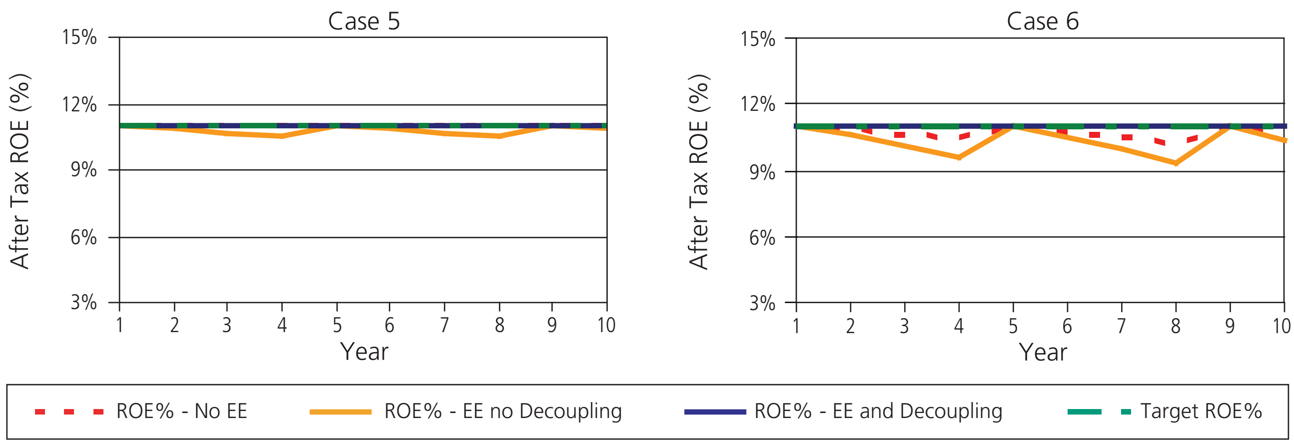
Because the vertically integrated utility has a large rate base, the impact of energy efficiency upon total earnings is limited and it has little impact upon ROE (with or without decoupling).

Case 6: Delivery Utility

Return on Equity (ROE)

With a smaller rate base and revenues only from kWh deliveries, energy efficiency has a larger impact on a ROE without decoupling than a vertically integrated utility.

Investor-Owned Utility Comparison of Return on Equity



Case 5: Vertically Integrated

Rates

Without energy efficiency, the utility sells higher volumes and has lower rates. Total retail rates, including delivery and energy, are similar for the vertically integrated and restructured utilities.

Case 6: Delivery Utility

Rates

Without energy efficiency, the utility sells higher volumes and has lower rates. Total retail rates, including delivery and energy, are similar for the vertically integrated and restructured utilities.

Comparison of Average Rate

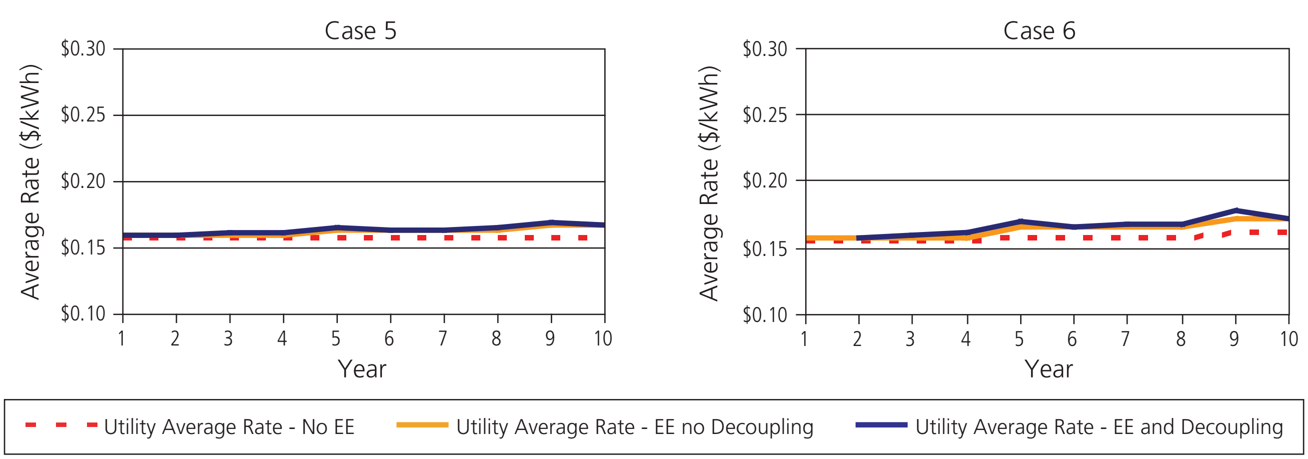


Table 4-5. Vertically Integrated and Delivery Company Results (continued)

Case 5: Vertically Integrated

Bills

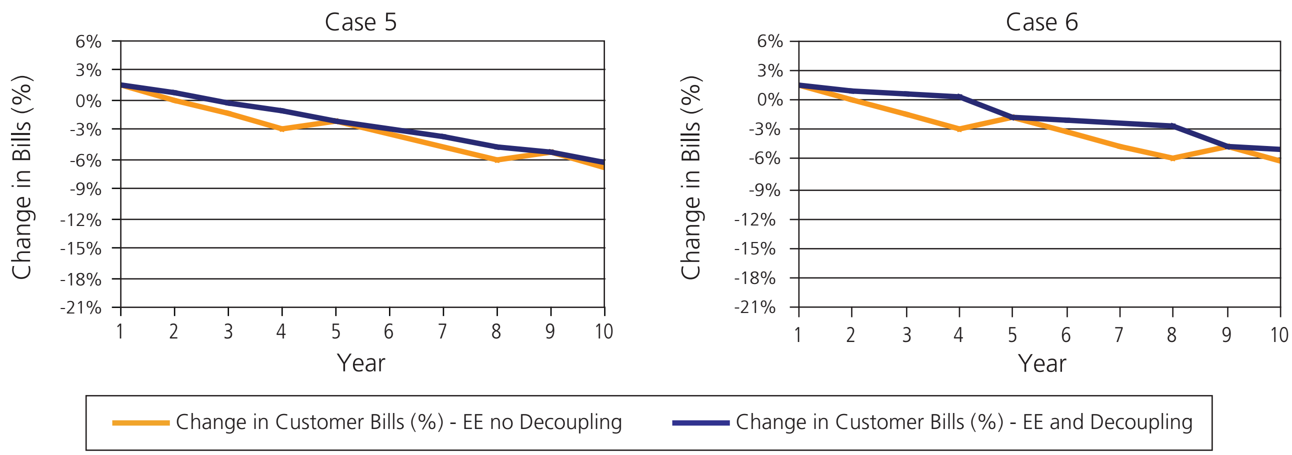
Total customer bills with energy efficiency programs decline over time, indicating average customer savings resulting from lower energy consumption. Customer utility bills decrease more smoothly with decoupling as a result of the more frequent rate adjustments.

Case 6: Delivery Utility

Bills

Total customer bills with energy efficiency programs decline over time, indicating average customer savings resulting from lower energy consumption. Customer utility bills decrease more slowly in the decoupling case, because rates are increased earlier to offset reduced sales.

Percent Change in Customer Bills



Case 5: Vertically Integrated

Net Societal Benefits

Over time, the savings from energy efficiency exceed the annual costs. The societal cost and societal savings are the same, with and without decoupling.

Case 6: Delivery Utility

Net Societal Benefits

As with the vertically integrated utility, savings from energy efficiency exceed the costs over time. The distribution utility has a lower initial societal savings because the distribution company reduces fewer capital expenditures at the outset of the energy efficiency investments. Over time, the societal costs and savings are similar to the distribution company.

Delivered Costs and Benefits of EE

however, introducing energy efficiency reduces ROE and earnings for both utilities unless a decoupling mechanism is put in place. Customer rates increases, bill savings, and societal benefits follow similar trends with energy efficiency, as discussed in Cases 1 and 2.

Cases 7 and 8: Publicly and Cooperatively Owned Electric Utilities

The first six cases used an investor-owned electric utility to illustrate the business case for energy efficiency. The Calculator also can evaluate the impact of efficiency programs on publicly and cooperatively owned electric utilities. Many of the issues related to the impact of growth rates and capital deferral discussed in the investor-owned utility examples apply equally to publicly and cooperatively owned utilities. From a net societal benefit perspective, the results are identical for publicly, cooperatively, and privately owned utilities. The ratemaking and utility financing perspectives are different, however.

The financial position of publicly owned utilities is evaluated primarily based on either the debt coverage ratio (which is critical to maintaining a high bond rating and low cost capital) or the minimum cash position (for utilities with no debt). Table 4-6 shows the results of a publicly or cooperatively owned utility with an energy efficiency program of 2 percent of revenue and load growth of 2 percent. In both cases, the assumption is made that the utility adjusts rates whenever the debt coverage ratio or minimum cash position falls below a threshold. This assumption makes comparisons of different cases more difficult, but the trends are similar to the investor-owned utilities on a regular rate case cycle. The change in utility financial health due to energy efficiency is relatively modest because of the ability to adjust the retail rates to maintain financial health. The publicly and cooperatively owned utilities will experience similar financial health problems as investor-owned utilities if they do not adjust rates.

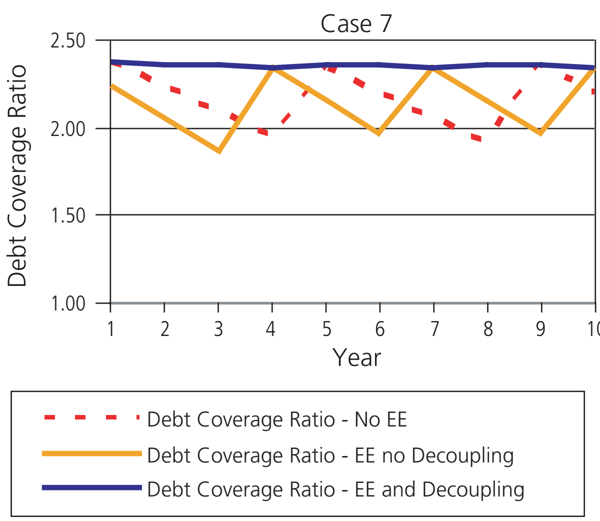
Table 4-6. Publicly and Cooperatively Owned Utility Results

Case 7: Minimum Debt Coverage Ratio

Utility Financial Health

A decoupling mechanism stabilizes the utility's ability to cover debt by adjusting rates for variations in throughput. Without decoupling, rates are adjusted whenever the debt coverage rate falls below a threshold (ratio 2 in the example). The rate adjustment is required earlier in the energy efficiency scenario.

Public Power/Cooperative Debt Coverage Ratio



Case 8: Minimum Cash Position

Utility Financial Health

In the no decoupling cases (with and without energy efficiency), rates are reset if the cash position falls below a minimum threshold ($70 million in this example). With decoupling, the utility adjusts rates to hit the target cash level in each year. The results are similar as long as there is an ability to reset rates when needed to maintain a minimum cash position.

Cash Position at End of Year

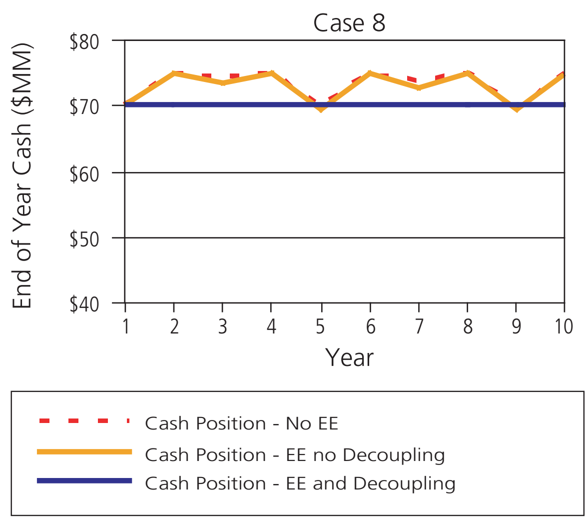


Table 4-6. Publicly and Cooperatively Owned Utility Results (continued)

Case 7: Minimum Debt Coverage Ratio

Customer Rates

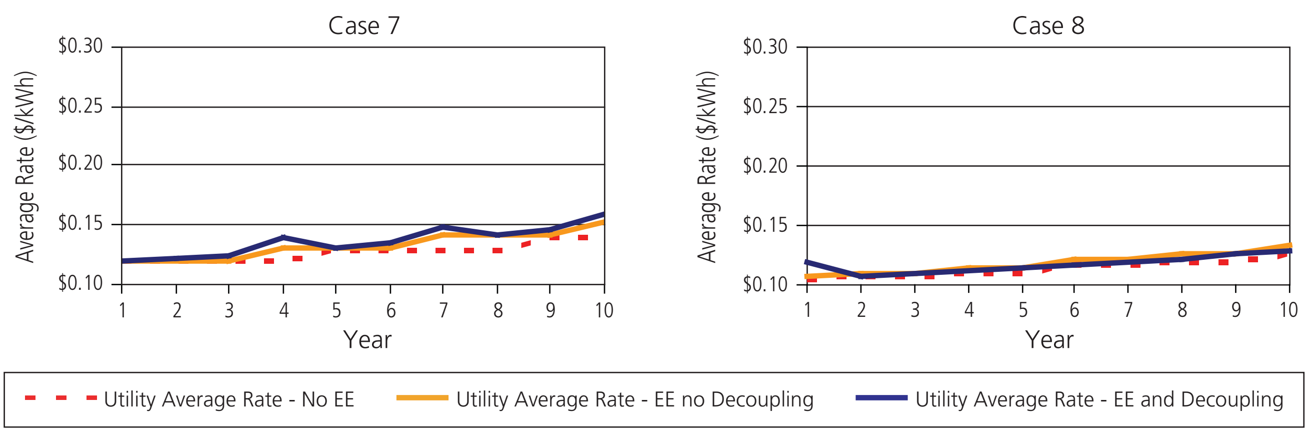
With or without decoupling, rates are adjusted to maintain financial health. Rates are lowest without energy efficiency and highest with energy efficiency and decoupling.

Case 8: Minimum Cash Position

Customer Rates

Once energy efficiency is implemented, retail rate levels are similar, with or without decoupling in place. The decoupling case is slightly smoother with smaller, more frequent rate adjustments.

Comparison of Average Rate



Case 7: Minimum Debt Coverage Ratio

Customer Bills

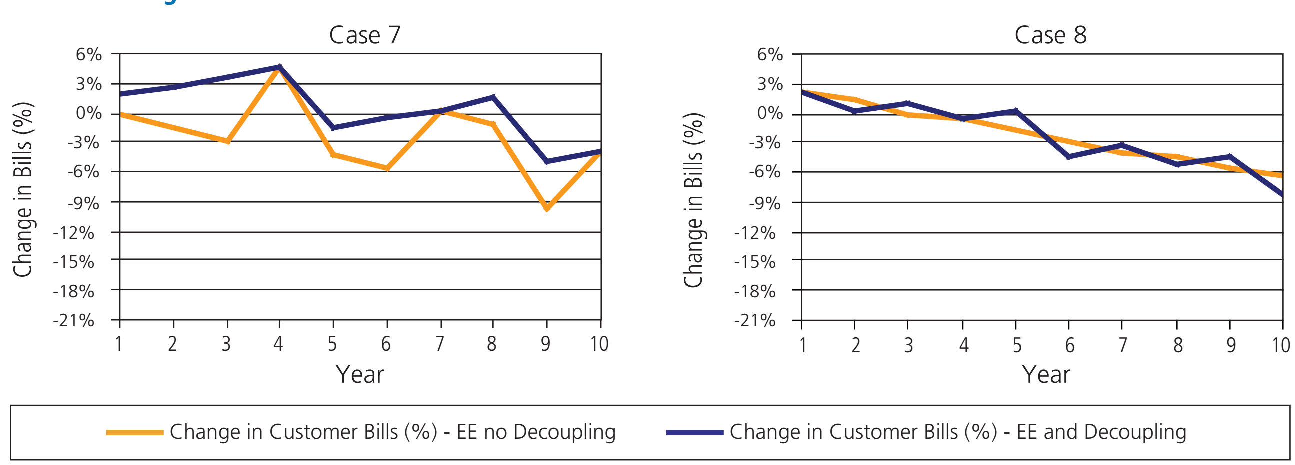
Average customer bills decline with energy efficiency investments, with and without decoupling. The 'randomness' in the bill change is due to different timing of rate adjustments in the energy efficiency and no energy efficiency cases. However, overall the trend is downward.

Case 8: Minimum Cash Position

Customer Bills

Average customer bills decline with energy efficiency investments in both the decoupling and no decoupling cases.

Percent Change in Customer Bills



Key Findings

This chapter summarizes eight business cases for energy efficiency resulting from the Energy Efficiency Benefits Calculator. This Calculator provides simplified results from a utility, customer, and societal perspective. As stated on page 4-1, the key findings from the eight cases examined include:

- For both electric and gas utilities, energy efficiency investments consistently lower costs over time for both utilities and customers, while providing positive net benefits to society. When enhanced by ratemaking policies to address utility financial barriers to energy efficiency, such as decoupling the utility's revenues from sales volumes, utility financial health can be maintained while comprehensive, cost-effective energy efficiency programs are implemented.

- The costs of energy efficiency and reduced sales volume might initially raise gas or electricity bills due to slightly higher rates from efficiency investment and reduced sales. However, as the efficiency gains help participating customers lower their energy consumption, the decreased energy use offsets higher rates to drive their total energy bills down. In the 8 cases examined, average customer bills were reduced by 2 percent to 9 percent over a ten year period, compared to the no-efficiency scenario.

- Investment in cost-effective energy efficiency programs yields a net benefit to society—on the order of hundreds of millions of dollars in NPV for the illustrative case studies (small- to medium-sized utilities).

Recommendations and Options

The National Action Plan for Energy Efficiency Leadership Group offers the following recommendation as a way to overcome many of the barriers to energy efficiency, and provides the following options for consideration by utilities, regulators, and stakeholders (*as presented in the Executive Summary*).

Recommendation: Broadly communicate the benefits of, and opportunities for, energy efficiency. Experience shows that energy efficiency programs help customers save money and contribute to lower cost energy systems. But these impacts are not fully documented nor recognized by customers, utilities, regulators and policy-makers. More effort is needed to establish the business case for energy efficiency for all decision-makers and to show how a well-designed approach to energy efficiency can benefit customers, utilities, and society by (1) reducing customers bills over time, (2) fostering financially healthy utilities (return on equity [ROE], earnings per share, debt coverage ratios unaffected), and (3) contributing to positive societal net benefits overall. Effort is also necessary to educate key stakeholders that, although energy efficiency can be an important low-cost resource to integrate into the energy mix, it does require funding, just as a new power plant requires funding.

Options to Consider:

- Establishing and educating stakeholders on the business case for energy efficiency at the state, utility, and other appropriate level addressing relevant customer, utility, and societal perspectives.

- Communicating the role of energy efficiency in lowering customer energy bills and system costs and risks over time.

Reference

National Action Plan for Energy Efficiency. (2006). *Energy Efficiency Benefits Calculator.* <http://www.epa.gov/cleanenergy/eeactionplan.htm>