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)

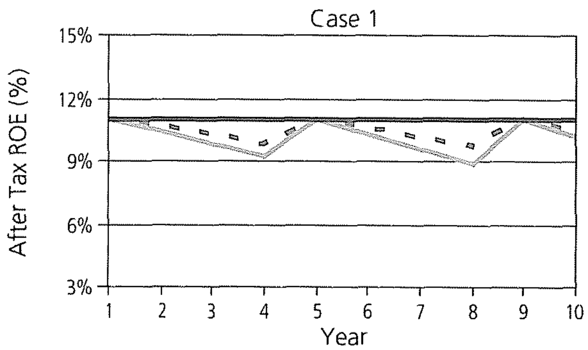
Without efficiency and decoupling, the low sales drive ROE below the target return. Target ROE is achieved with energy efficiency (EE) and decoupling. Increasing energy efficiency without decoupling decreases ROE.

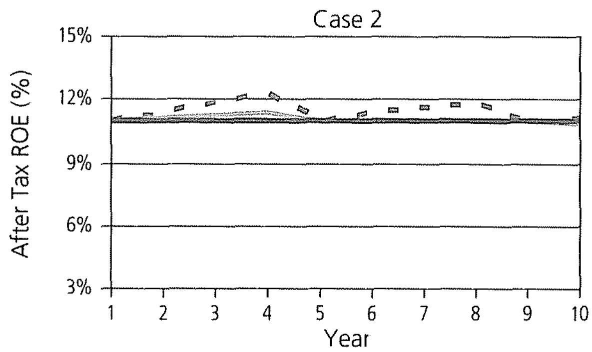
Case 2: High-Growth (5%)

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





ROE% - No EE — ROE% - EE no Decoupling — ROE% - EE and Decoupling — Target ROE%

Case 1: Low-Growth (1%)

Rates

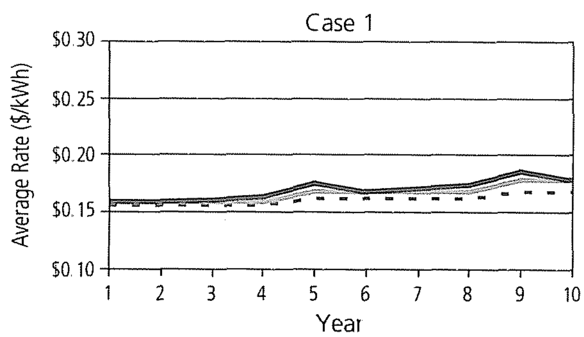
Without energy efficiency, the utility sells higher volumes than in the no efficiency scenarios and has slightly lower rates. Rates in the energy efficiency scenario increase primarily due to lower throughput; rates are slightly higher in the decoupling scenario due to increase earnings to the target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

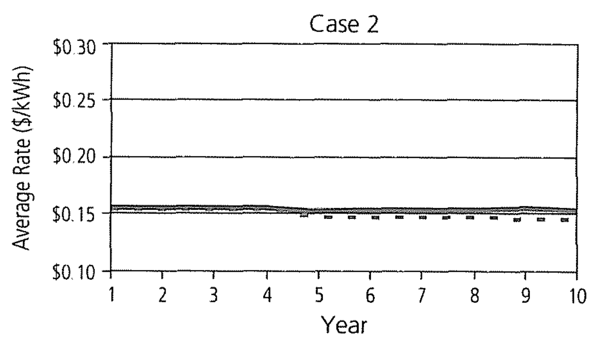
Case 2: High-Growth (5%)

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





Utility Average Rate - No EE — Utility Average Rate - EE no Decoupling — Utility Average Rate - EE and Decoupling 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

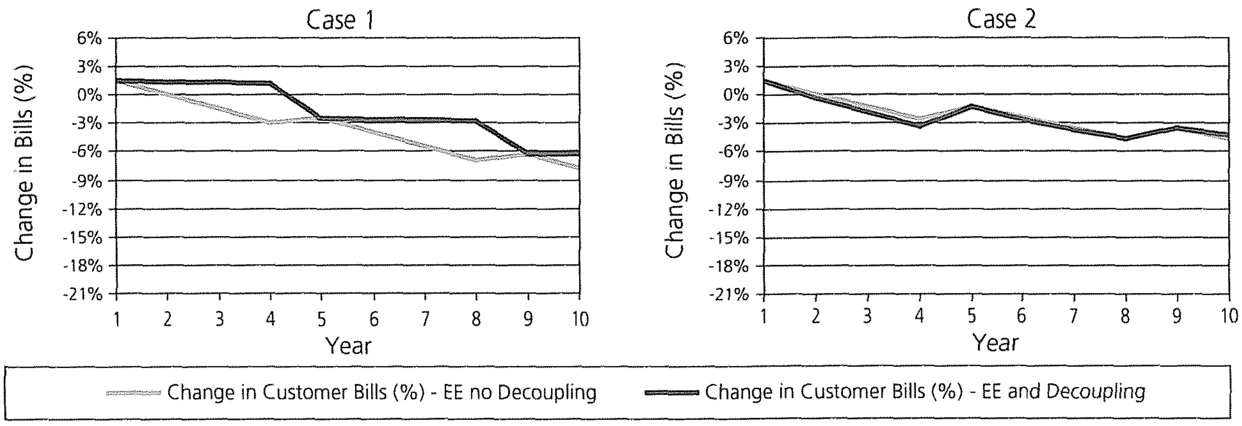
Total customer bills with energy efficiency programs decline over time, indicating customer savings resulting from lower energy consumption. Rate increases through the decoupling mechanism reduce the pace of bill savings in the decoupling case.

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

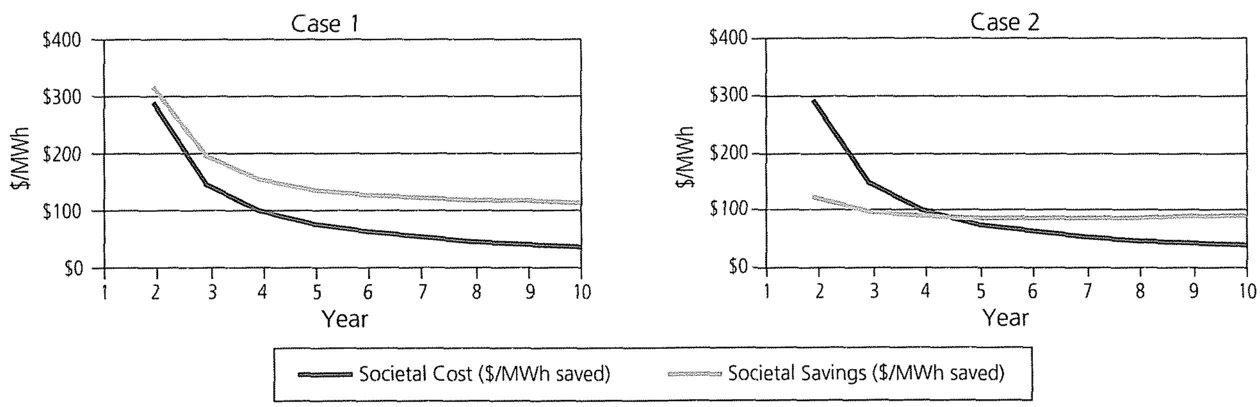
Over time, the savings from energy efficiency exceed the annual costs. The societal cost and societal savings are the same, with and without decoupling.

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)

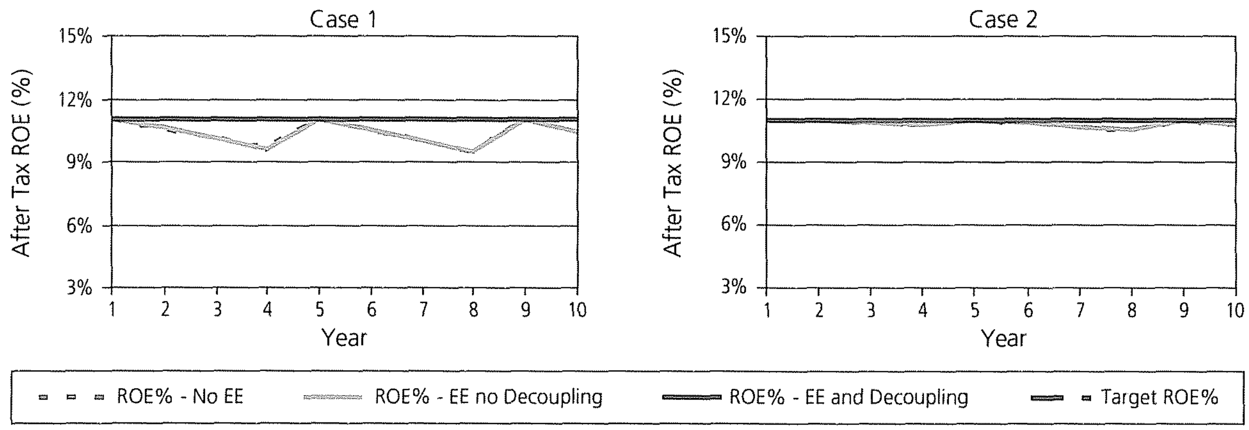
Without efficiency and decoupling, the low sales result in ROE falling below the target return. Similarly, energy efficiency without decoupling drops utility return below target ROE. Target ROE is achieved with decoupling.

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

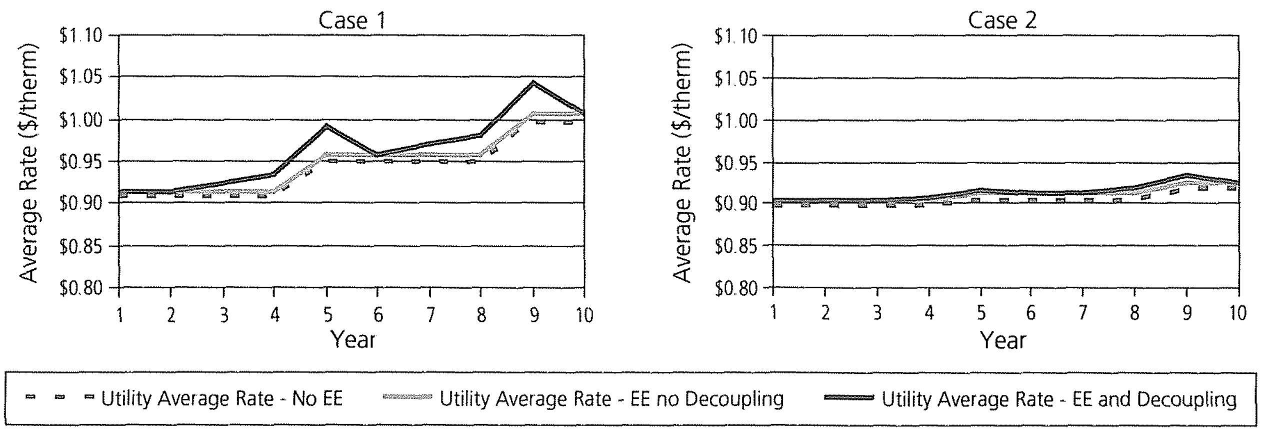


Table 4-3. High- and Low-Growth Results: Natural Gas Utility (continued)

Case 1: Low-Growth (0%)

Customer Bills

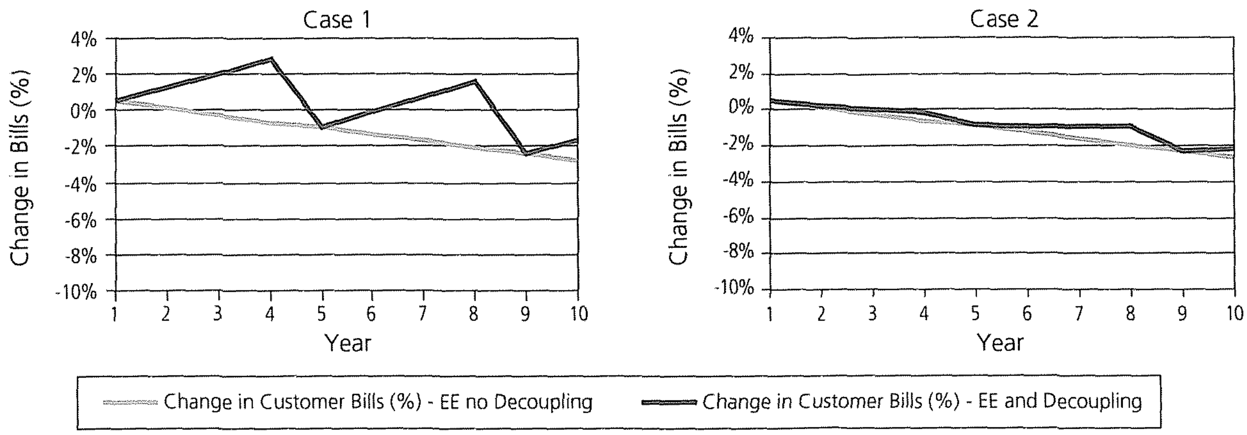
Total customer bills with energy efficiency decline over time, indicating customer savings resulting from lower energy consumption. Customer utility bills initially increase slightly with decoupling as rates are increased to hold ROE at the target level and spending increases on efficiency.

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

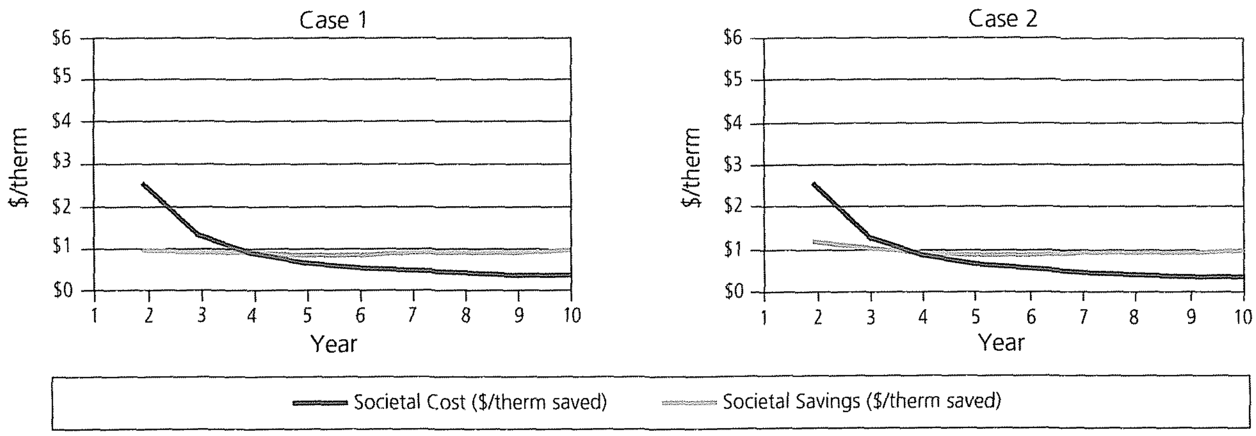
Over time, the savings from energy efficiency exceed the annual costs. The societal cost and societal savings are the same, with and without decoupling.

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

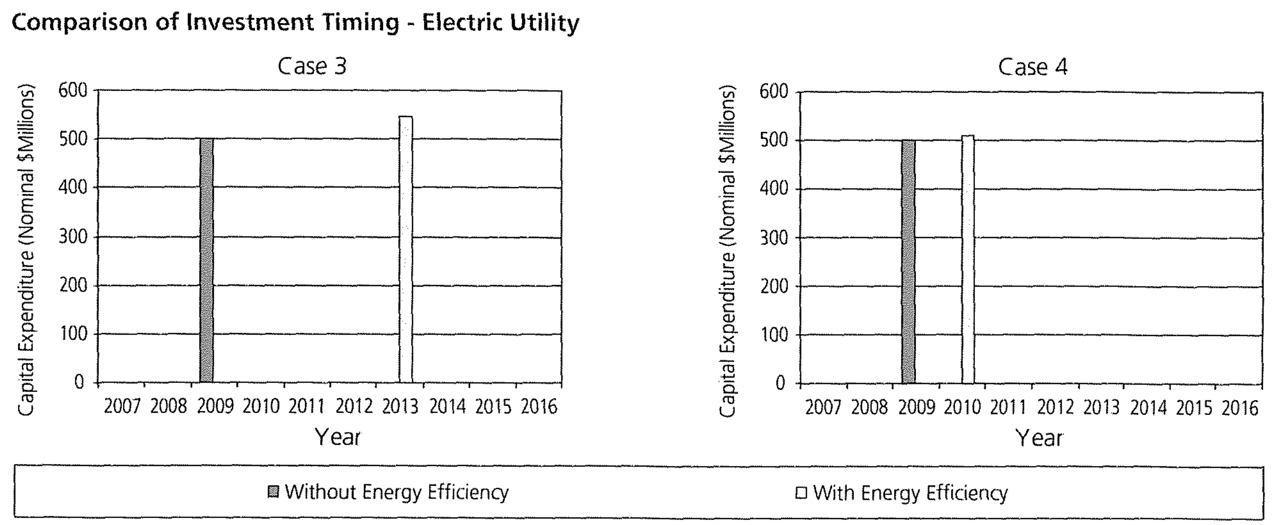
This case study examines an electric investor-owned utility with a large capital project (modeled here as a 500-MW combined-cycle power plant, although the conclusions are similar for other large capital projects), planned for construction in 2009.[9] Again the effect of a 1 percent growth rate (Case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

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.

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.

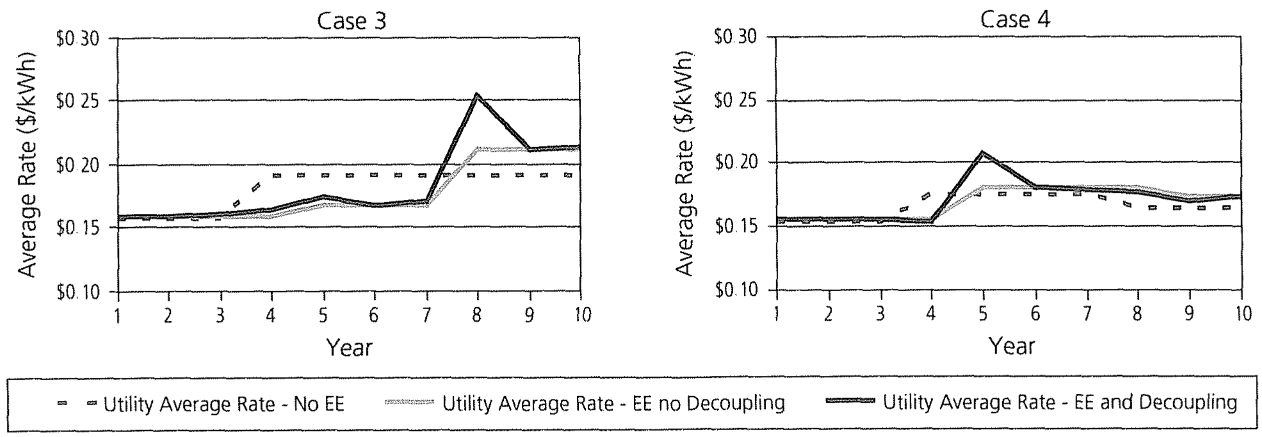
Case 4: High-Growth (5%)

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.

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%)

Customer Bills

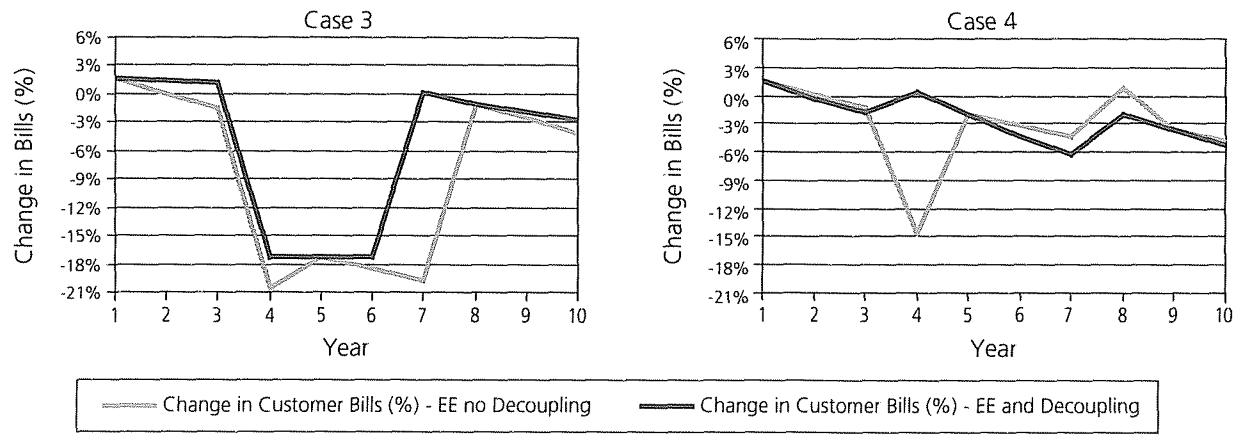
Although rates rise with large capital expenditures, bills continue to fall over time as energy efficiency drives customer volume down to offset the higher rates.

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.

Percent Change in Customer Bills



Case 3: Low-Growth (1%)

Load Impact

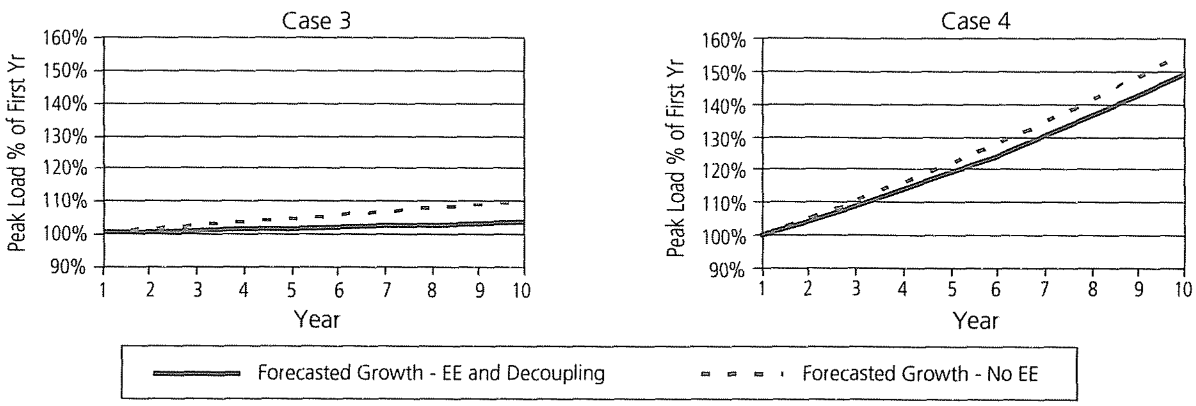
Energy efficiency significantly reduces load growth and reduces the need for new capital investment.

Case 4: High-Growth (5%)

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)

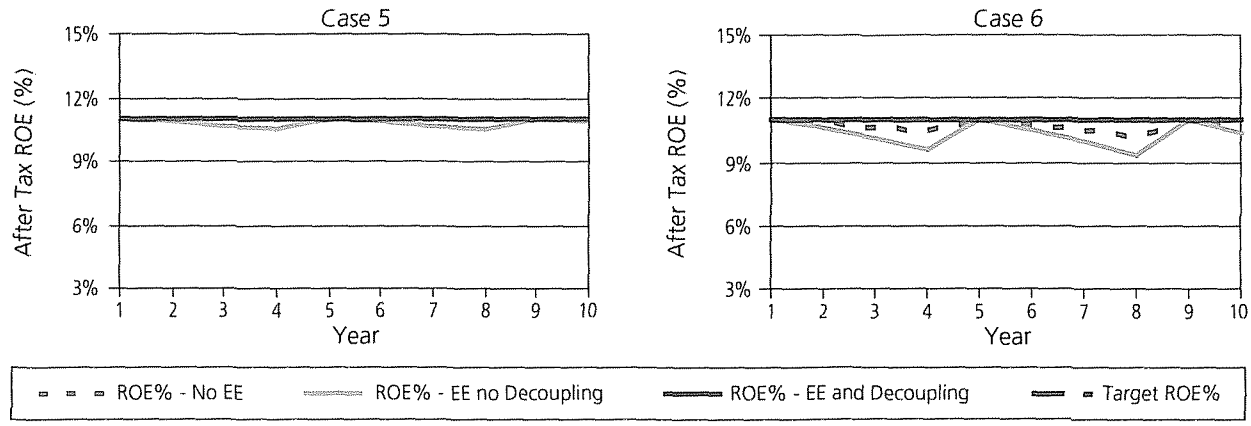
Because the vertically integrated utility has a large rate base, the impact of energy efficiency upon total earnings is limited and it has little impact upon ROE (with or without decoupling).

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

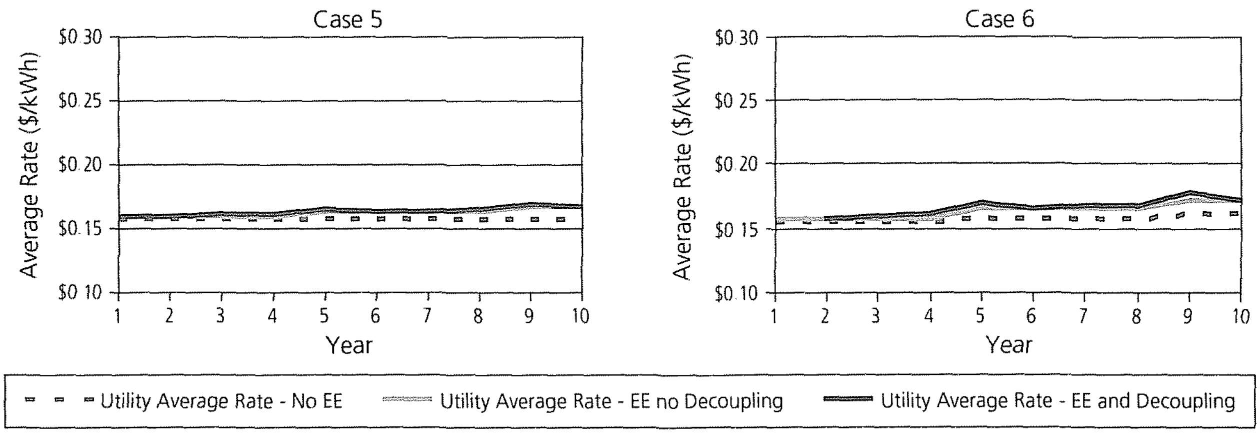


Table 4-5. Vertically Integrated and Delivery Company Results (continued)

Case 5: Vertically Integrated

Bills

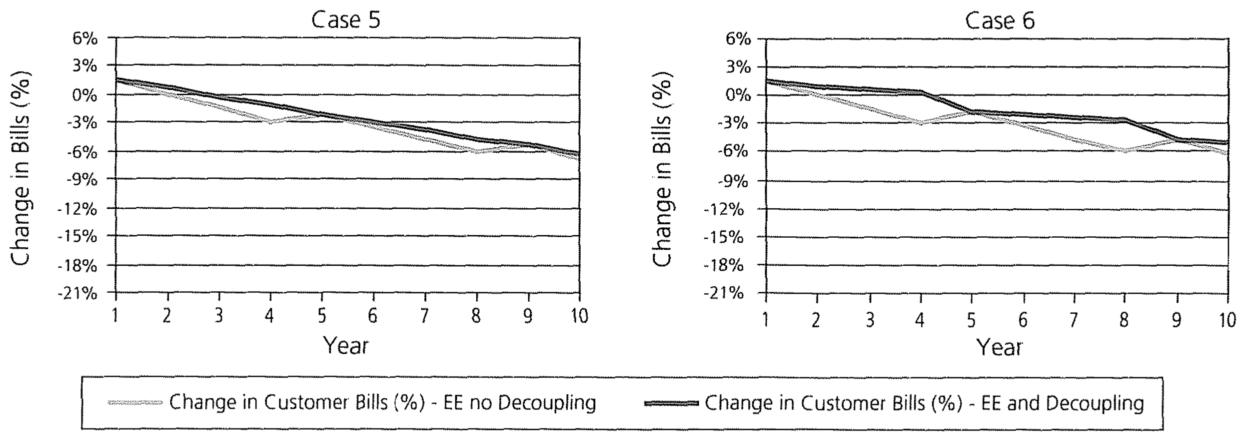
Total customer bills with energy efficiency programs decline over time, indicating average customer savings resulting from lower energy consumption. Customer utility bills decrease more smoothly with decoupling as a result of the more frequent rate adjustments.

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

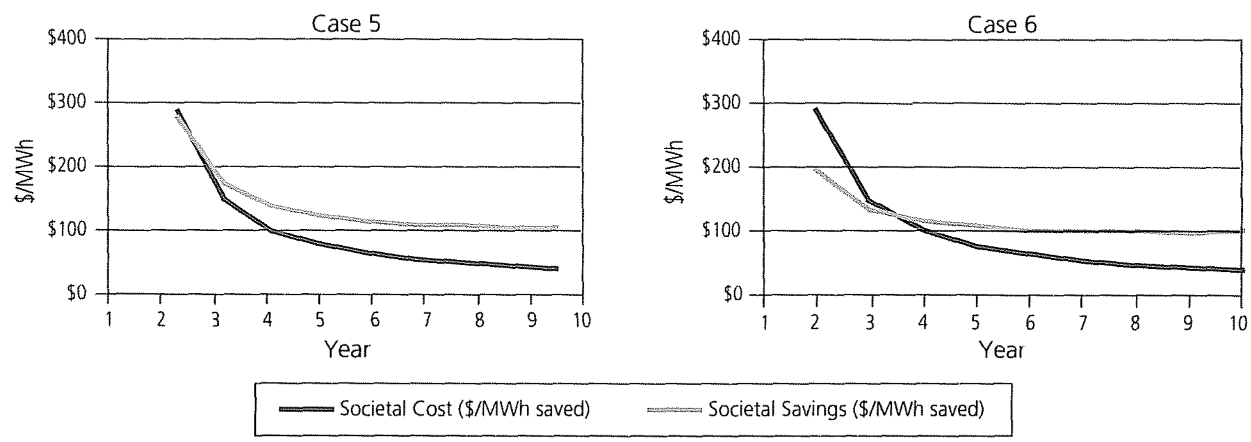
Over time, the savings from energy efficiency exceed the annual costs. The societal cost and societal savings are the same, with and without decoupling.

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.

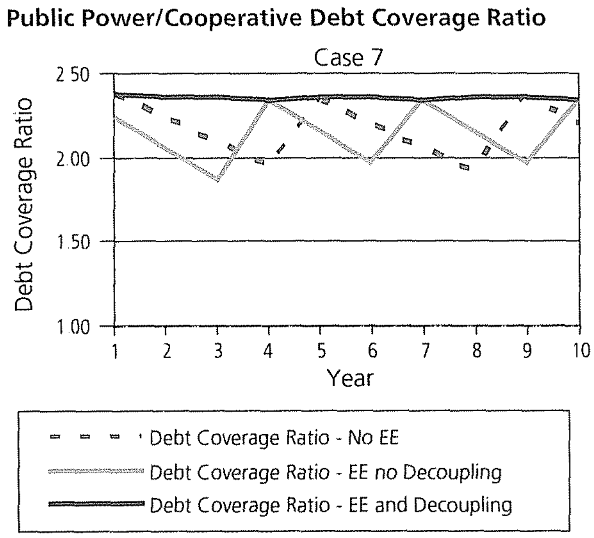
The financial position of publicly owned utilities is evaluated primarily based on either the debt coverage ratio (which is critical to maintaining a high bond rating and low cost capital) or the minimum cash position (for utilities with no debt). Table 4-6 shows the results of a publicly or cooperatively 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.



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.

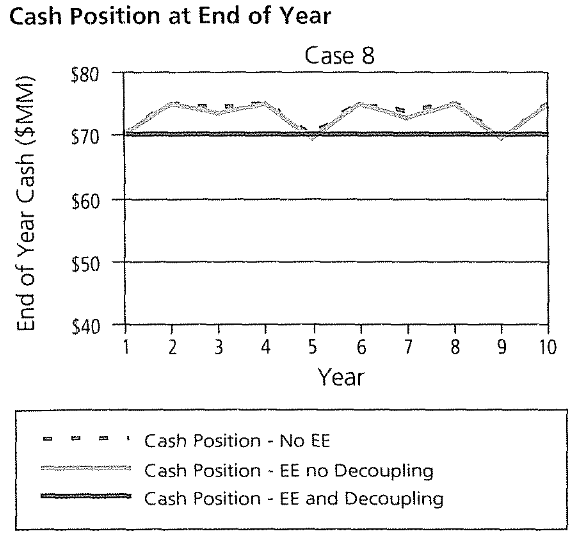


Table 4-6. Publicly and Cooperatively Owned Utility Results (continued)

Case 7: Minimum Debt Coverage Ratio

Customer Rates

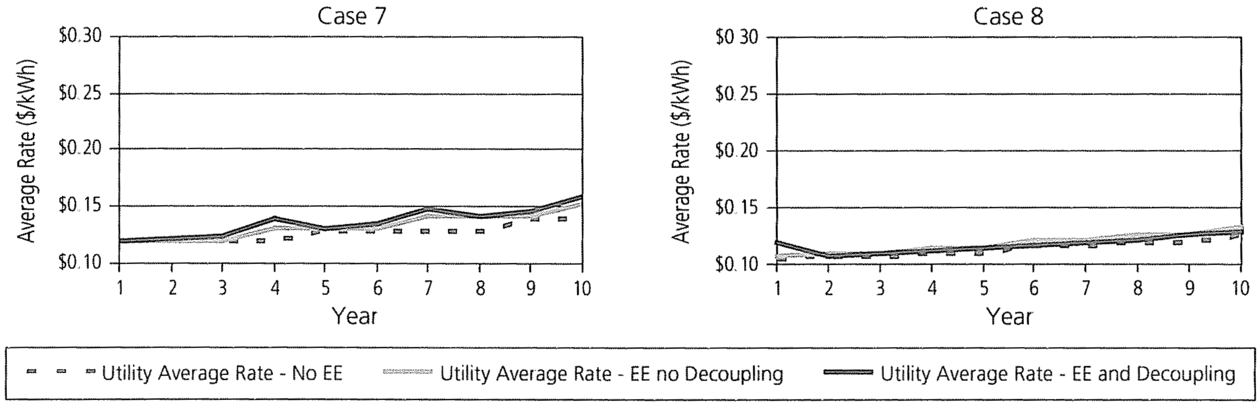
With or without decoupling, rates are adjusted to maintain financial health. Rates are lowest without energy efficiency and highest with energy efficiency and decoupling.

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

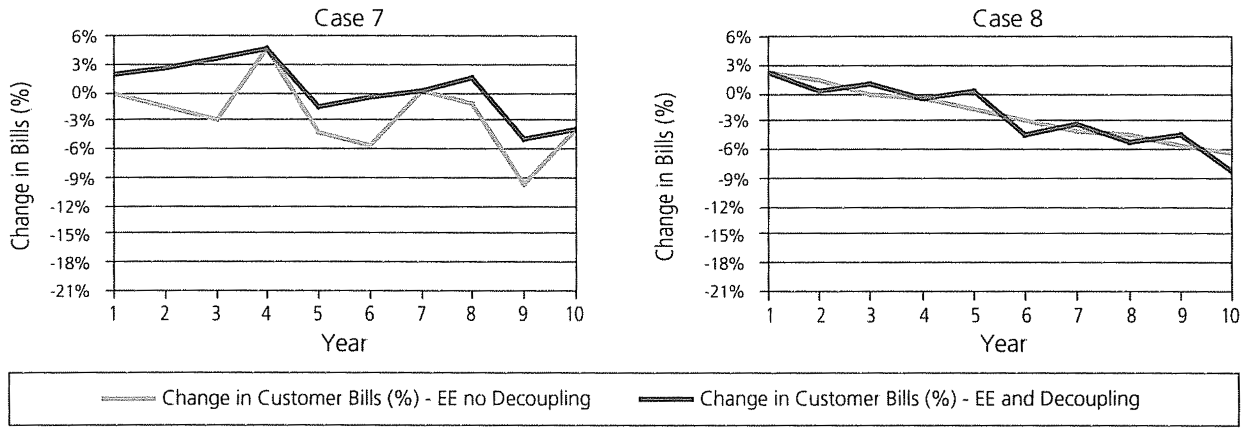
Average customer bills decline with energy efficiency investments, with and without decoupling. The 'randomness' in the bill change is due to different timing of rate adjustments in the energy efficiency and no energy efficiency cases. However, overall the trend is downward.

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:

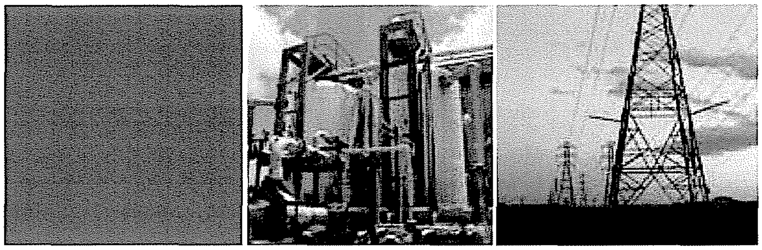
- Establishing and educating stakeholders on the business case for energy efficiency at the state, utility, and other appropriate level addressing relevant customer, utility, and societal perspectives.

- 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>

5: Rate Design



Retail electricity and natural gas utility rate structures and price levels influence customer consumption, and thus are an important tool for encouraging the adoption of energy-efficient technologies and practices. The rate design process typically involves balancing multiple objectives, among which energy efficiency is often overlooked. Successful rate designs must balance the overall design goals of utilities, customers, regulators, and other stakeholders, including encouraging energy efficiency.

Overview

Retail rate designs with clear and meaningful price signals, coupled with good customer education, can be powerful tools for encouraging energy efficiency. At the same time, rate design is a complex process that must take into account multiple objectives (Bonbright, 1961; Philips, 1988). The main priorities for rate design are recovery of utility revenue requirements and fair apportionment of costs among customers.

Other important regulatory and legislative goals include:

- Stable revenues for the utility.
- Stable rates for customers.
- Social equity in the form of lifeline rates for essential needs of households (PURPA of 1978).
- Simplicity of understanding for customers and ease of implementation for utilities.
- Economic efficiency to promote cost-effective load management.

This chapter considers the additional goal of encouraging investment in energy efficiency. While it is difficult to achieve every goal of rate design completely, consideration of a rate design's impact on adoption of energy efficiency and any necessary trade-offs can be included as part of the ratemaking process.

Using Rate Design to Promote Energy Efficiency

In developing tariffs to encourage energy efficiency, the following questions arise: (1) What are the key rate design issues, and how do they affect rate designs for energy efficiency? (2) What different rate design options are possible, and what are their pros and cons? (3) What other mechanisms can encourage efficiency that are not driven by tariff savings? and (4) What are the most successful strategies for encouraging energy efficiency in different jurisdictions? These questions are addressed throughout this chapter.

Leadership Group Recommendations Applicable to Rate Design

- Modify ratemaking practices to promote energy efficiency investments.
- Broadly communicate the benefits of, and opportunities for, energy efficiency.

A more detailed list of options specific to the objective of promoting energy efficiency in rate design is provided at the end of this chapter.

Background: Revenues and Rates

Utility rates are designed to collect a specific revenue requirement based on natural gas or electricity sales. As rates are driven by sales and revenue requirements, these three aspects of regulation are tightly linked. (Revenue requirement issues are discussed in Chapter 2: Utility Ratemaking & Revenue Requirements.)

Until the 1970s, rate structures were based on the principle of average-cost pricing in which customer prices reflected the average costs to utilities of serving their customer class. Because so many of a utility's costs were fixed, the main goal of rate design up until the 1970s was to promote sales. Higher sales allowed fixed costs to be spread over a larger base and helped push rates down, keeping stakeholders content with average-cost based rates (Hyman et al., 2000).

This dynamic began to change in many jurisdictions in the 1970s, with rising oil prices and increased emphasis on conservation. With the passage of the 1978 Public Utility Regulatory Policies Act (PURPA), declining block rates were replaced by flat rates or even inverted block rates, as utilities began to look for ways to defer new plant investment and reduce the environmental impact of energy consumption.

Key Rate Design Issues

Utilities and regulators must balance competing goals in designing rates. Achieving this balance is essential for obtaining regulatory and customer acceptance. The main rate design issues are described below.

Provide Recovery of Revenue Requirements and Stable Utility Revenues

A primary function of rates is to let utilities collect their revenue requirements. Utilities often favor rate forms that maximize stable revenues, such as declining block rates. The declining block rate has two or more tiers of usage, with the highest rates in the first tier. Tier 1 is typically a relatively low monthly usage level that most customers exceed. This rate gives utilities a high degree of certainty regarding the number of kilowatt-hours (kWh) or therms that will be billed in Tier 1. By designing Tier 1 rates to collect the utility's fixed costs, the utility gains stability in the collection of those costs. At the same time, the lower Tier 2 rates encourage higher energy consumption rather than efficiency, which is detrimental to energy efficiency impacts.[1] Because energy efficiency measures are most likely to change customer usage in Tier 2, customers will see smaller bill reductions under declining block rates than under flat rates. Although many utilities have phased out declining block rates, a number of utilities continue to offer them.[2]

Another rate element that provides revenue stability but also detracts from the incentive to improve efficiency is collecting a portion of the revenue requirement through a customer charge that is independent of usage. Because the majority of utility costs do not vary with changes in customer usage level in the short run, the customer charge also has a strong theoretical basis. This approach has mixed benefits for energy efficiency. On one hand, a larger customer charge means a smaller volumetric charge (per kWh or therm), which lowers the customer incentive for energy efficiency. On the other hand, a larger customer charge and lower volumetric charge reduces the utilities profit from increased sales, reducing the utility disincentive to promote energy efficiency.

Rate forms like declining block rates and customer charges promote revenue stability for the utility, but they create a barrier to customer adoption of energy efficiency because they reduce the savings that customers can realize from reducing usage. In turn, electricity demand is more likely to increase, which could lead to long-term higher rates and bills where new supply is more costly than energy efficiency. To promote energy efficiency, a key challenge is to provide a

[1] Brown and Sibley (1986) opine that a declining block structure can promote economic efficiency if the lowest tier rate can be set above marginal cost, while inducing additional consumption by some consumers. A rising marginal cost environment suggests, however, that a declining block rate structure with rates below the increasing marginal costs is economically inefficient.

[2] A partial list of utilities with declining block residential rates includes: Dominion Virginia Power, VA; Appalachian Power Co, VA; Indianapolis Power and Light Co., IN; Kentucky Power Co., KY; Cleveland Electric Illum Co., OH; Toledo Edison Co., OH; Rappahannock Electric Coop, VA; Lincoln Electric System, NE; Cuivre River Electric Coop Inc., MO; Otter Tail Power Co., ND; Wheeling Power Co., WV; Matanuska Electric Assn Inc., AK; Homer Electric Association Inc., AK; Lower Valley Energy, NE.

level of certainty to utilities for revenue collection without dampening customer incentive to use energy more efficiently.

Fairly Apportion Costs Among Customers

Revenue allocation is the process that determines the share of the utility's total revenue requirement that will be recovered from each customer class. In regulatory proceedings, this process is often contentious, as each customer class seeks to pay less. This process makes it difficult for utilities to propose rate designs that shift revenues between different customer classes.

In redesigning rates to encourage energy efficiency, it is important to avoid unnecessarily or inadvertently shifting costs between customer classes. Rate design changes should instead focus on providing a good price signal for customer consumption decisions.

Promote Economic Efficiency for Cost-Effective Load Management

According to economic theory, the most efficient outcome occurs when prices are equal to marginal costs, resulting in the maximum societal net benefit from consumption.

Marginal Costs

Marginal costs are the *changes* in costs required to produce one additional unit of energy. In a period of rising marginal costs, rates based on marginal costs more realistically reflect the cost of serving different customers, and provide an incentive for more efficient use of resources (Bonbright, 1961; Kahn, 1970; Huntington, 1975; Joskow, 1976; Joskow, 1979).

A utility's marginal costs often include its costs of complying with local, state, and federal regulations (e.g., Clean Air Act), as well as any utility commission policies addressing the environment (e.g., the use of the societal test for benefit-cost assessments). Rate design based on the utility's marginal costs that promotes cost-effective energy efficiency will further increase environmental protection by reducing energy consumption.

Despite its theoretical attraction, there are significant barriers to fully implementing marginal-cost pricing in electricity, especially at the retail level. In contrast to other commodities, the necessity for generation to match load at all times means that outputs and production costs are constantly changing, and conveying these costs as real time "price signals" to customers, especially residential customers, can be complicated and add additional costs. Currently, about half of the nation's electricity customers are served by organized real-time electricity markets, which can help provide time-varying prices to customers by regional or local area.

Notwithstanding the recent price volatility, exacerbated by the 2005 hurricane season and current market conditions, wholesale natural gas prices are generally more stable than wholesale electricity prices, largely because of the ability to store natural gas. As a result, marginal costs have been historically a less important issue for natural gas pricing.

Short-Run Versus Long-Run Price Signals

There is a fundamental conflict between whether electricity and natural gas prices should reflect short-run or long-run marginal costs. In simple terms, short-run costs reflect the variable cost of production and delivery, while long-run costs also include the cost of capital expansion. For programs such as real-time pricing in electricity, short-run marginal costs are used for the price signals so they can induce efficient operating decisions on a daily or hourly basis.

Rates that reflect long-run marginal costs will promote economically efficient investment decisions in energy efficiency, because the long-run perspective is consistent with the long expected useful lives of most energy efficiency measures, and the potential for energy efficiency to defer costly capital investments. For demand-response and other programs intended to alter consumption on a daily or hourly basis, however, rates based on short-run

Applicability of Rate Design Issues

Implications for Clean Distributed Generation and Demand Response. The rate issues for energy efficiency also apply to clean distributed generation and demand response, with two exceptions. Demand response is focused on reductions in usage that occur for only a limited number of hours in a year, and occur at times that are not known far in advance (typically no more than one day notice, and often no more than a few hours notice). Because of the limited hours of operation, the revenue erosion from demand response is small compared to an energy efficiency measure. In addition, it could be argued that short-run, rather than long-run, costs are the appropriate cost metric to use in valuing and pricing demand response programs.

Public Versus Private Utilities. The rate issues are essentially the same for both public and private utilities. Revenue stability might be a lesser concern for public utilities, as they could approach their city leaders for rate changes. Frequent visits to council chambers for rate changes might be frowned upon, however, so revenue stability will likely remain important to many public utilities as well.

Gas Versus Electric. As discussed above, gas marginal costs are less volatile than electricity marginal costs, so providing prices that reflect marginal costs is generally less of a concern for the gas utilities. In addition, the nature of gas service does not lend itself to complicated rate forms such as those seen for some electricity customers. Nevertheless, gas utilities could implement increasing tier block rates, and/or seasonally differentiated rates to stimulate energy efficiency.

Restructured Versus Non-Restructured Markets. Restructuring has had a substantial impact on the funding, administration, and valuation of energy efficiency programs. It is no coincidence that areas with high retail electricity rates have been more apt to restructure their electricity markets. The higher rates increase the appeal of energy efficiency measures, and the entry of third-party energy service companies can increase customer interest and education regarding energy efficiency options. In a retail competition environment, however, there might be relatively little ratemaking flexibility. In several states, restructuring has created transmission and distribution-only utilities, so the regulator's ability to affect full electricity rates might be limited to distribution costs and rates for default service customers.

marginal cost might be more appropriate. Therefore, in developing retail rates, the goals of short-run and long-run marginal based pricing must be balanced.

Cost Causation

Using long-run marginal costs to design an energy-efficiency enhancing tariff can present another challenge —potential inconsistency with the cost-causation principle that a tariff should reflect the utility's various costs of serving a customer. This potential inconsistency diminishes in the long run, however, because over the long run, some costs that might be considered fixed in the near term (e.g., generation or transmission capacity, new interstate pipeline capacity or storage) are actually variable. Such costs can be reduced through sustained load reductions provided by energy efficiency investment, induced by appropriately designed marginal cost-based rates. Some costs of a utility do not vary with a customer's kWh usage (e.g., hookup and local distribution). As a result, a marginal cost-based rate design may necessarily include some fixed costs, which can be collected via a volumetric adder or a relatively small customer charge. However, utilities that set usage rates near long-run marginal costs will encourage energy efficiency and promote other social policy goals such as affordability for low-income and low-use customers whose bills might increase with larger, fixed charges. Hence, a practical implementation of marginal-cost based ratemaking should balance the trade-offs and competing goals of rate design.

Provide Stable Rates and Protect Low-Income Customers
Rate designs to promote energy efficiency must consider whether or not the change will lead to bill increases. Mitigating large bill increases for individual customers is a fundamental goal of rate design, and in some jurisdictions low-income customers are also afforded particular attention to ensure that they are not adversely affected by rate changes. In some cases, low-income customers are eligible for special rates or rate riders that protect them from large rate increases, as exemplified by the lifeline rates provision in Section 114 of the 1978 PURPA. Strategies to manage bill impacts include phasing-in rate changes to reduce the rate shock in any single year, creating exemptions for certain at-risk customer groups, and disaggregating customers into small customer groups to allow more targeted rate forms.

Because of the concern over bill impacts, new and innovative rates are often offered as voluntary rates. While improving acceptance, voluntary rate structures generally attract a relatively small percentage of customers (less than 20 percent) unless marketed heavily by the utility. Voluntary rates can lead to some "free riders," meaning customers who achieve bill reductions without changing their consumption behavior and providing any real savings to the utility. Rates to promote energy efficiency can be offered as voluntary, but the low participation and free rider issues should be taken into account in their design to ensure that the benefits of the consumption changes they encourage are at least as great as the resulting bill decreases.

Maintain Rate Simplicity

Economists and public policy analysts can become enamored with efficient pricing schemes, but customers generally prefer simple rate forms. The challenge for promoting energy efficiency is balancing the desire for rates that provide the right signals to customers with the need to have rates that customers can understand, and to which they can respond. Rate designs that are too complicated for customers to understand will not be effective at promoting efficient consumption decisions. Particularly in the residential sector, customers might pay more attention to the total bill than to the underlying rate design.

Addressing the Issues: Alternative Approaches

The prior sections listed the issues that stakeholders must balance in designing new rates. This section presents some traditional and non-traditional rate designs and discusses their merits for promoting energy efficiency. The alternatives described below vary by metering/billing requirement, information complexity, and ability to reflect marginal cost.[3]

Rate Design Options

Inclining Tier Block
Inclining tier block rates, also referred to as inverted block rates, have per-unit prices that increase for each successive block of energy consumed. Inclining tiered rates offer the advantages of being simple to understand and simple to meter and bill. Inclining rates can also meet the policy goal of protecting small users, which often include low-income customers. In fact, it was the desire to protect small users that prompted the initiation of increasing tiers in California. Termed "lifeline rates" at the time, the intention was to provide a small base level of electricity to all residential customers at a low rate, and charge the higher rate only to usage above that base level. The concept of lifeline rates continues in various forms for numerous services such as water and sewer services, and can be considered for delivery or commodity rates for electricity and natural gas. However, in many parts of the country, low-income customers are not necessarily low-usage customers, so a lifeline rate might not protect all low-income customers from energy bills.

[3] As part of its business model, a utility may use innovative rate options for the purpose of product differentiation For example, advanced metering that enables a design with continuously time-varying rates can apply to an end-use (e g., air conditioning) that is the main contributor to the utility's system peak Another example is the bundling of sale of electricity and consumer devices (e g., a 10-year contract for a central air conditioner whose price includes operation cost)

Tiered rates also provide a good fit for regions where the long-run marginal cost of energy exceeds the current average cost of energy. For example, regions with extensive hydroelectric resources might have low average costs, but their marginal cost might be set by much higher fossil plant costs or market prices (for purchase or export).

See Table 5-1 for additional utilities that offer inclining tier residential rates.

Time of Use (TOU)

TOU rates establish varying charges by season or time of day. Their designs can range from simple on- and off-peak rates that are constant year-round to more complicated rates with seasonally differentiated prices for several time-of-day periods (e.g., on-, mid- and off-peak). TOU rates have support from many utilities because of the flexibility to reflect marginal costs by time of delivery.

TOU rates are commonly offered as voluntary rates for residential electric customers,[4] and as mandatory rates for larger commercial and industrial customers. Part of the reason for TOU rates being applied primarily to larger users is the additional cost of TOU metering and billing, as well as the assumed greater ability of larger customers to shift their loads.

TOU rates are less applicable to gas rates, because the natural storage capability of gas mains allows gas utilities to procure supplies on a daily, rather than hourly, basis. Additionally, seasonal variations are captured to a large extent in costs for gas procurement, which are typically passed through to the customer. An area with constrained seasonal gas transportation capacity, however, could merit a higher distribution cost during the constrained season. Alternatively, a utility could recover a higher share of its fixed costs during the high demand season, because seasonal peak demand drives the sizing of the mains.

As TOU rates are typically designed to be revenue-neutral with the status quo rates, a high on-peak price will be accompanied by a low off-peak price. Numerous studies in electricity have shown that while the high on-peak prices do cause a reduction in usage during that period, the low off-peak prices lead to an increase in usage in the low-cost period. There has also been an

Table 5-1. Partial List of Utilities With Inclining Tier Residential Rates

Utility Name	State	Tariff URL
Florida Power and Light	FL	http://www.fpl.com/access/contents/how_to_read_your_bill.shtml
Consolidated Edison	NY	http://www.coned.com/documents/elec/201-210.pdf
Pacific Gas & Electric	CA	http://www.pge.com/res/financial_assistance/medical_baseline_life_support/understanding/index.html#topic4
Southern California Edison	CA	http://www.sce.com/NR/rdonlyres/728FFC8C-91FD-4917-909B-
Arizona Public Service Co	AZ	https://www.aps.com/my_account/RateComparer.html
Sacramento Municipal Util Dist	CA	http://www.smud.org/residential/rates.html
Indiana Michigan Power Co	MI	https://www.indianamichiganpower.com/global/utilities/tariffs/Michigan/MISTD1-31-06.pdf
Modesto Irrigation District	CA	http://www.mid.org/services/tariffs/rates/ums-d-residential.pdf
Turlock Irrigation District	CA	http://www.tid.org/Publisher_PDFs/DE.pdf
Granite State Electric Co	NH	http://www.nationalgridus.com/granitestate/home/rates/4_d.asp
Vermont Electric Cooperative, Inc	VT	http://www.vtcoop.com/PageViewer.aspx?PageName=Rates%20Summary
City of Boulder	NV	http://www.bcnv.org/utilities.html#electric,waterandsewer

4 For a survey of optional rates with voluntary participation, see Horowitz and Woo (2006).

"income effect" observed where people buy more energy as their overall bill goes down, due to switching consumption to lower price periods. The net effect might not be a significant decrease in total electricity usage, but TOU rates do encourage reduced usage when that reduction is the most valuable. Another important consideration with TOU prices is the environmental impact. Depending on generation mix and the diurnal emissions profile of the region, shifting consumption from the on-peak period to off-peak period might provide environmental net benefits.

The Energy Policy Act of 2005 Section 1252 requires states and non-regulated utilities, by August 8, 2007, to consider adopting a standard requiring electric utilities to offer all of their customers a time-based rate schedule such as time-of-use pricing, critical peak pricing, real-time pricing, or peak load reduction credits.

Dynamic Rates

Under a dynamic rate structure, the utility has the ability to change the cost or availability of power with limited, or no, notice. Common forms of dynamic rates include the following:

- Real-time pricing (RTP) rates vary continuously over time in a way that directly reflects the wholesale price of electricity.

- Critical peak pricing (CPP) rates have higher rates during periods designated as critical peak periods by the utility. Unlike TOU blocks, the days in which critical peaks occur are not designated in the tariff, but are designated on relatively short notice for a limited number of days during the year.

- Non-firm rates typically follow the pricing form of the otherwise applicable rates, but offer discounts or incentive payments for customers to curtail usage during times of system need (Horowitz and Woo, 2006). Such periods of system need are not designated in advance through the tariff, and the customer might receive little notice before energy supply is interrupted. In some cases, customers may be allowed to "buy through" periods when their supply will be interrupted by paying a higher energy charge (a non-compliance penalty). In those cases, the non-firm rate becomes functionally identical to CPP rates.

Dynamic rates are generally used to: 1) promote load shifting by large, sophisticated users, 2) give large users access to low "surplus energy" prices, or 3) reduce peak loads on the utility system. Therefore, dynamic rates are complementary to energy efficiency, but are more useful for achieving demand response during peak periods than reducing overall energy usage.

Two-Part Rates

Two-part rates refer to designs wherein a base level of customer usage is priced at rates similar to the status quo (Part 1) and deviations from the base level of usage are billed at the alternative rates (Part 2). Two-part rates are common among RTP programs to minimize the free rider problem. By implementing a two-part rate, customers receive the real time price only for their change in usage relative to their base level of usage. Without the two-part rate form, most low load-factor customers on rates with demand charges would see large bill reductions for moving to an RTP rate.

A two-part rate form, however, could also be combined with other rate forms that are more conducive to energy efficiency program adoption. For example, a two-part rate could be structured like an increasing tiered block rate, with the Tier 1 allowance based on the customer's historical usage. This structure would address many of the rate design barriers such as revenue stability. Of course, there would be implementation issues, such as determining what historical period is used to set Part 1, and how often that baseline is updated to reflect changes in usage. Also, new customers would need to be assigned an interim baseline.

Demand Charges

Demand charges bill customers based on their peak usage rather than their total usage during the month. For electricity, demand charges are based on usage during particular TOU periods (e.g., peak demand) or usage during any period in the month (e.g., maximum demand). Demand charges can also use a percentage of the highest demand over the prior year or prior season as a minimum demand level used for billing. For natural gas, demand can be based on the highest monthly usage over the past year or season.

For both gas and electricity, utilities prefer demand charges over volumetric charges because they provide greater revenue certainty, and encourage more consistent asset utilization. In contrast to a demand charge, a customer charge that covers more of a utility's fixed costs reduces profits from increased sales, and the utility disincentive to promote energy efficiency.

For energy efficiency programs, demand charges could help promote reductions in usage for those end uses that cause the customer's peak.[5] In general, however, volumetric rates are more favorable for energy efficiency promotion. Increasing the demand charges would reduce the magnitude of the price signal that could be sent through a volumetric charge.

Mechanisms Where Customer Benefits Are Not Driven by Tariff Savings

The rate design forms discussed above allow customers to benefit from energy efficiency through bill reductions; however, other types of programs provide incentives that are decoupled from the customer's retail rate.

Discount for Efficiency via Conservation Behavior

In some cases, energy efficiency benefits are passed on to customers through mechanisms other than retail rates. For example, in California the "20/20" program was implemented in 2001, giving customers a 20 percent rebate off their summer bills if they could reduce their electricity consumption by 20 percent compared to the summer period the prior year. The program's success was likely due to a combination of aggressive customer education, energy conservation behavior (reducing consumption through limiting usage of appliances and end-uses) and investment in energy efficiency. Pacific Gas & Electric (PG&E) has just implemented a similar program for natural gas, wherein customers can receive a rebate of 20 percent of their last winter's bill if they can reduce natural gas usage by 10 percent this winter season. The 20/20 program was popular and effective. It was easy for customers to understand, and there might be a psychological advantage to a program that gives you a rebate (a received reward), as opposed to one that just allows you to pay less than you otherwise would have (a lessened penalty). Applying this concept might require some adjustments to account for changes in weather or other factors.

Benefit Sharing

There are two types of benefit sharing with customers.[6] Under the first type of shared savings, a developer (utility or third party) installs an energy-saving device. The customer shares the bill savings with the developer until the customer's project load has been paid off. In the second type of shared savings, the utility is typically the developer and installs an energy efficiency or distributed generation device at the customer site. The customer then pays an amount comparable to what the bill would have been without the device or measures installed, less a portion of the savings of the device based on utility avoided costs. This approach decouples the customer benefits from the utility rate, but it can be complicated to determine what the consumption would have been without the device or energy efficiency.

PacifiCorp in Oregon tackled this problem by offering a cash payment of 35 percent of the cost savings for residential weatherization measures, where the cost savings was based on the measure's expected annual kWh savings and a schedule of lifecycle savings per kWh (PacifiCorp, 2002).

[5] Horowitz and Woo (2006) show that demand charges can be used to differentiate service reliability, thus implementing curtailable and interruptible service programs that are useful for meeting system resource adequacy.

[6] Note that benefit sharing is not the same as "shared savings," used in the context of utility incentives for promoting energy efficiency programs.

Table 5-2. Pros and Cons of Rate Design Forms

Program Type	Criteria				
	Avoided Cost Benefits and Utility Incentives	Energy and Peak Reductions	Customer Incentive and Bill Impact	Impact on Non-Participants	Implementation and Transition Issues
Increasing Tier Block (Inverted block) http://www.pge.com/tariffs/pdf/E-1.pdf http://www.sdge.com/tm2/pdf/DR.pdf http://www.sdge.com/tm2/pdf/GR.pdf	**Pro:** Good match when long-run marginal costs are above average costs. **Con:** Might not be the right price signal if long-run marginal costs are below average costs.	**Pro:** Can achieve annual energy reductions. **Con:** Does not encourage reductions in any particular period (unless combined with a time-based rate like TOU).	**Pro:** Provides strong incentive to reduce usage. **Con:** Could result in large bill increases for users that cannot change their usage level, and could encourage more usage by the smaller customers.	**Pro:** If mandatory, little impact on other customer classes. **Con:** Could not be implemented on a voluntary basis because of free rider losses.	**Pro:** Simple to bill with existing meters. **Con:** Could require phased transition to mitigate bill impacts.
Time of Use (TOU) http://www.nationalgridus.com/masselectric/home/rates/4_tou.asp	**Pro:** (1) Low implementation cost; (2) Tracks expected marginal costs. **Con:** Unclear if marginal costs should be short- or long-run.	**Pro:** Can achieve peak load relief. **Con:** Might not achieve substantial energy reductions or produce significant emissions benefits.	**Pro:** Provides customers with more control over their bills than flat rates, and incentive to reduce peak usage. **Con:** If mandatory, could result in large bill increases for users that cannot change their usage pattern.	**Pro:** If mandatory, little average impact, but can be large on some customers. **Con:** If optional, potentially large impact due to free riders, which can be mitigated by a careful design.	**Pro:** Extensive industry experience with TOU rate. **Con:** (1) If mandatory, likely opposed by customers, but not necessarily the utility; (2) If optional, opposed by non-participants and possibly the utility.
Dynamic Rates: Real Time Pricing (RTP) http://www.exeloncorp.com/comed/library/pdfs/advance_copy_tariff_revision6.pdf http://www.southerncompany.com/gulfpower/pricing/gulf_rates.asp?mnuOpco=gulf&mnuType=com&mnuItem=er#rates http://www.nationalgridus.com/niagaramohawk/non_html/rates_psc207.pdf	**Pro:** (1) Tracks day-ahead or day-of short-run marginal cost for economically efficient daily consumption decisions; (2) RTP rates can be set to help allocate capacity in an economically efficient manner during emergencies. **Con:** No long-run price signal for investment decisions.	**Pro:** Can achieve peak load relief. **Con:** (1) Not applicable to gas; (2) Might not achieve substantial annual energy reductions or produce significant emissions benefits.	Same as above.	Same as above.	**Con:** (1) If mandatory, likely opposed by customers and the utility due to complexity and implementation cost; (2) High implementation cost for metering and information system costs.
Dynamic Rates: Critical Peak Pricing (CPP) http://www.southerncompany.com/gulfpower/pricing/pdf/rsvp.pdf http://www.idahopower.com/aboutus/regulatoryinfo/tariffPdf.asp?id=263&.pdf http://www.pge.com/tariffs/pdf/E-3.pdf	**Pro:** (1) Tracks short-run marginal cost shortly before emergency; (2) If the CPP rates are set at correctly predicted marginal cost during emergency, they ration capacity efficiently. **Con:** High implementation cost.	**Pro:** Likely to achieve load relief. **Con:** Unlikely to provide significant annual energy reductions.	Same as above.	**Pro:** Little impact, unless the utility heavily discounts the rate for the non-critical hours.	**Con:** (1) If mandatory, likely opposed by customers and the utility due to high implementation cost; (2) If optional, few would object, unless the implementation cost spills over to other customer classes.

Table 5-2. Pros and Cons of Rate Design Forms *(continued)*

Program Type	Criteria				
	Avoided Cost Benefits and Utility Incentives	Energy and Peak Reductions	Customer Incentive and Bill Impact	Impact on Non-Participants	Implementation and Transition Issues
Dynamic Rates Nonfirm http://www.pacificorp.com/Regulatory_Rule_Schedule/Regulatory_Rule_Schedule2220.pdf	**Pro:** (1) Provides emergency load relief to support system reliability; (2) Implements efficient rationing. **Con:** (1) Does not track costs; (2) Potentially high implementation cost.	**Pro:** (1) Can achieve load reductions to meet system needs; (2) Applicable to both gas and electric service. **Con:** Unlikely to encourage investment in energy efficiency measures.	**Pro:** Bill savings compensate customer for accepting lower reliability.	**Pro:** Little impact, unless the utility offers a curtailable rate discount that exceeds the utility's expected cost savings.	**Pro:** (1) If optional, non-participants would not object unless discount is "excessive"; (2) If mandatory, different levels of reliability (at increasing cost) would need to be offered. **Con:** Complicated notice and monitoring requirements.
Two-Part Rates http://www.aepcustomer.com/tariffs/Michigan/pdf/MISTD4-28-05.pdf:	**Pro:** Allows rate to be set at utility avoided cost. **Con:** Requires establishing customer baseline, which is subject to historical usage, weather, and other factors.	**Pro:** Can be used to encourage or discourage peak usage depending on characteristics of "part two" rate form.	**Pro:** Provides incentives for changes in customer's usage. Therefore, no change in usage results in the same bill.	**Pro:** Non-participants are held harmless.	**Pro:** Complexity can be controlled through design of "part two" rate form. **Con:** (1) Customers might not be accustomed to the concept; (2) Difficult to implement for many smaller customers.
Demand Charges http://www.sce.com/NR/sc3/tm2/pdf/ce30-12.pdf	**Pro:** Reflects the customer's usage of the utility infrastructure. **Con:** Does not consider the duration of the usage (beyond 15 minutes or one hour for electric).	**Pro:** Can achieve load reductions. **Con:** Might not achieve substantial annual reductions.	**Pro:** Provides customers with incentive to reduce peak usage and flatten their usage profile. **Con:** If mandatory, could result in large bill increases for users who cannot change their usage pattern.	**Pro:** If mandatory, little average impact, but can be large on some customers. **Con:** If optional, potentially large impact due to free riders, but this can be mitigated by a careful design.	**Con:** (1) If mandatory, likely opposed by customers and the utility due to high implementation cost; (2) If optional, few would object, unless the implementation cost spills over to other customer classes.
Discount for Efficiency, Benefit Sharing, etc. http://www.cpuc.ca.gov/PUBLISHED/NEWS_RELEASE/51362.htm http://www.pacificorp.com/Regulatory_Rule_Schedule/Regulatory_Rule_Schedule7794.pdf	**Pro:** Incentive can be tied directly to avoided costs, without the need to change overall rate design. **Con:** Only a portion of the benefits are reflected in the incentive, as rate savings will still be a factor for most options.	**Pro:** Utilities generally have control over what measures are eligible for an incentive, so the mix of peak and energy savings can be determined during program design. **Con:** Impacts might be smaller than those attainable through mandatory rate programs.	**Pro:** (1) Provides direct incentive for program participation, plus ongoing bill reductions (for most options); (2) Does not require rate changes. **Con:** Existing rate forms might impede adoption because of overly low bill savings.	**Pro:** Reflects the characteristics of the underlying rate form.	**Pro:** Implementation simplified by the ability to keep status quo rates. **Con:** Places burden for action on the energy efficiency implementer, whereas a mandatory rate change could encourage customers to seek out efficiency options.
Energy Efficiency Customer Rebate Programs (e.g., 20/20 program in California) www.sce.com/RebatesandSavings/2020 www.sdge.com/tm2/pdf/20-20-TOU.pdf www.pge.com/tariffs/pdf/EZ-2020.pdf	**Pro:** Can avoid more drastic rationing mechanisms when resources are significantly constrained. **Con:** Customer discounts are not set based on utility cost savings, and therefore these programs might over-reward cutomers who qualify.	**Pro:** (1) Links payment of incentive directly to metered energy savings; (2) Easy to measure and verify. **Con:** Focused on throughput and not capacity savings.	**Pro:** (1) Provides a clear incentive to customers to reduce their energy usage, motivates customers, and gets them thinking about their energy usage; (2) Can provide significant bill savings; (3) Doesn't require customers to sign up for any program and can be offered to everyone.	**Con:** Shifts costs to non-participants to the extent that the rebate exceeds the change in utility cost.	**Pro:** Very successful during periods when public interest is served for short-term resource savings, (e.g. energy crisis.) **Con:** Implementation and effectiveness might be reduced after being in place for several years.

On-Bill Financing

The primary function of on-bill financing is to remove the barrier presented by the high first-time costs of many energy efficiency measures. On-bill financing allows the customer to pay for energy efficiency equipment over time, and fund those payments through bill savings. On-bill financing can also deliver financial benefits to the participants by providing them access to low financing costs offered by the utility. An example of on-bill financing is the "Pay As You Save" (PAYS) program, which provides upfront funding in return for a monthly charge that is always less than the savings.[7]

Pros and Cons of Various Designs

Rate design involves tradeoffs among numerous goals. Table 5-2 summarizes the pros and cons of the various rate design forms from various stakeholder perspectives, considering implementation and transition issues. In most cases, design elements can be combined to mitigate weaknesses of any single design element, so the table should be viewed as a reference and starting point.

Successful Strategies

Rate design is one of a number of factors that contribute to the success of energy efficiency programs. Along with rate design, it is important to educate customers about their rates so they understand the value of energy efficiency investment decisions. Table 5-3 shows examples of four states with successful energy efficiency programs and complementary rate design approaches. Certainly, one would expect higher rates to spur energy efficiency adoption, and that appears to be the case for three of the four example states. However, Washington has an active and cost-effective energy efficiency program, despite an average residential rate far below the national average of 10.3 cents per kWh. (EIA, 2006)

Table 5-3. Conditions That Assist Success

	California	Washington State	Massachusetts	New York
Rate Forms and Cost Structures	Increasing tier block rates for residential (PG&E, SCE, and SDG&E). Increasing block rate for residential gas (SDG&E). http://www.pge.com/tariffs/pdf/E-1.pdf http://www.sce.com/NR/sc3/tm2/pdf/ce12-12.pdf http://www.sdge.com/tm2/pdf/DR.pdf http://www.sdge.com/tm2/pdf/GR.pdf	Increasing tier block rates for residential electric (PacifiCorp). Gas rates are flat volumetric (Puget Sound Electric [PSE]). High export value for electricity, especially in the summer afternoon. http://www.pacificorp.com/Regulatory_Rule_Schedule/Regulatory_Rule_Schedule2205.pdf	Flat electricity rates per kWh with voluntary TOU rates for distribution service (Massachusetts Electric). http://www.nationalgridus.com/masselectric/non_html/rates_tariff.pdf	Increasing tier rates for residential (Consolidated Edison). http://www.coned.com/documents/elec/201-210.pdf
Resource and Load Characteristics	Summer electric peaks. Marginal resources are fossil units. High marginal cost for electricity, especially in the summer afternoon. Import transfer capability can be constrained. Winter gas peaks, although electric generation is flattening the difference. http://www.ethree.com/CPUC/E3_Avoided_Costs_Final.pdf	Winter peaking electric loads, but summer export opportunities. Heavily hydroelectric, so resource availability can vary with precipitation. Gas is winter peaking. http://www.nwcouncil.org/energy/powersupply/outlook.asp http://www.nwcouncil.org/energy/powerplan/plan/Default.htm http://www.pse.com/energyEnvironment/supplyPDFs/II--Summary%20Charts%20and%20Graphs.pdf	Part of Indpendant System Operator New England (ISO-NE), which is summer peaking. http://www.nepool.com/trans/celt/report/2005/2005_celt_report.pdf	High summer energy costs and capacity concerns in the summer for the New York City area. http://www.eia.doe.gov/cneaf/electricity/page/fact_sheets/newyork.html

7 See http://www.paysamerica.org/.

Table 5-3. Conditions That Assist Success *(continued)*

	California	Washington State	Massachusetts	New York
Average Residential Electric Rates	13.7 cents/kWh (EIA, 2006)	6.7 cents/kWh (EIA, 2006)	17.6 cents/kWh (EIA, 2006)	15.7 cents/kWh (EIA, 2006)
Market and Utility Structure	Competitive electric generation and gas procurement. Regulated wires and pipes. http://www.energy.ca.gov/electricity/divestiture.html http://www.cpuc.ca.gov/static/energy/electric/ab57_briefing_assembly_may_10.pdf	Vertically integrated. http://www.wutc.wa.gov/webimage.nsf/63517e4423a08de988256576006a80bc/fe15f75d7135a7e28825657e00710928!OpenDocument	Competitive generation. Regulated wires. http://www.eia.doe.gov/cneaf/electricity/page/fact_sheets/mass.html	Competitive generation. Regulated wires. http://www.nyserda.org/sep/sepsection2-1.pdf
Political and Administrative Actors	Environmental advocacy in the past and desire to avoid another energy capacity crisis. Energy efficiency focuses on electricity. http://www.energy.ca.gov/2005publications/CEC-999-2005-015/CEC-999-2005-015.PDF http://www.energy.ca.gov/2005publications/CEC-999-2005-011/CEC-999-2005-011.PDF http://www.cpuc.ca.gov/PUBLISHED/NEWS_RELEASE/49757.htm http://www.cpuc.ca.gov/static/energy/electric/energy+efficiency/about.htm	Strong environmental commitment and desire to reduce susceptibility to market risks. http://www.nwenergy.org/news/news/news_conservation.html	DSM instituted as an alternative to new plant construction in the late 1980s and early 1990s (integrated resource management). Energy efficiency now under the oversight of Division of Energy Resources. http://www.mass.gov/Eoca/docs/doer/pub_info/ee-long.pdf	PSC established policy goals to promote competitive energy efficiency service and provide direct benefits to the people of New York. On 1/16/06, Governor George E. Pataki unveiled "a comprehensive, multi-faceted plan that will help reduce New York's dependence on imported energy." http://www.getenergysmart.org/AboutNYES.asp http://www.ny.gov/governor/press/06/0116062.html
Demand-Side Management (DSM) Funding	System benefits charge (SBC) and procurement payment. http://www.cpuc.ca.gov/static/energy/electric/energy+efficiency/ee_funding.htm	SBC. http://www.wutc.wa.gov/webimage.nsf/8d712cfdd4796c8888256aaa007e94b4/0b2e39343c0be04a88256a3b007449fe!OpenDocument	SBC. http://www.mass.gov/Eoca/docs/doer/pub_info/ee-long.pdf	SBC. http://www.getenergysmart.org/AboutNYES.asp

Part of Washington's energy efficiency efforts can be explained by the high value for power exports to California, and partly by the regional focus on promoting energy efficiency. Washington and the rest of the Pacific Northwest region place a high social value on environmental protection, so Washington might be a case where the success of energy efficiency is fostered by high public awareness, and the willingness of the public to look beyond the short-term out-of-pocket costs and consider the longer term impacts on the environment.

The other three states shown in Table 5-3 share the common characteristics of high residential rates, energy efficiency funded through a system benefits surcharge, and competitive electric markets. The formation of competitive electric markets could have also encouraged energy efficiency by: (1) establishing secure funding sources or energy efficiency agencies to promote energy efficiency, (2) increasing awareness of energy issues and risks regarding future energy prices, and (3) the entrance of new energy agents promoting energy efficiency.

Key Findings

This chapter summarizes the challenges and opportunities for employing rate designs to encourage utility promotion and customer adoption of energy efficiency. Key findings of this chapter include:

- Rate design is a complex process that balances numerous regulatory and legislative goals. It is important to recognize the promotion of energy efficiency in the balancing of objectives.

- Rate design offers opportunities to encourage customers to invest in efficiency where they find it to be cost-effective, and to participate in new programs that provide innovative technologies (e.g., smart meters) to help customers control their energy costs.

- Utility rates that are designed to promote sales or maximize stable revenues tend to lower the incentive for customers to adopt energy efficiency.

- Rate forms like declining block rates, or rates with large fixed charges reduce the savings that customers can attain from adopting energy efficiency.

- Appropriate rate designs should consider the unique characteristics of each customer class. Some general rate design options by customer class are listed below.

— *Residential.* Inclining tier block rates. These rates can be quickly implemented for all residential and small commercial and industrial electric and gas customers. At a minimum, eliminate declining tier block rates. As metering costs decline, also explore dynamic rate options for residential customers.

— *Small Commercial.* Time of use rates. While these rates might not lead to much change in annual usage, the price signals can encourage customers to consume less energy when energy is the most expensive to produce, procure, and deliver.

— *Large Commercial and Industrial.* Two-part rates. These rates provide bill stability and can be established so that the change in consumption through adoption of energy efficiency is priced at marginal cost. The complexity in establishing historical baseline quantities might limit the application of two-part rates to the larger customers on the system.

— *All Customer Classes.* Seasonal price differentials. Higher prices during the higher cost peak season encourage customer conservation during the peak and can reduce peak load growth. For example, higher winter rates can encourage the purchase of more efficient space heating equipment.

- Energy efficiency can be promoted through non-tariff mechanisms that reach customers through their utility bill. Such mechanisms include:

— *Benefit Sharing Programs.* Benefit sharing programs can resolve situations where normal customer bill savings are smaller than the cost of energy efficiency programs.

— *On-Bill Financing.* Financing support can help customers overcome the upfront costs of efficiency devices.

— *Energy Efficiency Rebate Programs.* Programs that offer discounts to customers who reduce their energy consumption, such as the 20/20 rebate program in California, offer clear incentives to customers to focus on reducing their energy use.

- More effort is needed to communicate the benefits and opportunities for energy efficiency to customers, regulators, and utility decision-makers.

Recommendations and Options

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

Recommendation: Modify ratemaking practices to promote energy efficiency investments. Rate design offers opportunities to encourage customers to invest in efficiency where they find it to be cost-effective, and to participate in new programs that bring them innovative technologies (e.g., smart meters) to help them control their energy costs.

Options to Consider:

- Including the impact on adoption of energy efficiency as one of the goals of retail rate design, recognizing that it must be balanced with other objectives.
- Eliminating rate designs that discourage energy efficiency by not increasing costs as customers consume more electricity or natural gas.
- Adopting rate designs that encourage energy efficiency, considering the unique characteristics of each customer class, and including partnering tariffs with other mechanisms that encourage energy efficiency, such as benefit sharing programs and on-bill financing.

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 policymakers. 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. Further, education is necessary on the impact that energy efficiency programs can have in concert with other energy efficiency policies such as building codes, appliance standards, and tax incentives.

Option to Consider:

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

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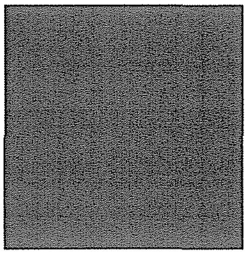
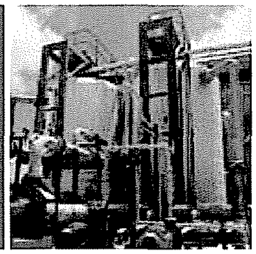
6: Energy Efficiency Program Best Practices





Energy efficiency programs have been operating successfully in some parts of the country since the late 1980s. From the experience of these successful programs, a number of best practice strategies have evolved for making energy efficiency a resource, developing a cost-effective portfolio of energy efficiency programs for all customer classes, designing and delivering energy efficiency programs that optimize budgets, and ensuring that programs deliver results.

Overview

Cost-effective energy efficiency programs have been delivered by large and small utilities and third-party program administrators in some parts of the country since the late 1980s. The rationale for utility investment in efficiency programming is that within certain existing markets for energy-efficient products and services, there are barriers that can be overcome to ensure that customers from all sectors of the economy choose more energy-efficient products and practices. Successful programs have developed strategies to overcome these barriers, in many cases partnering with industry and voluntary national and regional programs so that efficiency program spending is used not only to acquire demand-side resources, but also to accelerate market-based purchases by consumers.

Leadership Group Recommendations Applicable to Energy Efficiency Program Best Practices

- Recognize energy efficiency as a high priority energy resource.
- Make a strong, long-term commitment to cost-effective energy efficiency as a resource.
- Broadly communicate the benefits of, and opportunities for, energy efficiency.
- Provide sufficient and stable program funding to deliver energy efficiency where cost-effective.

A list of options for promoting best practice energy efficiency programs is provided at the end of this chapter.

Challenges that limit greater utility investment in energy efficiency include the following:

- The majority of utilities recover fixed operating costs and earn profits based on the volume of energy they sell. *Strategies for overcoming this throughput disincentive to greater investment in energy efficiency are discussed in Chapter 2: Utility Ratemaking & Revenue Requirements.*
- Lack of standard approaches on how to quantify and incorporate the benefits of energy efficiency into resource planning efforts, and institutional barriers at many utilities that stem from the historical business model of acquiring generation assets and building transmission and distribution systems. *Strategies for overcoming these challenges are addressed in Chapter 3: Incorporating Energy Efficiency in Resource Planning.*
- Rate designs that are counterproductive to energy efficiency might limit greater efficiency investment by large customer groups, where many of the most cost-effective opportunities for efficiency programming exist. *Strategies for encouraging rate designs that are compatible with energy efficiency are discussed in Chapter 5: Rate Design.*
- Efficiency programs need to address multiple customer needs and stakeholder perspectives while simultaneously addressing multiple system needs, in many cases while competing for internal resources. *This chapter focuses on strategies for making energy efficiency a resource, developing a cost-effective portfolio of energy efficiency programs for all customer classes, designing and delivering efficiency programs that optimize budgets, and ensuring that those programs deliver results are the focus of this chapter.*

Programs that have been operating over the past decade, and longer, have a history of proven savings in megawatts (MW), megawatt-hours (MWh), and therms, as well as on customer bills. These programs show that energy efficiency can compare very favorably to supply-side options.

This chapter summarizes key findings from a portfolio-level[1] review of many of the energy efficiency programs that have been operating successfully for a number of years. It provides an overview of best practices in the following areas:

- Political and human factors that have led to increased reliance on energy efficiency as a resource.
- Key considerations used in identifying target measures[2] for energy efficiency programming in the near- and long-term.
- Program design and delivery strategies that can maximize program impacts and increase cost-effectiveness.
- The role of monitoring and evaluation in ensuring that program dollars are optimized and that energy efficiency investments deliver results.

Background

Best practice strategies for program planning, design and implementation, and evaluation were derived from a review of energy efficiency programs at the portfolio level across a range of policy models (e.g., public benefit charge administration, integrated resource planning). The box on page 6-3 describes the policy models and Table 6-1 provides additional details and examples of programs operating under various policy models. This chapter is not intended as a comprehensive review of the energy efficiency programs operating around the country, but does highlight key factors that can help improve and accelerate energy efficiency program success. Organizations reviewed for this effort have a sustained history of successful energy efficiency program implementation (See Tables 6-2 and 6-3 for summaries of these programs) and share the following characteristics:

- Significant investment in energy efficiency as a resource within their policy context.
- Development of cost-effective programs that deliver results.
- Incorporation of program design strategies that work to remove near- and long-term market barriers to investment in energy efficiency.
- Willingness to devote the necessary resources to make programs successful.

Most of the organizations reviewed also have conducted full-scale impact evaluations of their portfolio of energy efficiency investments within the last few years.

The best practices gleaned from a review of these organizations can assist utilities, their commissions, state energy offices, and other stakeholders in overcoming barriers to significant energy efficiency programming, and begin tapping into energy efficiency as a valuable and clean resource to effectively meet future supply needs.

1 For the purpose of this chapter, *portfolio* refers to the collective set of energy efficiency programs offered by a utility or third-party energy efficiency program administrator.

2 *Measures* refer to the specific technologies (e.g., efficient lighting fixture) and practices (e.g., duct sealing) that are used to achieve energy savings.

Energy Efficiency Programs Are Delivered Within Many Policy Models

Systems Benefits Charge (SBC) Model

In this model, funding for programs comes from an SBC that is either determined by legislation or a regulatory process. The charge is usually a fixed amount per kilowatt-hour (kWh) or million British thermal units (MMBtu) and is set for a number of years. Once funds are collected by the distribution or integrated utility, programs can be administered by the utility, a state agency, or a third party. If the utility implements the programs, it usually receives current cost recovery and a shareholder incentive. Regardless of administrative structure, there is usually an opportunity for stakeholder input.

This model provides stable program design. In some cases, funding has become vulnerable to raids by state agencies. In areas aggressively pursuing energy efficiency as a resource, limits to additional funding have created a ceiling on the resource. While predominantly used in the electric sector, this model can, and is, being used to fund gas programs.

Integrated Resource Plan (IRP) Model

In this model, energy efficiency is part of the utility's IRP. Energy efficiency, along with other demand-side options, is treated on an equivalent basis with supply. Cost recovery can either be in base rates or through a separate charge. The utility might receive a shareholder incentive, recovery of lost revenue (from reduced sales volume), or both. Programs are driven more by the resource need than in the SBC models. This generally is an electric-only model. The regional planning model used by the Pacific Northwest is a variation on this model.

Request For Proposal (RFP) Model

In this case, a utility or an independent system operator (ISO) puts out a competitive solicitation RFP to acquire energy efficiency from a third-party provider to meet demand, particularly in areas where there are transmission and distribution bottlenecks or a generation need. Most examples of this model to date have been electric only. The focus of this type of program is typically on saving peak demand.

Portfolio Standard

In this model, the program adminstrator is subject to a portfolio standard expressed in terms of percentage of overall energy or demand. This model can include gas as well as electric, and can be used independently or in conjunction with an SBC or IRP requirement.

Municipal Utility/Electric Cooperative Model

In this model, programs are administered by a municipal utility or electric cooperative. If the utility/cooperative owns or is responsible for generation, the energy efficiency resource can be part of an IRP. Cost recovery is most likely in base rates. This model can include gas as well as electric.

Table 6-1. Overview of Energy Efficiency Programs

Policy Model/ Examples	Funding Type	Shareholder Incentive[1]	Lead Administrator	Role in Resource Acquisition	Scope of Programs	Political Context
SBC with utility implementation: • California • Rhode Island • Connecticut • Massachusetts	Separate charge	Usually	Utility	Depends on whether utility owns generation	Programs for all customer classes	Most programs of this type came out of a restructuring settlement in states where there was an existing infrastructure at the utilities
SBC with state or third-party implementation: • New York • Vermont • Wisconsin	Separate charge	No	State agency Third party	None or limited	Programs for all customer classes	Most programs of this type came out of a restructuring settlement
IRP or gas planning model: • Nevada • Arizona • Minnesota • Bonneville Power Administration (BPA) (regional planning model as well) • Vermont Gas • Keyspan	Varies: in rates, capitalized, or separate charge	In some cases	Utility	Integrated	Program type dictated by resource need	Part of IRP requirement; may be combined with other models
RFP model for full-scale programs and congestion relief	Varies	No	Utility buys from third party	Integrated – can be T&D only	Program type dictated by resource need	Connecticut and Con Edison going out to bid to reduce congestion
Portfolio standard model (can be combined with SBC or IRP): • Nevada • California • Connecticut • Texas	Varies	Varies	Utility may implement programs or buy to meet standard	Standard portfolio	Programs for all customer classes	Generally used in states with existing programs to increase program activity
Municipal utility & electric cooperative: • Sacramento Municipal Utility District (CA) • City of Austin (TX) • Great River Energy (MN)	In rates	No	Utility	Depends on whether utility owns generation	Programs for all customer classes	Based on customer and resource needs; can be similar to IRP model

[1] A shareholder incentive is a financial incentive to a utility (above those that would normally be recovered in a rate case) for achieving set goals for energy efficiency program performance.

Key Findings

Overviews of the energy efficiency programs reviewed for this chapter are provided in Table 6-2 and 6-3. Key findings drawn from these programs include:

- Energy efficiency resources are being acquired on average at about one-half the cost of the typical new power sources, and about one-third of the cost of natural gas supply in many cases—and contribute to an overall lower cost energy system for rate-payers (EIA, 2006).

- Many energy efficiency programs are being delivered at a total program cost of about $0.02 to $0.03 per lifetime kilowatt-hour (kWh) saved and $0.30 to $2.00 per lifetime million British thermal units (MMBtu) saved. These costs are less than the avoided costs seen in most regions of the country. Funding for the majority of programs reviewed ranges from about 1 to 3 percent of electric utility revenue and 0.5 to 1 percent of gas utility revenue.

- Even low energy cost states, such as those in the Pacific Northwest, have reason to invest in energy efficiency, as energy efficiency provides a low-cost, reliable resource that reduces customer utility bills. Energy efficiency also costs less than constructing new generation, and provides a hedge against market, fuel, and environmental risks (Northwest Power and Conservation Council, 2005).

- Well-designed programs provide opportunities for customers of all types to adopt energy savings measures and reduce their energy bills. These programs can help customers make sound energy use decisions, increase control over their energy bills, and empower them to manage their energy usage. Customers can experience significant savings depending on their own habits and the program offered.

- Consistently funded, well-designed efficiency programs are cutting electricity and natural gas load—providing annual savings for a given program year of 0.15 to 1 percent of energy sales. These savings typically will accrue at this level for 10 to 15 years. These programs are helping to offset 20 to 50 percent of expected energy growth in some regions without compromising end-user activity or economic well being.

- Research and development enables a continuing source of new technologies and methods for improving energy efficiency and helping customers control their energy bills.

- Many state and regional studies have found that pursuing economically attractive, but as yet untapped energy efficiency could yield more than 20 percent savings in total electricity demand nationwide by 2025. These savings could help cut load growth by half or more, compared to current forecasts. Savings in direct use of natural gas could similarly provide a 50 percent or greater reduction in natural gas demand growth. Potential varies by customer segment, but there are cost-effective opportunities for all customer classes.

- Energy efficiency programs are being operated successfully across many different contexts: regulated and unregulated markets; utility, state, or third-party administration; investor-owned, public, and cooperatives; and gas and electric utilities.

- Energy efficiency resources are being acquired through a variety of mechanisms including system benefits charges (SBCs), energy efficiency portfolio standards (EEPSs), and resource planning (or cost of service) efforts.

- Cost-effective energy efficiency programs for electricity and natural gas can be specifically targeted to reduce peak load.

- Effective models are available for delivering gas and electric energy efficiency programs to all customer classes. Models may vary based on whether a utility is in the initial stages of energy efficiency programming, or has been implementing programs for a number of years.

Table 6-2. Efficiency Measures of Natural Gas Savings Programs

Program Administrator	Keyspan (MA)	Vermont Gas (VT)	SoCal Gas (CA)
Policy Model	Gas	Gas	Gas
Period	2004	2004	2004
Program Funding			
Average Annual Budget ($MM)	12	1.1	21
% of Gas Revenue	1.00%	1.60%	0.53%
Benefits			
Annual MMBtu Saved [1] (000s MMBtu)	500	60	1,200
Lifetime MMBtu Saved [2] (000s MMBtu)	6,000	700	15,200
Cost-Effectiveness			
Cost of Energy Efficiency ($/lifetime MMBtu)	2	2	1
Retail Gas Prices ($/thousand cubic feet [Mcf])	11	9	8
Cost of Energy Efficiency (% Avoided Energy Cost)	19%	18%	18%
Total Avoided Cost (2005 $/MMBtu) [3]	12	11	7

[1] SWEEP, 2006; Southern California Gas Company, 2004.
[2] Lifetime MMBtu calculated as 12 times annual MMBtu saved where not reported (not reported for Keyspan or Vermont Gas).
[3] VT and MA avoided cost (therms) represents all residential (not wholesale) cost considerations (ICF Consulting, 2005).

- Energy efficiency programs, projects, and policies benefit from established and stable regulations, clear goals, and comprehensive evaluation.
- Energy efficiency programs benefit from committed program administrators and oversight authorities, as well as strong stakeholder support.
- Most large-scale programs have improved productivity, enabling job growth in the commercial and industrial sectors.
- Large-scale energy efficiency programs can reduce wholesale market prices.

Lessons learned from the energy efficiency programs operated since inception of utility programs in the late 1980s are presented as follows, and cover key aspects of energy efficiency program planning, design, implementation, and evaluation.

Summary of Best Practices

In this chapter, best practice strategies are organized and explained under four major groupings:

- Making Energy Efficiency a Resource
- Developing an Energy Efficiency Plan
- Designing and Delivering Energy Efficiency Programs
- Ensuring Energy Efficiency Investments Deliver Results

For the most part, the best practices are independent of the policy model in which the programs operate. Where policy context is important, it is discussed in relevant sections of this chapter.

Making Energy Efficiency a Resource

Energy efficiency is a resource that can be acquired to help utilities meet current and future energy demand. To realize this potential requires leadership at multiple levels, organizational alignment, and an understanding of the nature and extent of the energy efficiency resource.

- *Leadership* at multiple levels is needed to establish the business case for energy efficiency, educate key stakeholders, and enact policy changes that increase investment in energy efficiency as a resource. Sustained leadership is needed from:

— Key individuals in upper management at the utility who understand that energy efficiency is a resource alternative that can help manage risk, minimize long-term costs, and satisfy customers.

— State agencies, regulatory commissions, local governments and associated legislative bodies, and/or consumer advocates that expect to see energy efficiency considered as part of comprehensive utility management.

— Businesses that value energy efficiency as a way to improve operations, manage energy costs, and contribute to long-term energy price stability and availability, as well as trade associations and businesses, such as Energy Service Companies (ESCOs), that help members and customers achieve improved energy performance.

— Public interest groups that understand that in order to achieve energy efficiency and environmental objectives, they must help educate key stakeholders and find workable solutions to some of the financial challenges that limit acceptance and investment in energy efficiency by utilities.[3]

- *Organizational alignment.* With policies in place to support energy efficiency programming, organizations need to institutionalize policies to ensure that energy efficiency goals are realized. Factors contributing to success include:

— Strong support from upper management and one or more internal champions.

— A framework appropriate to the organization that supports large-scale implementation of energy efficiency programs.

— Clear, well-communicated program goals that are tied to organizational goals and possibly compensation.

— Adequate staff resources to get the job done.

— A commitment to continually improve business processes.

- *Understanding of the efficiency resource* is necessary to create a credible business case for energy efficiency. Best practices include the following:

— Conduct a "potential study" prior to starting programs to inform and shape program and portfolio design.

— Outline what can be accomplished at what costs.

— Review measures for all customer classes including those appropriate for hard-to-reach customers, such as low income and very small business customers.

Developing an Energy Efficiency Plan

An energy efficiency plan should reflect a long-term perspective that accounts for customer needs, program cost-effectiveness, the interaction of programs with other policies that increase energy efficiency, the opportunities for new technology, and the importance of addressing multiple system needs including peak load reduction and congestion relief. Best practices include the following:

- Offer programs for all key customer classes.

- Align goals with funding.

3 Public interest groups include environmental organizations such as the National Resources Defense Council (NRDC), Alliance to Save Energy (ASE), and American Council for an Energy Efficient Economy (ACEEE) and regional market transformation entities such as the Northeast Energy Efficiency Partnerships (NEEP), Southwest Energy Efficiency Project (SWEEP), and Midwest Energy Efficiency Alliance (MEEA).

Table 6-3. Efficiency Measures of Electric and Combination Programs

	NYSERDA (NY)	Efficiency Vermont (VT)	MA Utilities (MA)	WI Department of Administration[12]	CA Utilities (CA)
Policy Model	SBC w/State Admin	SBC w/3rd Party Admin	SBC w/Utility Admin	SBC w/State Admin	SBC w/Utility Admin & Portfolio Standard
Period	2005	2004	2002	2005	2004
Program Funding					
Spending on Electric Energy Efficiency ($MM) [1]	138	14	123	63	317
Budget as % of Electric Revenue [2]	1.3%	3.3%	3.0%	1.4%	1.5%
Avg Annual Budget Gas ($MM)	NR [10]	NA	3 [11]	NA	NA
% of Gas Revenue	NR [10]	NA	NA	NA	NA
Benefits					
Annual MWh Saved / MWh Sales [3,4]	0.2%	0.9%	0.4%	0.1%	1.0%
Lifetime MWh Saved [5] **(000s MWh)**	6,216	700	3,428	1,170	22,130
Annual MW Reduction	172	15	48	81	377
Lifetime MMBtu Saved [5] **(000s MMBtu)**	17,124	470	850	11,130	43,410
Annual MMBtu Saved (000s MMBtu)	1,427	40	70	930	3,620
Non-Energy Benefits	$79M bill reduction	37,200 CCF of water	$21M bill reduction 2,090 new jobs created	Value of non-energy benefits: Residential: $6M C/I: $36M	NR
Avoided Emissions (tons/yr for 1 program year) (could include benefits from load response, renewable, and DG programs)	NO_X: 470 SO_2: 850 CO_2: 400,000	Unspecified pollutants: 460,000 over lifetime	NO_X: 135 SO_2: 395 CO_2: 161,205	NO_X: 2,167 SO_2: 4,270 CO_2: 977,836 (annual savings from 5 program years)	NR
Cost-Effectiveness					
Cost of Energy Efficiency					
$/lifetime (kWh) [6]	0.02	0.02	0.03	0.05	0.01
$/lifetime (MMBtu)	NA	NA	0.32	NA	NA
Retail Electricity Prices ($/kWh)	0.13	0.11	0.11	0.07	0.13
Retail Gas Prices ($/mcf)	NA	NA	NR	NA	NA
Avoided Costs (2005$) [7,8]					
Energy ($/kWh)	0.03	0.07	0.07	0.02 to 0.06 [13]	0.06
Capacity ($/kW)[9]	28.20	3.62	6.64		
On-Peak Energy ($/kWh)			0.08		
Off-Peak Energy ($/kWh)			0.06		
Cost of Energy Efficiency as % Avoided Energy Cost	89%	29%	10%	90%	23%

C/I = Commercial and Industrial; CO_2 = Carbon Dioxide; $MM = Million Dollars; N/A = Not Applicable; NR = Not Reported; NO_X = Nitrogen Oxides; SO_2 = Sulfur Dioxide

1 NYSERDA 2005 spending derived from subtracting cumulative 2004 spending from cumulative 2005 spending; includes demand response and research and development (R&D).

2 ACEEE, 2004; Seattle City Light, 2005.

3 Annual MWh Saved averaged over program periods for Wisconsin and California Utilities. NYSERDA 2005 energy efficiency savings derived from subtracting cumulative 2004 savings from 2005 cumulative reported savings.

4 EIA, 2006; Austin Energy, 2004; Seattle City Light, 2005. Total sales for California Utilities in 2003 and SMUD in 2004 were derived based on growth in total California retail sales as reported by EIA.

5 Lifetime MWh savings based on 12 years effective life of installed equipment where not reported for NYSERDA, Wisconsin, Nevada, SMUD, BPA, and Minnesota. Lifetime MMBtu savings based on 12 years effective life of installed equipment.

Table 6-3. Efficiency Measures of Electric and Combination Programs (continued)

Nevada	CT Utilities (CT)	SMUD (CA)	Seattle City Light (WA)	Austin Energy	Bonneville Power Administration (ID, MT, OR, WA)	MN Electric and Gas Investor-Owned Utilities (MN)
IRP with Portfolio Standard	SBC w/Utility Admin & Portfolio Standard	Municipal Utility	Municipal Utility	Municipal Utility	Regional Planning	IRP and Conservation Improvement Program
2003	2005	2004	2004	2005	2004	2003
Program Funding						
11	65	30	20	25	78	52
0.5%	3.1%	1.5%	3.4%	1.9%	NR	NR
NA	NA	NA	NA	NA	NA	$14
NA	NA	NA	NA	NA	NA	0.50%
Benefits						
0.1%	1.0%	0.5%	0.7%	0.9%		0.5%
420	4,400	630	1,000	930	3,080	3,940
16	135	14	7	50	47.2	129
NA	NA	NA	NA	10,777	NA	22,010
NA	NA	NA	NA	1,268	NA	1,830
NR	lifetime savings of $550M on bills	NR	lifetime savings of $430M on bills created	Potentially over 900 jobs created Residential: $6M C/I: $36M	NR	NR
NR	NO_X: 334 SO_2: 123 CO_2: 198,586	NO_X: 18	CO_2: 353,100 (cummulative annual savings for 13 years)	NO_X: 640 SO_2: 104 CO_2: 680,000 over lifetime	NR	NR
Cost-Effectiveness						
0.03	0.01	0.03	0.02	0.03	0.03	0.01
NA	NA	NA	NA	2.32	NA	0.06
0.09	0.10	0.10	0.06	0.12	Wholesaler - NA	0.06
NA	NA	NA	NA	NA	NA	5.80
	0.07		NR	NR	Wholesaler - NA	NR
36.06	20.33					
		0.08				
		0.06				
Not calculated	21%	63%		Not calculated	Not calculated	Not calculated

6 Calculated for all cases except SMUD; SMUD data provided by J. Parks, Manager, Energy Efficiency and Customer R&D, Sacramento Municipal Utility District (personal communication, May 19, 2006).

7 Avoided cost reported as a consumption ($/kWh) not a demand (kW) figure.

8 Total NSTAR avoided cost for 2006.

9 Avoided capacity reported by NYSERDA as the three-year averaged hourly wholesale bid price per MWh.

10 NYSERDA does not separately track gas-related project budget, revenue, or benefits.

11 NSTAR Gas only.

12 Wisconsin has a portfolio that includes renewable distributed generation; some comparisons might not be appropriate.

13 Range based on credits given for renewable distributed generation.

- Use cost-effectiveness tests that are consistent with long-term planning.
- Consider building codes and appliance standards when designing programs.
- Plan to incorporate new technologies.
- Consider efficiency investments to alleviate transmission and distribution constraints.
- Create a roadmap of key program components, milestones, and explicit energy use reduction goals.

Designing and Delivering Energy Efficiency Programs

Program administrators can reduce the time to market and implement programs and increase cost-effectiveness by leveraging the wealth of knowledge and experience gained by other program administrators throughout the nation and working with industry to deliver energy efficiency to market. Best practices include the following:

- *Begin with the market in mind.*

— Conduct a market assessment.

— Solicit stakeholder input.

— Listen to customer and trade ally needs.

— Use utility channels and brands.

— Promote both energy and non-energy (e.g., improved comfort, improved air quality) benefits of energy efficient products and practices to customers.

— Coordinate with other utilities and third-party program administrators.

— Leverage the national ENERGY STAR program.

— Keep participation simple.

— Keep funding (and other program characteristics) as consistent as possible.

— Invest in education, training, and outreach.

— Leverage customer contact to sell additional efficiency and conservation.

- *Leverage private sector expertise, external funding, and financing.*

— Leverage manufacturer and retailer resources through cooperative promotions.

— Leverage state and federal tax credits and other tax incentives (e.g., accelerated depreciation, first-year expensing, sales tax holidays) where available.

— Build on ESCO and other financing program options.

— Consider outsourcing some programs to private and not-for-profit organizations that specialize in program design and implementation through a competitive bidding process.

- *Start with demonstrated program models—build infrastructure for the future.*

— Start with successful program approaches from other utilities and program administrators and adapt them to local conditions to accelerate program design and effective implementation.

— Determine the right incentives, and if incentives are financial, make sure that they are set at appropriate levels.

— Invest in educating and training the service industry (e.g., home performance contractors, heating and cooling technicians) to deliver increasingly sophisticated energy efficiency services.

— Evolve to more comprehensive programs.

— Change measures over time to adapt to changing markets and new technologies.

— Pilot test new program concepts.

Ensuring Energy Efficiency Investments Deliver Results

Program evaluation helps optimize program efficiency and ensure that energy efficiency programs deliver intended results. Best practices include the following:

- *Budget, plan and initiate* evaluation from the onset; formalize and document evaluation plans and processes.

- *Develop program and project tracking systems* that support evaluation and program implementation needs.

- *Conduct process evaluations* to ensure that programs are working efficiently.

- *Conduct impact evaluations* to ensure that mid- and long-term goals are being met.

- *Communicate evaluation results* to key stakeholders. Include case studies to make success more tangible.

Making Energy Efficiency a Resource

Energy efficiency programs are being successfully operated across many different contexts including electric and gas utilities; regulated and unregulated markets; utility, state, and third-party administrators; and investor-owned, public, and cooperatively owned utilities. These programs are reducing annual energy use by 0.15 to 1 percent at spending levels between 1 and 3 percent of electric, and 0.5 and 1.5 percent of gas revenues—and are poised to deliver substantially greater reductions over time. These organizations were able to make broader use of the energy efficiency resource in their portfolio by having:

- Leadership at multiple levels to enact policy change.

- Organizational alignment to ensure that efficiency goals are realized.

- A well-informed understanding of the efficiency resource including, the potential for savings and the technologies for achieving them.

Examples of leadership, organizational alignment, and the steps that organizations have taken to understand the nature and extent of the efficiency resource are provided in the next sections.

Leadership

Many energy efficiency programs reviewed in this chapter began in the integrated resource plan (IRP) era of the electric utilities of the 1980s. As restructuring started in the late 1990s, some programs were suspended or halted. In some cases (such as California, New York, Massachusetts, Connecticut, and Rhode Island), however, settlement agreements were reached that allowed restructuring legislation to move forward if energy efficiency programming was provided through the distribution utility or other third-party providers. In many cases, environmental advocates, energy service providers, and state agencies played active roles in the settlement process to ensure energy efficiency was part of the restructured electric utility industry. Other states (such as Minnesota, Wisconsin, and Vermont) developed legislation to address the need for stable energy efficiency programming without restructuring their state electricity markets. In addition, a few states (including California, Minnesota, New Jersey, Oregon, Vermont, and Wisconsin) enacted regulatory requirements for utilities or other parties to provide gas energy efficiency programs (Kushler, et al., 2003). Over the past few years, the mountain states have steadily ramped up energy efficiency programs.

In all cases, to establish energy efficiency as a resource required leadership at multiple levels:

- *Leadership* is needed to establish the business case for energy efficiency, educate key stakeholders, and enact policy changes that increase investment in energy efficiency as a resource. Sustained leadership is needed from:

— Key individuals in upper management at the utility who understand that energy efficiency is a resource alternative that can help manage risk, minimize long-term costs, and satisfy customers.

— State agencies, regulatory commissions, local governments and associated legislative bodies, and/or consumer advocates that expect to see energy efficiency considered as part of comprehensive utility management.

— Businesses that value energy efficiency as a way to improve operations, manage energy costs, and contribute to long-term energy price stability and availability, as well as trade associations and businesses, such as ESCOs, that help members and customers achieve improved energy performance.

- Public interest groups that understand that in order to achieve energy efficiency and environmental objectives, they must help educate key stakeholders and find workable solutions to some of the financial challenges that limit acceptance and investment in energy efficiency by utilities.

The following are examples of how leadership has resulted in increased investment in energy efficiency:

- In Massachusetts, energy efficiency was an early consideration as restructuring legislation was discussed. The Massachusetts Department of Public Utilities issued an order in D.P.U. 95-30 establishing principles to "establish the essential underpinnings of an electric industry structure and regulatory framework designed to minimize long-term costs to customers while maintaining safe and reliable electric service with minimum impact on the environment." Maintaining demand side management (DSM) programs was one of the major principles the department identified during the transition to a restructured electric industry. The Conservation Law Foundation, the Massachusetts Energy Efficiency Council, the National Consumer Law Center, the Division of Energy Resources, the Union of Concerned Scientists, and others took leadership roles in ensuring energy efficiency was part of a restructured industry (MDTE, 1995).

- Leadership at multiple levels led to significantly expanded programming of Nevada's energy efficiency program, from about $2 million in 2001 to an estimated $26 million to $33 million in 2006:

  "There are 'champions' for expanded energy efficiency efforts in Nevada, either in the state energy office or in the consumer advocate's office. Also, there have been very supportive individuals in key positions within the Nevada utilities. These individuals are committed to developing and implementing effective DSM programs, along with a supportive policy framework" (SWEEP, 2006).

  Public interest organizations, including SWEEP, also played an important role by promoting a supportive policy framework (see box on page 6-13, "Case Study: Nevada Efficiency Program Expansion" for additional information).

- Fort Collins City Council (Colorado) provides an example of local leadership. The council adopted the Electric Energy Supply Policy in March 2003. The Energy Policy includes specific goals for city-wide energy consumption reduction (10 percent per capita reduction by 2012) and peak demand reduction (15 percent per capita by 2012). Fort Collins Utilities introduced a variety of new demand-side management (DSM) programs and services in the last several years in pursuit of the energy policy objectives.

- Governor Huntsman's comprehensive policy on energy efficiency for the state of Utah, which was unveiled in April 2006, is one of the most recent examples of leadership. The policy sets a goal of increasing the state's energy efficiency by 20 percent by the year 2015. One key strategy of the policy is to collaborate with utilities, regulators, and the private sector to expand energy efficiency programs, working to identify and remove barriers, and assisting the utilities in ensuring that efficiency programs are effective, attainable, and feasible to implement.

Organizational Alignment

Once policies and processes are in place to spearhead increased investment in energy efficiency, organizations often institutionalize these policies to ensure that goals are realized. The most successful energy efficiency programs by utilities or third-party program administrators share a number of attributes. They include:

- Clear support from upper management and one or more internal champions.
- Clear, well-communicated program goals that are tied to organizational goals and, in some cases, compensation.
- A framework appropriate to the organization that supports large-scale implementation of energy efficiency programs.
- Adequate staff resources to get the job done.
- Strong regulatory support and policies.
- A commitment to continually improve business processes.

"Support of upper management is critical to program success" (Komor, 2005). In fact, it can make or break a program. If the CEO of a company or the lead of an agency is an internal champion for energy efficiency, it will be truly a part of how a utility or agency does business. Internal champions below the CEO or agency level are critical as well. These internal champions motivate their fellow employees and embody energy efficiency as part of the corporate culture.

Case Study: Nevada Efficiency Program Expansion

Nevada investor-owned utilities (IOUs), Nevada Power, and Sierra Pacific Power Company phased-out DSM programs in the mid-1990s. After 2001, when the legislature refined the state's retail electric restructuring law to permit only large customers (>1 megawatt [MW]) to purchase power competitively, utilities returned to a vertically integrated structure and DSM programs were restarted, but with a budget of only about $2 million that year.

As part of a 2001 IRP proceeding, a collaborative process was established for developing and analyzing a wider range of DSM program options. All parties reached an agreement to the IRP proceeding calling for $11.2 million per year in utility-funded DSM programs with an emphasis on peak load reduction but also significant energy savings. New programs were launched in March 2003.

In 2004, the Nevada public utilities commission also approved a new policy concerning DSM cost recovery, allowing the utilities to earn their approved rate of return plus 5 percent (e.g., a 15 percent return if the approved rate is 10 percent) on the equity-portion of their DSM program funding. This step gave the utilities a much greater financial incentive to expand their DSM programs.

In June 2005, legislation enacted in Nevada added energy savings from DSM programs to the state's Renewable Portfolio Standard. This innovative policy allows energy savings from utility DSM programs and efficiency measures acquired through contract to supply up to 25 percent of the requirements under the renamed clean energy portfolio standard. The clean energy standard is equal to 6 percent of electricity supply in 2005 and 2006 and increases to 9 percent in 2007 and 2008, 12 percent from 2009 to 2010, 15 percent in 2011 and 2012, 18 percent in 2013 and 2014, and 20 percent in 2015 and thereafter. At least half of the energy savings credits must come from electricity savings in the residential sector.

Within months of passage, the utilities proposed a large expansion of DSM programs for 2006. In addition to the existing estimated funding of $26 million, the Nevada utilities proposed adding another $7.5 million to 2006 DSM programs. If funding is approved, the Nevada utilities estimate the 2006 programs alone will yield gross energy savings of 153 gigawatt-hours/yr and 63 MW (Larry Holmes, personal communication, February 28, 2006).

Source: Geller, 2006.

Tying energy efficiency to overall corporate goals and compensation is important, particularly when the utility is the administrator of energy efficiency programs. Ties to corporate goals make energy efficiency an integral part of how the organization does business as exemplified below:

- Bonneville Power Administration (BPA) includes energy efficiency as a part of its overall corporate strategy, and its executive compensation is designed to reflect how well the organization meets its efficiency goals. BPA's strategy map states, "Development of all cost-effective energy efficiency in the loads BPA serves facilitates development of regional renewable resources, and adopts cost-effective non-construction alternatives to transmission expansion" (BPA, 2004).

- National Grid ties energy efficiency goals to staff and executive compensation (P. Arons, personnel communication, June 15, 2006).

- Sacramento Municipal Utility District (SMUD) ties energy efficiency to its reliability goal: "To ensure a reliable energy supply for customers in 2005, the 2005 budget includes sufficient capacity reserves for the peak summer season. We have funded all of the District's commercial and residential load management programs, and on-going efficiency programs in Public Good to continue to contribute to peak load reduction" (SMUD, 2004a).

- Nevada Power's Conservation Department had a "Performance Dashboard" that tracks costs, participating customers, kWh savings, kW savings, $/kWh, $/kW, customer contribution to savings, and total customer costs on a real time basis, both by program and overall.

- Austin Energy's Mission Statement is "to deliver clean, affordable, reliable energy and excellent customer services" (Austin Energy, 2004).

- Seattle City Light has actively pursued conservation as an alternative to new generation since 1977 and has tracked progress toward its goals (Seattle City Light, 2005). Its longstanding, resolute policy direction establishes energy conservation as the first choice resource. In more recent years, the utility has also been guided by the city's policy to meet of all the utility's future load growth with conservation and renewable resources (Steve Lush, personal communication, June 2006).

From Pacific Gas and Electric's (PG&E's) Second Annual Corporate Responsibility Report (2004):

"One of the areas on which PG&E puts a lot of emphasis is helping our customers use energy more efficiently."

"For example, we plan to invest more than $2 billion on energy efficiency initiatives over the next 10 years. What's exciting is that the most recent regulatory approval we received on this was the result of collaboration by a large and broad group of parties, including manufacturers, customer groups, environmental groups, and the state's utilities."

— Beverly Alexander, Vice President,
Customer Satisfaction, PG&E

Having an appropriate framework within the organization to ensure success is also important. In the case of the utility, this would include the regulatory framework that supports the programs, including cost recovery and potentially shareholder incentives and/or decoupling. For a third-party administrator, an appropriate framework might include a sound bidding process by a state agency to select the vendor or vendors and an appropriate regulatory arrangement with the utilities to manage the funding process.

Adequate resources also are critical to successful implementation of programs. Energy efficiency programs need to be understood and supported by departments outside those that are immediately responsible for program delivery. If information technology, legal, power supply, transmission, distribution, and other departments do not share and support the energy efficiency goals and programs, it is difficult for energy efficiency programs to succeed. When programs are initiated, the need for support from other departments is greatest. Support from other departments needs to be considered in planning and budgeting processes.

As noted in the Nevada case study, having a shareholder incentive makes it easier for a utility to integrate efficiency goals into its business because the incentive offsets some of the concerns related to financial treatment of program expenses and potential lost revenue from decreased sales. For third-party program administrators, goals might be built into the contract that governs the overall implementation of the programs. For example, Efficiency Vermont's contract with the Vermont Department of Public Service Board has specific performance targets. An added shareholder return will not motivate publicly and cooperatively owned utilities, though they might appreciate reduced risks from exposure to wholesale markets, and the value added in improved customer service. SMUD, for example, cites conservation programs as a way to help customers lower their utility bills (SMUD, 2004b). These companies, like IOUs, can link employee compensation to achieving energy efficiency targets.

Business processes for delivering energy efficiency programs and services to customers should be developed and treated like other business processes in an organization and reviewed on a regular basis. These processes should include documenting clear plans built on explicit assumptions, ongoing monitoring of results and plan inputs (assumptions), and regular reassessment to improve performance (using improved performance itself as a metric).

Understanding the Efficiency Resource

Energy efficiency potential studies provide the initial justification (the business case) for utilities embarking on or expanding energy efficiency programs, by providing information on (1) the overall potential for energy efficiency and (2) the technologies, practices, and sectors with the greatest or most cost-effective opportunities for achieving that potential. Potential studies illuminate the nature of energy efficiency resource, and can be used by legislators and regulators to inform efficiency policy and programs. Potential studies can usually be completed in three to eight months, depending on the level of detail, availability of data, and complexity. They range in cost from \$100,000 to \$300,000 (exclusive of primary data collection). Increasingly, many existing studies can be drawn from to limit the extent and cost of such an effort.

The majority of organizations reviewed in developing this chapter have conducted potential studies in the past five years. In addition, numerous other studies have been conducted in recent years by a variety of organizations interested in learning more about the efficiency resource in their state or region. Table 6-4 summarizes key findings for achievable potential (i.e., what can realistically be achieved from programs within identified funding parameters), by customer class, from a selection of these studies. It also illustrates that this potential is well represented across the residential, commercial, and industrial sectors. The achievable estimates presented are for a future time period, are based on realistic program scenarios, and represent potential program impacts above and beyond naturally occurring conservation. Energy efficiency potential studies are based on currently available technologies. New technologies such as those discussed in Table 6-9 will continuously and significantly increase potential over time.

The studies show that achievable potential for reducing overall energy consumption ranges from 7 to 32 percent for electricity and 5 to 19 percent for gas, and that demand for electricity and gas can be reduced by about 0.5 to 2 percent per year. For context, national electricity consumption is projected to grow by 1.6 percent per year, and gas consumption is growing 0.7 percent per year (EIA, 2006a).

The box on page 6-17, "Overview of a Well-Designed Potential Study" provides information on key elements of a potential study. Related best practices for efficiency programs administrators include:

- Conducting a "potential study" prior to starting programs.
- Outlining what can be accomplished at what cost.
- Reviewing measures appropriate to all customer classes including those appropriate for hard-to-reach customers, such as low income and very small business customers.

Table 6-4. Achievable Energy Efficiency Potential From Recent Studies

State/Region	Study Length (Years)	Achievable Demand Reduction (MW)			Achievable Gas Consumption Reduction (MMBtu)			Achievable GWh Reduction			Demand Savings as % of 2004 State Nameplate Capacity [10]	Annual % MW Savings	Electricity Savings as % of Total 2004 State Usage [11]	Annual % GWh Savings	Gas Savings as % of Total 2004 State Usage[12]	Annual % MMBtu Savings
		Residential	Commercial	Industrial	Residential	Commercial	Industrial	Residential	Commercial	Industrial	Electricity		Electricity		Gas	
U.S. (Clean Energy Future) [1]	20	n/a	n/a	n/a	500,000,000	300,000,000	1,400,000,000	392,732	281,360	292,076	n/a	n/a	24%	1.2%	10%	0.5%
Con Edison [2]	10	n/a	n/a	n/a	11,396,700	10,782,100	231,000	n/a	n/a	n/a	n/a	n/a	n/a	n/a	19%	1.9%
Pacific NW [3]	20	n/a	n/a	n/a	n/a	n/a	n/a	11,169	9,715	5,011	n/a	n/a	12.5%	0.6%	n/a	n/a
Puget Sound [4]	20	133	148	16	n/a	n/a	n/a	1,169	1,293	139	9.3%	0.5%	9.5%	0.5%	n/a	n/a
Connecticut [5]	8	240	575	93	n/a	n/a	n/a	1,655	2,088	723	12.5%	1.6%	13.4%	1.7%	n/a	n/a
California [6]	9	1,800	2,600	1,550	27,500,000	20,600,000	-	9,200	11,900	8,800	9.6%	1.1%	11.8%	1.3%	10%	1.1%
Southwest [7]	17	n/a	n/a	n/a	n/a	n/a	n/a	24,593	50,291	-	n/a	n/a	32.8%	1.9%	n/a	n/a
New York [8]	19	3,584	8,180	602	n/a	n/a	n/a	15,728	2,948	8,180	23.1%	1.2%	14.3%	0.8%	n/a	n/a
Illinois [9]	17	n/a	n/a	n/a	n/a	n/a	n/a	-	-	67,000	n/a	n/a	43.2%	2.5%	n/a	n/a
										AVERAGE:		1.1%		1.3%		1.2%

MW = Megawatt; MMBtu = Million British thermal units.

[1] ORNL, 2000.

[2] NYSERDA/OE, 2006.

[3] NPCC, 2005.

[4] Puget Sound Energy, 2003.

[5] GDS Associates and Quantum Consulting, 2004.

[6] KEMA, 2002; KEMA & XENERGY, 2003a; KEMA & XENERGY, 2003b.

[7] SWEEP, 2002.

[8] NYSERDA/OE, 2003.

[9] ACEEE, 1998.

[10] EIA, 2005a.

[11] EIA, 2005b.

[12] EIA, 2006b.

Overview of a Well-Designed Potential Study

Well-designed potential studies assess the following types of potential:

Technical potential assumes the complete penetration of all energy-conservation measures that are considered technically feasible from an engineering perspective.

Economic potential refers to the technical potential of those measures that are cost-effective, when compared to supply-side alternatives. The economic potential is very large because it is summing up the potential in existing equipment, without accounting for the time period during which the potential would be realized.

Maximum achievable potential describes the economic potential that could be achieved over a given time period under the most aggressive program scenario.

Achievable potential refers to energy saved as a result of specific program funding levels and incentives. These savings are above and **beyond those that would occur naturally** in the absence of any market intervention.

Naturally occurring potential refers to energy saved as a result of normal market forces, that is, in the absence of any utility or governmental intervention.

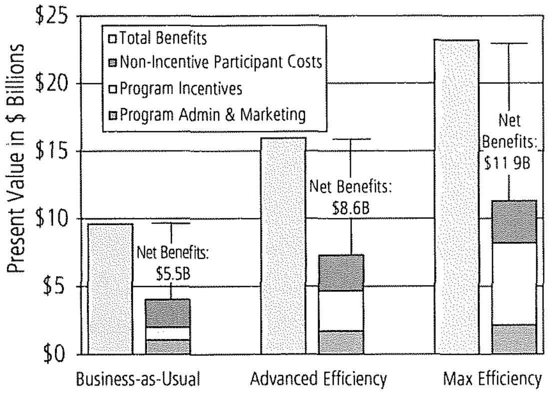
The output of technical and economic potential is the size of the energy efficiency resource in MW, MWh, MMBtu and other resources. The potential is built up from savings and cost data from hundreds of measures and is typically summarized by sector using detailed demographic information about the customer base and the base of appliances, building stock, and other characteristics of the relevant service area.

After technical and economic potential is calculated, typically the next phase of a well-designed potential study is to create program scenarios to estimate actual savings that could be generated by programs or other forms of intervention, such as changing building codes or appliance standards.

Program scenarios developed to calculate achievable potential are based on modeling example programs and using market models to estimate the penetration of the program. Program scenarios require making assumptions about rebate or incentive levels, program staffing, and marketing efforts.

Scenarios can also be developed for different price assumptions and load growth scenarios, as shown below in the figure of a sample benefit/cost output from a potential study conducted for the state of California.

Benefits and Costs of Electric Energy Efficiency Savings, 2002-2011



Source: KEMA, 2002

- Ensuring that potential state and federal codes and standards are modeled and included in evaluation scenarios

- Developing scenarios for relevant time periods.

In addition, an emerging best practice is to conduct uncertainty analysis on savings estimates, as well as other variables such as cost.

With study results in hand, program administrators are well positioned to develop energy efficiency goals, identify program measures and strategies, and determine funding requirements to deliver energy efficiency programs to all customers. Information from a detailed potential study can also be used as the basis for calculating program cost-effectiveness and determining measures for inclusion during the program planning and design phase. Detailed potential studies can provide information to help determine which technologies are replaced most frequently and are therefore candidates to deliver early returns (e.g., an efficient light bulb), and how long the savings from various technologies persist and therefore will continue to deliver energy savings. For example, an energy efficient light bulb might last six years, whereas an efficient residential boiler might last 20 years. (Additional information on measure savings and lifetimes can be found in *Resources and Expertise*, a forthcoming product of the Action Plan Leadership Group.)

Developing an Energy Efficiency Plan

The majority of organizations reviewed for this chapter are acquiring energy efficiency resources for about \$0.03/lifetime kWh for electric programs and about \$1.30 to \$2.00 per lifetime MMBtu for gas program (as shown previously in Tables 6-1 and 6-2). In many cases, energy efficiency is being delivered at a cost that is substantially less than the cost of new supply—on the order of half the cost of new supply. In addition, in all cases where information is available, the costs of saved energy are less than the avoided costs of energy. These organizations operate in diverse locations under different administrative and regulatory structures. They do, however, share many similar best practices when it comes to program planning, including one or more of the following:

- Provide programs for all key customer classes.

- Align goals with funding.

- Use cost-effectiveness tests that are consistent with long-term planning.

- Consider building codes and appliance standards when designing programs.

- Plan for developing and incorporating new technology.

- Consider efficiency investments to alleviate transmission and distribution constraints.

- Create a roadmap that documents key program components, milestones, and explicit energy reduction goals.

Provide Programs for All Customer Classes

One concern sometimes raised when funding energy efficiency programs is that all customers are required to contribute to energy efficiency programming, though not all customers will take advantage of programs once they are available, raising the issue that non-participants subsidize the efficiency upgrades of participants.

While it is true that program participants receive the direct benefits that accrue from energy efficiency upgrades, all customer classes benefit from well-managed energy efficiency programs, regardless of whether or not they participate directly. For example, an evaluation of the New York State Energy Research and Development Authority's (NYSERDA's) program portfolio concluded that: "total cost savings for all customers, including non participating customers [in the New York Energy \$mart Programs] is estimated to be \$196 million for program activities through year-end 2003, increasing to \$420 to \$435 million at full implementation" (NYSERDA, 2004).

In addition, particularly for programs that aim to accelerate market adoption of energy efficiency products or services, there is often program "spillover" to non-program participants. For example, an evaluation of National Grid's Energy Initiative, Design 2000plus, and other small commercial and industrial programs found energy efficient measures were installed by non-participants due to program influences on design professionals and vendors. The analysis indicated that "non-participant spillover from the programs amounted to 12,323,174 kWh in the 2001 program year, which is approximately 9.2 percent of the total savings produced in 2001 by the Design 2000plus and Energy Initiative programs combined" (National Grid, 2002).

Furthermore, energy efficiency programming can help contribute to an overall lower cost system for all customers over the longer term by helping avoid the need to purchase energy, or the need to build new infrastructure such as generation, transmission and distribution lines. For example:

- The Northwest Power Planning and Conservation Council found in its Portfolio Analysis that strategies that included more conservation had the least cost and the least risk (measured in dollars) relative to strategies that included less conservation. The most aggressive conservation case had an expected system cost of $1.8 billion lower and a risk factor of $2.5 billion less than the strategy with the least conservation (NPPC, 2005).

- In its 2005 analysis of energy efficiency and renewable energy on natural gas consumption and price, ACEEE states, "It is important to note that while the direct benefits of energy efficiency investment flow to participating customers, the benefits of falling prices accrue to all customers." Based on their national scenario of cost-effective energy efficiency opportunities, ACEEE found that total costs for energy efficiency would be $8 billion, and would result in consumer benefits of $32 billion in 2010 (Elliot & Shipley, 2005).

- Through cost-effective energy efficiency investments in 2004, Vermonters reduced their annual electricity use by 58 million kWh. These savings, which are expected to continue each year for an average of 14 years, met 44 percent of the growth in the state's energy needs in 2004 while costing ratepayers just 2.8 cents per kWh. That cost is only 37 percent of the cost of generating, transmitting, and distributing power to Vermont's homes and businesses (Efficiency Vermont, 2004).

- The Massachusetts Division of Energy noted that cumulative impact on demand from energy efficiency measures installed from 1998 to 2002 (excluding reductions from one-time interruptible programs) was significant—reducing demand by 264 megawatt (MW). During the summer of 2002, a reduction of this magnitude meant avoiding the need to purchase $19.4 million worth of electricity from the spot market (Massachusetts, 2004).

Despite evidence that both program participants and non-participants can benefit from energy efficiency programming, it is a best practice to provide program opportunities for all customer classes and income levels. This approach is a best practice because, in most cases, funding for efficiency programs comes from all customer classes, and as mentioned above, program participants will receive both the indirect benefits of system-wide savings and reliability enhancements and the direct benefits of program participation.

All program portfolios reviewed for this chapter include programs for all customer classes. Program administrators usually strive to align program funding with spending based on customer class contributions to funds. It is not uncommon, however, to have limited cross-subsidization for (1) low-income, agricultural, and other hard-to-reach customers; (2) situations where budgets limit achievable potential, and the most cost-effective energy efficiency savings are not aligned with customer class contributions to energy efficiency funding; and (3) situations where energy efficiency savings are targeted geographically based on system needs—for example, air conditioner turn-ins or greater new construction incentives that are targeted to curtail load growth in an area with a supply or transmission and distribution need. For programs targeting low-income or other hard-to-reach customers, it is not uncommon for them to be implemented with a lower benefit-cost threshold, as long as the overall energy efficiency program portfolio for each customer class (i.e., residential, commercial, and industrial) meets cost-effectiveness criteria.

NYSERDA's program portfolio is a good example of programs for all customer classes and segments (see Table 6-5).

Table 6-5. NYSERDA 2004 Portfolio

Sector	Program	% of Sector Budget
Residential	Small Homes	23%
	Keep Cool	19%
	ENERGY STAR Products	20%
	Program Marketing	16%
	Multifamily	10%
	Awareness/Other	12%
Low Income	Assisted Multifamily	59%
	Assisted Home Performance	17%
	Direct Install	8%
	All Other	16%
Business	Performance Contracting	36%
	Peak Load Reduction	12%
	Efficient Products	9%
	New Construction	23%
	Technical Assistance	10%
	All Other	10%

Nevada Power/Sierra Pacific Power Company's portfolio provides another example with notable expansion of program investments in efficient air conditioning, ENERGY STAR appliances, refrigerator collection, and renewable energy investments within a one-year timeframe (see Table 6-6).

Align Goals With Funding

Regardless of program administrative structure and policy context, it is a best practice for organizations to align funding to explicit goals for energy efficiency over the near-term and long-term. How quickly an organization is able to ramp up programs to capture achievable potential can vary based on organizational history of running DSM programs, and the sophistication of the marketplace in which a utility operates (e.g., whether there is a network of home energy raters, ESCOs, or certified heating, ventilation, and air conditioning [HVAC] contractors).

Utilities or third-party administrators should set long-term goals for energy efficiency designed to capture a significant percentage of the achievable potential energy savings identified through an energy efficiency potential study. Setting long-term goals is a best practice for administrators of energy efficiency program portfolios, regardless of policy models and whether they are an investor-owned or a municipal or cooperative utility, or a third-party program administrator. Examples of how long-term goals are set are provided as follows:

- In states where the utility is responsible for integrated resource planning (the IRP Model), energy efficiency must be incorporated into the IRP. This process generally requires a long-term forecast of both spending and savings for energy efficiency at an aggregated level that is consistent with the time horizon of the IRP—generally at least 10 years. Five- and ten-year goals can then be developed based on the resource need. In states without an SBC, the budget for energy efficiency is usually a revenue requirement expense item, but can be a capital investment or a combination of the two. (As discussed in Chapter 2: Utility Ratemaking & Revenue Requirements, capitalizing efficiency program investments rather than expensing them can reduce short-term rate impacts.)

- Municipal or cooperative utilities that own generation typically set efficiency goals as part of a resource planning process. The budget for energy efficiency is usually a revenue requirement expense item, a capital expenditure, or a combination of the two.

Table 6-6. Nevada Resource Planning Programs

	2005 Budget	2006 Budget
Air Conditioning Load Management	$3,450,000	$3,600,000
High-Efficiency Air Conditioning	2,600,000	15,625,000
Commercial Incentives	2,300,000	2,800,000
Low-Income Support	1,361,000	1,216,000
Energy Education	1,205,000	1,243,000
ENERGY STAR Appliances	1,200,000	2,050,000
School Support	850,000	850,000
Refrigerator Collection	700,000	1,915,000
Commercial New Construction	600,000	600,000
Other – Miscellaneous & Technology	225,000	725,000
Total Nevada Resource Planning Programs	$14,491,000	$30,624,000
SolarGenerations	1,780,075	7,220,000
Company Renewable – PV	1,000,000	1,750,000
California Program	370,000	563,000
Sierra Natural Gas Programs	—	820,000
Total All Programs	$17,641,075	*$40,977,000*

- A resource portfolio standard is typically set at a percentage of overall energy or demand, with program plans and budgets developed to achieve goals at the portfolio level. The original standard can be developed based on achievable potential from a potential study, or as a percentage of growth from a base year.

- In most SBC models, the funding is determined by a small volumetric charge on each customer's utility bill. This charge is then used as a basis for determining the overall budget for energy efficiency programming—contributions by each customer class are used to inform the proportion of funds that should be targeted to each customer class. Annual goals are then based on these budgets and a given program portfolio. Over time, the goal of the program should be to capture a large percentage of achievable potential.

- In most gas programs, funding can be treated as an expense, in a capital budget, or a combination (as is the case in some of the electric examples shown previously). Goals are based on the budget developed for the time period of the plan.

Once actual program implementation starts, program experience is usually the best basis for developing future budgets and goals for individual program years.

Use Cost-Effectiveness Tests That Are Consistent With Long-Term Planning

All of the organizations reviewed for this chapter use cost-effectiveness tests to ensure that measures and programs are consistent with valuing the benefits and costs of their efficiency investments relative to long-term supply options. Most of the organizations reviewed use either the total resource cost (TRC), societal, or program administrator test (utility test) to screen measures. None of the organizations reviewed for this chapter used the rate impact measure (RIM) test as a primary decision-making test.[5] The key cost-effectiveness tests are described as follows, per Swisher, et al. (1997), with key benefits and costs further illustrated in Table 6-7.

- *Total Resource Cost (TRC) Test.* Compares the total costs and benefits of a program, including costs and benefits to the utility and the participant and the avoided costs of energy supply.

- *Societal Test.* Similar to the TRC Test, but includes the effects of other societal benefits and costs such as environmental impacts, water savings, and national security.

- *Utility/Program Administrator Test.* Assesses benefits and costs from the program administrator's perspective (e.g., benefits of avoided fuel and operating capacity costs compared to rebates and administrative costs).

- *Participant Test.* Assesses benefits and costs from a participant's perspective (e.g., the reduction in customers' bills, incentives paid by the utility, and tax credits received as compared to out-of-pocket expenses such as costs of equipment purchase, operation, and maintenance).

- *Rate Impact Measure (RIM).* Assesses the effect of changes in revenues and operating costs caused by a program on customers' bills and rates.

Another metric used for assessing cost-effectiveness is the cost of conserved energy, which is calculated in cents per kWh or dollars per thousand cubic feet (Mcf). This measure does not depend on a future projection of energy prices and is easy to calculate; however, it does not fully capture the future market price of energy.

An overall energy efficiency portfolio should pass the cost-effectiveness test(s) of the jurisdiction. In an IRP situation, energy efficiency resources are compared to new supply-side options–essentially the program administrator or utility test. In cases where utilities have divested generation, a calculated avoided cost or a wholesale market price projection is used to represent the generation benefits. Cost-effectiveness tests are appropriate to screen out poor program design, and to identify programs in markets that have been transformed and might need to be redesigned to continue. Cost-effectiveness analysis is important but must be supplemented by other aspects of the planning process.

If the TRC or societal tests are used, "other resource benefits" can include environmental benefits, water savings, and other fuel savings. Costs include all program costs (administrative, marketing, incentives, and evaluation) as well as customer costs. Future benefits from emissions trading (or other regulatory approaches that provide payment for emission credits) could be treated as additional benefits in any of these models. Other benefits of programs can include job impacts, sales generated, gross state product added, impacts from wholesale price reductions, and personal income (Wisconsin, 2006; Massachusetts, 2004).

Example of Other Benefits

The Massachusetts Division of Energy Resources estimates that its 2002 DSM programs produced 2,093 jobs, increased disposable income by $79 million, and provided savings to all customers of $19.4 million due to lower wholesale energy clearing prices (Massachusetts, 2004).

At a minimum, regulators require programs to be cost-effective at the sector level (residential, commercial, and industrial) and typically at the program level as well. Many program administrators bundle measures under a single program umbrella when, in reality, measures are delivered to customers through different strategies and marketing channels. This process allows program admin-

[5] The RIM test is viewed as less certain than the other tests because it is sensitive to the difference between long-term projections of marginal or market costs and long-term projections of rates (CEC, 2001).

Table 6-7. Overview of Cost-Effectiveness Tests

Test	Benefits					Costs			
	Externalities	Energy Benefits G, T&D	Demand Benefits G, T&D	Non-Energy Benefits	Other Resource Benefits	Impact On Rates	Program Implementation Costs	Program Evaluation Costs	Customer Costs
Total Resource Cost Test		X	X		X		X	X	X
Societal Test	X	X	X	X	X		X	X	X
Utility Test/ Administrator Test		X	X				X	X	
Rate Impact Test		X	X			X	X	X	
Participant Test		X	X	X					X

G, T&D = Generation, Transmission, and Distribution

istrators to adjust to market realities during program implementation. For example, within a customer class or segment, if a high-performing and well-subscribed program or measure is out-performing a program or measure that is not meeting program targets, the program administrator can redirect resources without seeking additional regulatory approval.

Individual programs should be screened on a regular basis, consistent with the regulatory schedule—typically, once a year. Individual programs in some customer segments, such as low income, are not always required to be cost-effective, as they provide other benefits to society that might not all be quantified in the cost-effectiveness tests. The same is true of education-only programs that have hard-to-quantify benefits in terms of energy impacts. (See section on conducting impact evaluations for information related to evaluating energy education programs.)

Existing measures should be screened by the program administrator at least every two years, and new measures should be screened annually to ensure they are performing as anticipated. Programs should be reevaluated and updated from time to time to reflect new methods, technologies, and systems. For example, many programs today include measures such as T-5 lighting that did not exist five to ten years ago.

Consider Building Codes and Appliance Standards When Designing Programs

Enacting state and federal codes and standards for new products and buildings is often a cost-effective opportunity for energy savings. Changes to building codes and appliance standards are often considered an intervention that could be deployed in a cost-effective way to achieve results. Adoption of state codes and standards in many states requires an act of legislation beyond the scope of utility programming, but utilities and other third-party program administrators can and do interact with state and federal codes and standards in several ways:

- In the case of building codes, code compliance and actual building performance can lag behind enactment of legislation. Some energy efficiency program administrators design programs with a central goal of improving code compliance. Efficiency Vermont's ENERGY STAR Homes program (described in the box on page 6-24) includes increasing compliance with Vermont Building Code as a specific program objective.

The California investor owned utilities also are working with the national ENERGY STAR program to ensure availability of ENERGY STAR/Title 24 Building Code-compliant residential lighting fixtures and to ensure overall compliance with their new residential building code through their ENERGY STAR Homes program.

- Some efficiency programs fund activities to advance codes and standards. For example, the California IOUs are funding a long-term initiative to contribute expertise, research, analysis, and other kinds of support to help the California Energy Commission (CEC) develop and adopt energy efficiency standards. One rationale for utility investment in advancing codes and standards is that utilities can lock in a baseline of energy savings and free up program funds to work on efficiency opportunities that could not otherwise be realized. In California's case, the IOUs also developed a method for estimating savings associated with their codes and standards work. The method was accepted by the California Public Utilities Commission, and is formalized in the California Energy Efficiency Evaluation Protocols: Technical, Methodological, and Reporting Require-ments for Evaluation Professionals (CPUC, 2006).

Regardless of whether they are a component of an energy efficiency program, organizations have found that it is essential to coordinate across multiple states and regions when pursuing state codes and standards, to ensure that retailers and manufacturers can respond appropriately in delivering products to market.

Program administrators must be aware of codes and standards. Changes in codes and standards affect the baseline against which future program impacts are measured. Codes and standards should be explicitly considered in planning to prevent double counting. The Northwest Power and Conservation Council (NWPCC) explicitly models both state codes and federal standards in its long-term plan (NWPCC, 2005).

Plan for Developing and Incorporating New Technology

Many of the organizations reviewed have a history of providing programs that change over time to accommodate changes in the market and the introduction of new technologies. The new technologies are covered using one or more of the following approaches:

- They are included in research and development (R&D) budgets that do not need to pass cost-effectiveness tests, as they are, by definition, addressing new or experimental technologies. Sometimes R&D funding

Efficiency Vermont ENERGY STAR Homes Program

In the residential new construction segment, Efficiency Vermont partners with the national ENERGY STAR program to deliver whole house performance to its customers and meet both resource acquisition and market transformation goals. Specific objectives of Efficiency Vermont's program are to:

- Increase market recognition of superior construction
- Increase compliance with the Vermont Building Code
- Increase penetration of cost-effective energy efficiency measures
- Improve occupant comfort, health, and safety (including improved indoor air quality)
- Institutionalize Home Energy Rating Systems (HERS)

Participating homebuilders agree to build to the program's energy efficiency standards and allow homes to be inspected by an HERS rater. The home must score 86+ on the HERS inspection and include four energy efficient light fixtures, power-vented or sealed combustion equipment, and an efficient mechanical ventilation system with automatic controls. When a home passes, builders receive a rebate check, program certificate, an ENERGY STAR Homes certificate, and gifts. **Efficiency Vermont ENERGY STAR Homes Program saved more than 700 MWh with program spending of $1.4 million in 2004.**

Source: Efficiency Vermont, 2005

comes from sources other than the utility or state agency. Table 6-8 summarizes R&D activities of several organizations reviewed.

- They are included in pilot programs that are funded as part of an overall program portfolio and are not individually subject to cost-effectiveness tests.

- They are tested in limited quantities under existing programs (such as commercial and industrial custom rebate programs).

Technology innovation in electricity use has been the cornerstone of global economic progress for more than 50 years. In the future, advanced industrial processes, heating and cooling, and metering systems will play very important roles in supporting customers' needs for efficient use of energy. Continued development of new, more efficient technologies is critical for future industrial and commercial processes. Furthermore, technology innovation that targets improved energy efficiency and energy management will enable society to advance and sustain energy efficiency in the absence of government-sponsored or regulatory-mandated programs. Robust and competitive consumer-driven markets are needed for energy efficient devices and energy efficiency service.

The Electric Power Research Institute (EPRI)/U.S. Department of Energy (DOE) Gridwise collaborative and the Southern California Edison (SCE) Lighting Energy Efficiency Demand Response Program are two examples of research and development activities:

- *The EPRI IntelliGrid Consortium* is an industry-wide initiative and public/private partnership to develop the technical foundation and implementation tools to evolve the power delivery grid into an integrated energy and communications system on a continental scale. A key development by this consortium is the IntelliGrid Architecture, an open-standards-based architecture

Table 6-8. Research & Development (R&D) Activities of Select Organizations

Program Administrator	R&D Funding Mechanism(s)	R&D as % of Energy Efficiency Budget	Examples of R&D Technologies/ Initiatives Funded
PG&E	CEC Public Interest Energy Research (PIER) performs research from California SBC funding (PG&E does not have access to their bills' SBC funds); other corporate funds support the California Clean Energy Fund	**1%**[a,b]	California Clean Energy Fund - New technologies and demonstration projects
NYSERDA	SBC funding	**13%**[c,d]	Product development, demonstration and evaluation, university research, technology market opportunities studies
BPA	In rates	**6%**[e,f]	PNL / DOE GridWise Collaborative, Northwest Energy Efficiency Alliance, university research
SCE	CEC Public Interest Energy Research (PIER) performs research from California SBC funding (SCE does not have access to their bills' SBC funds). Procurement proceedings and other corporate funds support Emerging Technologies and Innovative Design for Energy Efficiency programs.	**5%**[g,h,i]	Introduction of emerging technologies (second D of RD&D)

a [Numerator] $4 million in 2005 for Californial Clean Energy Fund (CCEF, 2005).

b [Denominator] $867 million to be spent 2006-2008 on energy efficiency projects not including evaluation, measurement, and validation (CPUC, 2005). 1/3 of full budget used for single year budget ($289 million).

c [Numerator] $17 million for annual energy efficiency R&D budget consists of "residential ($8 M), industrial ($6 M), and transportation ($3 M)" (G. Walmet, NYSERDA, personal communication, May 23, 2006).

d [Denominator] $134 M for New York Energy $mart from 3/2004-3/2005 (NYSERDA, 2005b).

e [Numerator] BPA funded the Northwest Energy Efficiency Alliance with $10 million in 2003. [Denominator] The total BPA energy efficiency allocation was $138 million (Blumstein, et al., 2005).

f [Note] BPA overall budgetting for energy efficiency increased in subsequent years (e.g., $170 million in 2004 with higher commitments going to an average of $245 million from 2006-2012) (Alliance to Save Energy, 2004).

g Funding for the statewide Emerging Technologies program will increase in 2006 to $10 million [Numerator] out of a total budget of $581 million [Denominator] for utility energy-efficiency programs (Mills and Livingston, 2005).

h [Note] Data from Mills and Livingston (2005) differs from $675 million 3-yr figure from CPUC (2005).

i Additional 3% is spent on Innovative Design for Energy Efficiency (InDEE) (D. Arambula, SCE, personal communication, June 8, 2006).

for integrating the data communication networks and smart equipment on the grid and on consumer premises. Another key development is the consumer portal—essentially, a two-way communication link between utilities and their customers to facilitate information exchange (EPRI, 2006). Several efficiency program administrators are pilot testing GridWise/Intelligrid as presented in the box below.

- *The Lighting Energy Efficiency Demand Response Program* is a program proposed by SCE. It will use Westinghouse's two–way wireless dimmable energy efficiency T-5 fluorescent lighting as a retrofit for existing T-12 lamps. SCE will be able to dispatch these lighting systems using wireless technology. The technology will be piloted in small commercial buildings, the educational sector, office buildings, and industrial facilities and could give SCE the ability to reduce load by 50 percent on those installations. This is an excellent example of combining energy efficiency and direct load control technologies.

Both EPRI and ESource (a for-profit, membership-based energy information service) are exploring opportunities to expand their efforts in these areas. ESource is also considering developing a database of new energy efficiency and load response technologies. Leveraging R&D resources through regional and national partnering efforts has been successful in the past with energy efficiency technologies. Examples include compact fluorescent lighting, high-efficiency ballasts and new washing machine technologies. Regional and national efforts send a consistent signal to manufacturers, which can be critical to increasing R&D activities.

Programs must be able to incorporate new technologies over time. As new technologies are considered, the programs must develop strategies to overcome the barriers specific to these technologies to increase their acceptance. Table 6-9 provides some examples of new technologies, challenges, and possible strategies for overcoming these challenges. A cross-cutting challenge for many of these technologies is that average rate designs do not send a price signal during periods of peak demand. A strategy for overcoming this barrier would be to investigate time-sensitive rates (see Chapter 5: Rate Design for additional information).

Pilot Tests of GridWise/Intelligrid

GridWise Pacific Northwest Demonstration Projects
These projects are designed to demonstrate how advanced, information-based technologies can be used to increase power grid efficiency, flexibility, and reliability while reducing the need to build additional transmission and distribution infrastructure. These pilots are funded by DOE's Office of Electricity Delivery and Energy Reliability.

Olympic Peninsula Distributed Resources Demonstration
This project will integrate demand response and distributed resources to reduce congestion on the grid, including demand response with automated control technology, smart appliances, a virtual real-time market, Internet-based communications, contract options for customers, and the use of distributed generation.

Grid-Friendly Appliance Demonstration
In this project, appliance controllers will be used in both clothes dryers and water heaters to detect fluctuations in frequency that indicate there is stress in the grid, and will respond by reducing the load on that appliance.

These pilots include: Pacific Northwest National Laboratory, Bonneville Power Administration, PacificCorp, Portland General Electric, Mason County PUD #3, Clallam County PUD, and the city of Port Angeles.

Table 6-9. Emerging Technologies for Programs

Technology/ Program	Description	Availability	Key Challenges	Key Strategies	Examples
Smart Grid/ GridWise technologies	Smart grid technologies include both customer-side and grid-side technologies that allow for more efficient operation of the grid.	Available in pilot situations	Cost Customer Acceptance Communication Protocols	Pilot programs R&D programs	GridWise pilot in Pacific NW
Smart appliances/ Smart Homes	Homes with gateways that would allow for control of appliances and other end-uses via the Internet.	Available	Cost Customer Acceptance Communication Protocols	Pilot programs Customer education	GridWise pilot in Pacific NW
Load control of A/C via smart thermostat	A/C controlled via smart thermostat. Communication can be via wireless, power line carrier (PLC) or Internet.	Widely available	Cost Customer acceptance	Used to control loads in congested situation Pilot and full-scale programs Customer education	Long Island Power Authority (LIPA), Austin Energy, Utah Power and Light, ISO New England
Dynamic pricing/critical peak pricing/ thermostat control with enhanced metering	Providing customers with either real time or critical peak pricing via a communication technology. Communication can be via wireless, PLC, or Internet. Customers can also be provided with educational materials.	Available	Cost Customer acceptance Split incentives in deregulated markets Regulatory barriers	Pilot and full-scale Programs Used in congested areas Customer education	Georgia (large users) Niagara Mohawk, California Peak Pricing Experiment, Gulf Power
Control of lighting via wireless, power line carrier or other communication technologies	Using direct control to control commercial lighting during high price periods.	Recently available	Cost Customer acceptance Contractor acceptance	R&D programs Pilot programs	SCE pilot using wireless NYSERDA pilot with power line carrier control
T-5s	Relatively new lighting technology for certain applications.	Widely available	Cost Customer acceptance Contractor acceptance	Add to existing programs as a new measure	Included in most large-scale programs
New generation tankless water heaters	Tankless water heaters do not have storage tanks and do not have standby losses. They can save energy relative to conventional water heaters in some applications. Peak demand implications are not yet known.	Widely available	Cost Customer acceptance Contractor acceptance	Add to existing programs as a new measure	More common in the EU

Some load control technologies will require more than R&D activities to become widespread. To fully capture and utilize some of these technologies, the following four building blocks are needed:

- *Interactive communications* Interactive communications that allow for two-way flow of price information and decisions would add new functionality to the electricity system.

- *Innovative rates and regulation.* Regulations are needed to provide adequate incentives for energy efficiency investments to both suppliers and customers.

- *Innovative markets.* Market design must ensure that energy efficiency and load response measures that are advanced by regulation become self-sustaining in the marketplace.

- *Smart end-use devices.* Smart devices are needed to respond to price signals and facilitate the management of the energy use of individual and networked appliances.

In addition, the use of open architecture systems is the only long-term way to take existing non-communicating equipment into an energy-efficient future that can use two-way communications to monitor and diagnose appliances and equipment.

Consider Efficiency Investments to Alleviate Transmission and Distribution Constraints

Energy efficiency has a history of providing value by reducing generation investments. It should also be considered with other demand-side resources, such as demand response, as a potential resource to defer or avoid investments in transmission and distribution systems. Pacific Gas and Electric's (PG&E) Model Energy Communities Project (the Delta Project) provides one of the first examples of this approach. This project was conceived to test whether demand resources could be used as a least cost resource to defer the capital expansion of the transmission and distribution system in a constrained area. In this case, efforts were focused on the constrained area, and customers were offered versions of existing programs and additional measures to achieve a significant reduction in the constrained area (PG&E, 1993). A recently approved settlement at the Federal Energy Regulatory Commission (FERC) allows energy efficiency along with load response and distributed generation to participate in the Independent System Operator New England (ISO-NE) Forward Capacity Market (FERC, 2006; FERC, 2005). In addition, Consolidated Edison has successfully used a Request For Proposals (RFP) approach to defer distribution upgrades in four substation areas with contracts totaling 45 MW. Con Ed is currently in a second round of solicitations for 150 MW (NAESCO, 2005). Recent pilots using demand response, energy efficiency, and intelligent grid are proving promising as shown in the BPA example in the box on page 6-29.

To evaluate strategies for deferring transmission and distribution investments, the benefits and costs of energy efficiency and other demand resources are compared to the cost of deferring or avoiding a distribution or transmission upgrade (such as a substation upgrade) in a constrained area. This cost balance is influenced by location-specific transmission and distribution costs, which can vary greatly.

Create a Roadmap of Key Program Components, Milestones, and Explicit Energy Use Reduction Goals

Decisions regarding the key considerations discussed throughout this section are used to inform the development of an energy efficiency plan, which serves as a roadmap with key program components, milestones, and explicit energy reduction goals.

A well-designed plan includes many of the elements discussed in this section including:

- Budgets (see section titled "Leverage Private-Sector Expertise, External Funding, and Financing" for information on the budgeting processes for the most common policy models)
  - Overall
  - By program
- Kilowatt , kWh, and Mcf savings goals overall and by program
  - Annual savings
  - Lifetime savings
- Benefits and costs overall and by program
- Description of any shareholder incentive mechanisms

Bonneville Power Administration (BPA) Transmission Planning

BPA has embarked on a new era in transmission planning. As plans take shape to address load growth, constraints, and congestion on the transmission system, BPA is considering measures other than building new lines, while maintaining its commitment to provide reliable transmission service. The agency, along with others in the region, is exploring "non-wires solutions" as a way to defer large construction projects.

BPA defines non-wires solutions as the broad array of alternatives including, but not limited to, demand response, distributed generation, conservation measures, generation siting, and pricing strategies that individually, or in combination, delay or eliminate the need for upgrades to the transmission system. The industry also refers to non-wires solutions as non-construction alternatives or options.

BPA has reconfigured its transmission planning process to include an initial screening of projects to assess their potential for a non-wires solution. BPA is now committed to using non-wires solutions screening criteria for all capital transmission projects greater than $2 million, so that it becomes an institutionalized part of planning. BPA is currently sponsoring a number of pilot projects to test technologies, resolve institutional barriers, and build confidence in using non-wires solution.

For each program, the plan should include the following:

- Program design description
- Objectives
- Target market
- Eligible measures
- Marketing plan
- Implementation strategy
- Incentive strategy
- Evaluation plan
- Benefit/cost outputs
- Metrics for program success
- Milestones

The plan serves as a road-map for programs. Most program plans, however, are modified over time based on changing conditions (e.g., utility supply or market changes) and program experience. Changes from the original roadmap should be both documented and justified. A plan that includes all of these elements is an appropriate starting point for a regulatory filing. A well-documented plan is also a good communications vehicle for informing and educating stakeholders. The plan should also include a description of any pilot programs and R&D activities.

Energy Efficiency Program Design and Delivery

The organizations reviewed for this chapter have learned that program success is built over time by understanding the markets in which efficient products and services are delivered, by addressing the wants and needs of their customers, by establishing relationships with customers and suppliers, and by designing and delivering programs accordingly.

- They have learned that it is essential to program success to coordinate with private market actors and other influential stakeholders, to ensure that they are well informed about program offerings and share this information with their customers/constituents.

- Many of the organizations reviewed go well beyond merely informing businesses and organizations, by actually partnering with them in the design and delivery of one or more of their efficiency programs.

- Recognizing that markets are not defined by utility service territory, many utilities and other third-party program administrators actively cooperate with one another and with national programs, such as ENERGY STAR, in the design and delivery of their programs.

This section discusses key best practices that emerge from a decade or more of experience designing and implementing energy efficiency programs.

Begin With the Market in Mind

Energy efficiency programs should complement, rather than compete with, private and other existing markets for energy efficient products and services. The rationale for utility or third-party investment in efficiency programming is usually based on the concept that within these markets, there are barriers that need to be overcome to ensure that an efficient product or service is chosen over a less efficient product or standard practice. Barriers might include higher initial cost to the consumer, lack of knowledge on the part of the supplier or the customer, split incentives between the tenant who pays the utility bills and the landlord who owns the building, lack of supply for a product or service, or lack of time (e.g., to research efficient options, seek multiple bids—particularly during emergency replacements).

Conduct a Market Assessment

Understanding how markets function is a key to successful program implementation, regardless of whether a program is designed for resource acquisition, market transformation, or a hybrid approach. A market assessment can be a valuable investment to inform program design and implementation. It helps establish who is part of the market (e.g., manufacturers, distributors, retailers, consumers), what the key barriers are to greater energy efficiency from the producer or consumer perspectives, who are the key trend-setters in the business and the key influencers in consumer decision-making, and what approaches might work best to overcome barriers to greater supply and investment in energy efficient options, and/or uptake of a program. A critical part of completing a market assessment is a baseline measurement of the goods and services involved and the practices, attitudes, behaviors, factors, and conditions of the marketplace (Feldman, 1994). In addition to informing program design and implementation, the baseline assessment also helps inform program evaluation metrics, and serves as a basis for which future program impacts are measured. As such, market assessments are usually conducted by independent third-party evaluation professionals. The extent and needs of a market assessment can vary greatly. For well-established program models, market assessments are somewhat less involved, and can rely on existing program experience and literature, with the goal of understanding local differences and establishing the local or regional baseline for the targeted energy efficiency product or service.

Table 6-10 illustrates some of the key stakeholders, barriers to energy efficiency, and program strategies that are explored in a market assessment, and are useful for considering when designing programs.

Solicit Stakeholder Input

Convening stakeholder advisory groups from the onset as part of the design process is valuable for obtaining multiple perspectives on the need and nature of planned programs. This process also serves to improve the program design, and provides a base of program support within the community.

Once programs have been operational for a while, stakeholder groups should be reconvened to provide program feedback. Stakeholders that have had an ongoing relationship with one or more of the programs can provide insight on how the programs are operating and perceived in the community, and can recommend program modifications. They are also useful resources for tapping into extended networks beyond those easily accessible to the program providers. For example, contractors, building owners, and building operators can be helpful in providing access to their specific trade or business organizations.

Table 6-10. Key Stakeholders, Barriers, and Program Strategies by Customer Segment

Customer Segment	Key Stakeholders	Key Program Barriers	Key Program Strategies
Large Commercial & Industrial Retrofit	• Contractors • Building owners and operators • Distributors: lighting, HVAC, motors, other • Product manufacturers • Engineers • Energy services companies	• Access to capital • Competing priorities • Lack of information • Short-term payback (<2 yr) mentality	• Financial incentives (rebates) • Performance contracting • Performance benchmarking • Partnership with ENERGY STAR • Low interest financing • Information from unbiased sources • Technical assistance • Operations and maintenance training
Small Commercial	• Distributors: lighting, HVAC, other • Building owners • Business owners • Local independent trades	• Access to capital • Competing priorities • Lack of information	• Financial incentives (rebates) • Information from unbiased sources • Direct installation • Partnership with ENERGY STAR
Commercial & Industrial New Construction	• Architects • Engineers • Building and energy code officials • Building owners • Potential occupants	• Project/program timing • Competing priorities • Split incentives (for rental property) • Lack of information • Higher initial cost	• Early intervention (ID requests for hook-up) • Design assistance • Performance targeting/benchmarking • Partnership with ENERGY STAR • Training of architects and engineers • Visible and ongoing presence in design community • Education on life cycle costs
Residential Existing Homes	• Distributors: appliances, HVAC, lighting • Retailers: appliance, lighting, windows • Contractors: HVAC, insulation, remodeling • Homeowners	• Higher initial cost • Lack of information • Competing priorities • Inexperience or prior negative experience w/technology (e.g., early compact florescent lighting) • Emergency replacements	• Financial incentives • Partnership with ENERGY STAR • Information on utility Web sites, bill inserts, and at retailers • Coordination with retailers and contractors
Residential New Homes	• Contractors: general and HVAC • Architects • Code officials • Builders • Home buyers • Real estate agents • Financial institutions	• Higher initial cost • Split incentives: builder is not the occupant	• Partnership with ENERGY STAR • Linking efficiency to quality • Working with builders • Building code education & compliance • Energy efficient mortgages
Multifamily	• Owners and operators • Contractors • Code officials • Tenants	• Split incentives • Lack of awareness	• Financial incentives • Marketing through owner and operator associations
Low Income	• Service providers: Weatherization Assistance Program (WAP), Low-Income Home Energy Assistance Program (LIHEAP) • Social service providers: state and local agencies • NGOs and advocacy groups • Credit counseling organizations • Tenants	• Program funding • Program awareness • Bureaucratic challenges	• Consistent eligibility requirements with existing programs • Direct installation • Leveraging existing customer channels for promotion and delivery • Fuel blind approach

To be successful, stakeholder groups should focus on the big picture, be well organized, and be representative. Stakeholder groups usually provide input on budgets, allocation of budgets, sectors to address, program design, evaluation, and incentives.

Listen to Customer and Trade Ally Needs

Successful energy efficiency programs do not exist without customer and trade ally participation and acceptance of these technologies. Program designs should be tested with customer market research before finalizing offerings. Customer research could include surveys, focus groups,

Best Practice: Solicit Stakeholder Input

Minnesota's Energy Efficiency Stakeholder Process exemplifies the best practice of engaging stakeholders in program design. The Minnesota Public Utility Commission hosted a roundtable with the commission, utilities, and other stakeholders to review programs. Rate implications and changes to the programs are worked out through this collaborative and drive program design (MPUC, 2005).

Successful stakeholder processes generally have the following attributes:

- Neutral facilitation of meetings.
- Clear objectives for the group overall and for each meeting.
- Explicit definition of stakeholder group's role in program planning (usually advisory only).
- Explicit and fair processes for providing input.
- A timeline for the stakeholder process.

forums, and in-depth interviews. Testing of incentive levels and existing market conditions by surveying trade allies is critical for good program design.

Use Utility Channels and Brand

Utilities have existing channels for providing information and service offerings to their customers. These include Web sites, call centers, bill stuffers, targeted newsletters, as well as public media. Using these channels takes advantage of existing infrastructure and expertise, and provides customers with energy information in the way that they are accustomed to obtaining it. These methods reduce the time and expense of bringing information to customers. In cases where efficiency programming is delivered by a third party, gaining access to customer data and leveraging existing utility channels has been highly valuable for program design and implementation. In cases such as Vermont (where the utilities are not responsible for running programs), it has been helpful to have linkages from the utility Web sites to Efficiency Vermont's programs, and to establish Efficiency Vermont as a brand that the utilities leverage to deliver information about efficiency to their customers.

Promote the Other Benefits of Energy Efficiency and Energy Efficient Equipment

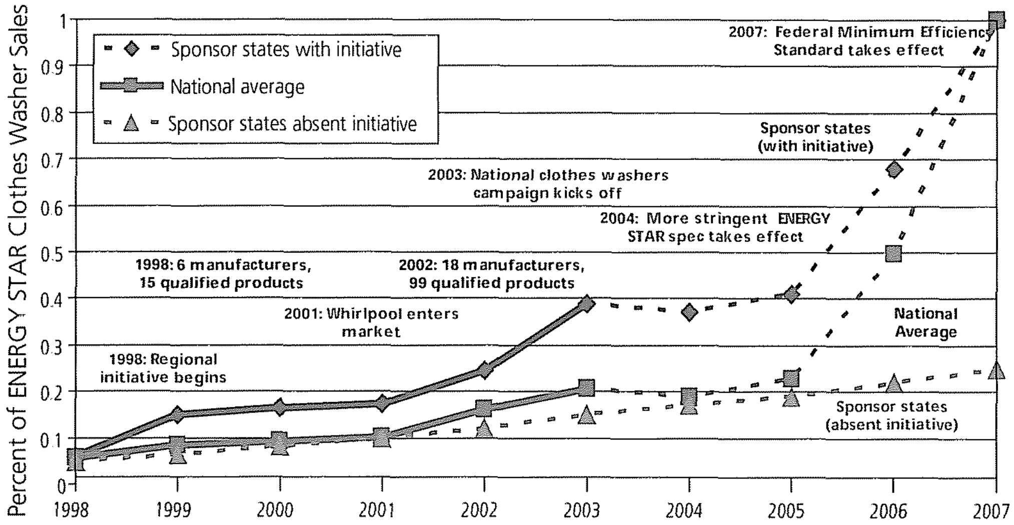
Most customers are interested in reducing energy consumption to save money. Many, however, have other motivations for replacing equipment or renovating space that are consistent with energy efficiency improvements. For example, homeowners might replace their heating system to improve the comfort of their home. A furnace with a variable speed drive fan will further increase comfort (while saving energy) by providing better distribution of both heating and cooling throughout the home and reducing fan motor noise. It is a best practice for program administrators to highlight these features where non-energy claims can be substantiated.

Coordinate With Other Utilities and Third-Party Program Administrators

Coordination with other utilities and third-party program administrators is also important. Both program allies and customers prefer programs that are consistent across states and regions. This approach reduces transaction costs for customers and trade allies and provides consistent messages that avoid confusing the market. Some programs can be coordinated at the regional level by entities such as Northeast Energy Efficiency Partnership (NEEP), the Northwest Energy Efficiency Alliance, and the Midwest Energy Efficiency Alliance. Figure 6-1 illustrates the significant impact that initiative sponsors of the Northeast Lighting and Appliance Initiative (coordinated regionally by NEEP) have been able to have on the market for energy-efficient clothes washers by working in coordination over a long time period. **NEEP estimates the program is saving an estimated 36 million kWh per year, equivalent to the annual electricity needs of 5,000 homes** (*NEEP, undated*).

Similarly, low-income programs benefit from coordination with and use of the same eligibility criteria as the federal Low-Income Home Energy Assistance Program (LIHEAP) or Weatherization Assistance Program (WAP). These programs have existing delivery channels that can

Figure 6-1. Impacts of the Northeast Lighting and Appliance Initiative



be used to keep program costs down while providing substantial benefit to customers. On average, weatherization reduces heating bills by 31 percent and overall energy bills by $274 per year for an average cost per home of $2,672 per year. Since 1999, DOE has been encouraging the network of weatherization providers to adopt a whole-house approach whereby they approach residential energy efficiency as a system rather than as a collection of unrelated pieces of equipment (DOE, 2006). The Long Island Power Authority's (LIPA) program shown at right provides an example.

Leverage the National ENERGY STAR Program

Nationally, ENERGY STAR provides a platform for program implementation across customer classes and defines voluntary efficiency levels for homes, buildings, and products. ENERGY STAR is a voluntary, public-private partnership designed to reduce energy use and related greenhouse gas emissions. The program, administered by the U.S. Environmental Protection Agency (EPA) and the DOE, has an extensive network of partners including equipment manufacturers, retailers, builders, ESCOs, private businesses, and public sector organizations.

Since the late 1990s, EPA and DOE have worked with utilities, state energy offices, and regional nonprofit organizations to help leverage ENERGY STAR messaging, tools, and strategies to enhance local energy efficiency programs. Today more than 450 utilities (and other efficiency program administrators), servicing 65 percent of U.S. households, participate in the ENERGY STAR program. (See box on page 6-34 for additional information.) New Jersey and Minnesota provide examples of states that have leveraged ENERGY STAR.

Long Island Power Authority (LIPA): Residential Energy Affordability Partnership Program (REAP)

This program provides installation of comprehensive electric energy efficiency measures and energy education and counseling. The program targets customers who qualify for DOE's Low-Income Weatherization Assistance Program (WAP), as well as electric space heating and cooling customers who do not qualify for WAP and have an income of no more than 60 percent of the median household income level. **LIPA's REAP program has saved 2.5 MW and 21,520 MWh 1999 to 2004 with spending of $12.4 million.**

Source: LIPA, 2004

- *New Jersey's Clean Energy Program.* The New Jersey Board of Public Utilities, Office of Clean Energy has incorporated ENERGY STAR tools and strategies since the inception of its residential products and Warm Advantage (gas) programs. Both programs encourage customers to purchase qualified lighting, appliances, windows, programmable thermostats, furnaces, and boilers. The New Jersey Clean Energy Program also educates consumers, retailers, builders, contractors, and manufacturers about ENERGY STAR. **In 2005, New Jersey's Clean Energy Program saved an estimated 60 million kWh of electricity, 1.6 million therms of gas, and 45,000 tons of carbon dioxide (CO_2).**

ENERGY STAR Program Investments

In support of the ENERGY STAR program, EPA and DOE invest in a portfolio of energy efficiency efforts that utilities and third-party program administrators can leverage to further their local programs including:

- *Education and Awareness Building.* ENERGY STAR sponsors broad-based public campaigns to educate consumers on the link between energy use and air emissions, and to raise awareness about how products and services carrying the ENERGY STAR label can protect the environment while saving money.

- *Establishing Performance Specifications and Performing Outreach on Efficient Products.* More than 40 product categories include ENERGY STAR-qualifying models, which ENERGY STAR promotes through education campaigns, information exchanges on utility-retailer program models, and extensive online resources. Online resources include qualifying product lists, a store locator, and information on product features.

- *Establishing Energy Efficiency Delivery Models to Existing Homes.* ENERGY STAR assistance includes an emphasis on home diagnostics and evaluation, improvements by trained technicians/building professionals, and sales training. It features online consumer tools including the Home Energy Yardstick and Home Energy Advisor.

- *Establishing Performance Specifications and Performing Outreach for New Homes.* ENERGY STAR offers builder recruitment materials, sales toolkits, consumer messaging, and outreach that help support builder training, consumer education, and verification of home performance.

- *Improving the Performance of New and Existing Commercial Buildings.* EPA has designed an Energy Performance Rating System to measure the energy performance at the whole-building level, to help go beyond a component-by-component approach that misses impacts of design, sizing, installation, controls, operation, and maintenance. EPA uses this tool and other guidance to help building owners and utility programs maximize energy savings.

Additional information on strategies, tools, and resources by customer segment is provided in the fact sheet "ENERGY STAR—A Powerful Resource for Saving Energy," which can be downloaded from *www.epa.gov/cleanenergy/pdf/napee_energystar-factsheet.pdf.*

- *Great River Energy, Minnesota.* In 2005, Great River Energy emphasized cost-effective energy conservation by offering appliance rebates to cooperative members who purchase ENERGY STAR qualifying refrigerators, clothes washers, and dishwashers. Great River provided its member cooperatives with nearly $2 million for energy conservation rebates and grants, including the ENERGY STAR rebates, as a low-cost resource alternative to building new peaking generation. In addition to several off-peak programs, Great River Energy's residential DSM/conservation program consists of:

— Cycled air conditioning

— Interruptible commercial load response/management

— Interruptible irrigation

— Air and ground source heat pumps

— ENERGY STAR high-efficiency air conditioning rebate

— ENERGY STAR appliance rebates

— ENERGY STAR compact fluorescent lamp rebate

— Low-income air conditioning tune-ups

— Residential and commercial energy audits

Keep Participation Simple

Successful programs keep participation simple for both customers and trade allies. Onerous or confusing participation rules, procedures, and paperwork can be a major deterrent to participation from trade allies and customers. Applications and other forms should be clear and require the minimum information (equipment and customer) to confirm eligibility and track participation by customer for measurement and verification (M&V) purposes. Given that most energy efficiency improvements are made at the time of either equipment failure or retrofit, timing can be critical. A program that potentially delays equipment installation or requires customer or contractor time for participation will have fewer participants (and less support from trade allies). Seattle City Light's program shown above has two paths for easy participation.

A Seattle City Light Example of a Simple Program

Seattle City Light's $mart Business program offers a "per-fixture" rebate for specific fixtures in existing small businesses. Customers can use their own licensed electrical contractor or select from a pre-approved contractor list. Seattle City Light provides the rebate to either the installer or participating customer upon completion of the work. Completed work is subject to onsite verification.

Since 1986, Seattle City Light's $mart Business program has cumulative savings (for all measures) of 70,382 MWh and 2.124 MW.

Source: Seattle City Light, 2005

Keep Funding (and Other Program Characteristics) as Consistent as Possible

Over time, both customers and trade allies become increasingly aware and comfortable with programs. Disruptions to program funding frustrate trade allies who cannot stock appropriately or are uncomfortable making promises to customers regarding program offerings for fear that efficiency program administrators will be unable to deliver on services or financial incentives.

Invest in Education, Training, and Outreach

Some of the key barriers to investment in energy efficiency are informational. Education, outreach, and training should be provided to trade allies as well as customers. Some programs are information-only programs; some programs have educational components integrated into the program design and budget; and in some cases, education is budgeted and delivered somewhat independently of specific programs. In general, stand-alone education programs do not comprise more than

10 percent of the overall energy efficiency budget, but information, training, and outreach might comprise a larger portion of some programs that are designed to affect long-term markets, when such activities are tied to explicit uptake of efficiency measures and practices. This approach might be particularly applicable in the early years of implementation, when information and training are most critical for building supply and demand for products and services over the longer term. KeySpan and Flex Your Power are examples of coordinating education, training, and outreach activities with programs.

Leverage Customer Contact to Sell Additional Efficiency and Conservation Measures

Program providers can take advantage of program contact with customers to provide information on other program offerings, as well as on no or low-cost opportunities to reduce energy costs. Information might include proper use or maintenance of newly purchased or installed equipment or general practices around the home or workplace for efficiency improvements. Education is often included in low-income programs, which generally include direct installation of equipment, and thus already include in-home interaction between the program provider and customer. The box below provides some additional considerations for low-income programs.

Leverage Private-Sector Expertise, External Funding, and Financing

Well-designed energy efficiency programs leverage external funding and financing to stretch available dollars and to take advantage of transactions as they occur in

KeySpan Example

KeySpan uses training and certification as critical parts of its energy efficiency programs. KeySpan provides building operator certification training, provides training on the Massachusetts state building code, and trains more than 1,000 trade allies per year.

Source: Johnson, 2006

California: Flex Your Power Campaign

The California Flex Your Power Campaign was initiated in 2001 in the wake of California's rolling black-outs. While initially focused on immediate conservation measures, the campaign has transitioned to promoting energy efficiency and long-term behavior change. The program coordinates with the national ENERGY STAR program as well as the California investor-owned utilities to ensure that consumers are aware of energy efficiency options and the incentives available to them through their utilities.

Low-Income Programs

Most utilities offer energy efficiency programs targeted to low-income customers for multiple reasons:

- Low-income customers are less likely to take advantage of rebate and other programs, because they are less likely to be purchasing appliances or making home improvements.
- The "energy burden" (percent of income spent on energy) is substantially higher for low-income customers, making it more difficult to pay bills. Programs that help reduce energy costs reduce the burden, making it easier to maintain regular payments.
- Energy efficiency improvements often increase the comfort and safety of these homes.
- Utilities have the opportunity to leverage federal programs, such as LIHEAP and WAP, to provide comprehensive services to customers.
- Low-income customers often live in less efficient housing and have older, less efficient appliances.
- Low-income customers often comprise a substantial percentage (up to one-third) of utility residential customers and represent a large potential for efficiency and demand reduction.
- Using efficiency education and incentives in conjunction with credit counseling can be very effective in this sector.

the marketplace. This approach offers greater financial incentives to the consumer without substantially increasing program costs. It also has some of the best practice attributes discussed previously, including use of existing channels and infrastructure to reach customers. The following are a few opportunities for leveraging external funding and financing:

- *Leverage Manufacturer and Retailer Resources Through Cooperative Promotions.* For example, for mass market lighting and appliance promotions, many program administrators issue RFPs to retailers and manufacturers asking them to submit promotional ideas. These RFPs usually require cost sharing or in-kind advertising and promotion, as well as requirements that sales data be provided as a condition of the contract. This approach allows competitors to differentiate themselves and market energy efficiency in a way that is compatible with their business model.

- *Leverage State and Federal Tax Credits Where Available.* Many energy efficiency program administrators are now pointing consumers and businesses to the new federal tax credits and incorporating them in their programs. In addition, program administrators can educate their customers on existing tax strategies, such as accelerated depreciation and investment tax strategies, to help them recoup the costs of their investments faster. Some states offer additional tax credits, and/or offer sales tax "holidays," where sales tax is waived at point of sale for a specified period of time ranging from one day to a year. The North Carolina Solar Center maintains a database of efficiency incentives, including state and local tax incentives, at *www.dsireusa.org*.

- *Build on ESCO and Other Financing Program Options.* This is especially useful for large commercial and industrial projects.

The NYSERDA and California programs presented at right and on the following page are both good examples of leveraging the energy services market and increasing ESCO presence in the state.

New York Energy $mart Commercial/Industrial Performance Program

The New York Energy $mart Commercial/Industrial Performance Program, which is administered by NYSERDA, is designed to promote energy savings and demand reduction through capital improvement projects and to support growth of the energy service industry in New York state. Through the program, ESCOs and other energy service providers receive cash incentives for completion of capital projects yielding verifiable energy and demand savings. By providing $111 million in performance-based financial incentives, this nationally recognized program has leveraged more than $550 million in private capital investments. M&V ensures that electrical energy savings are achieved. **Since January 1999, more than 860 projects were completed in New York with an estimated savings of 790 million kWh/yr.**

Sources: Thorne-Amann and Mendelsohn, 2005; AESP, 2006

- *Leverage Organizations and Outside Education and Training Opportunities.* Many organizations provide education and training to their members, sometimes on energy efficiency. Working with these organizations provides access to their members, and the opportunity to leverage funding or marketing opportunities provided by these organizations.

In addition, the energy efficiency contracting industry has matured to the level that many proven programs have been "commoditized." A number of private firms and not-for-profit entities deliver energy efficiency programs throughout the United States or in specific regions of the country. "The energy efficiency industry is now a $5 billion to $25 billion industry (depending on how expansive one's definition) with a 30-year history of developing and implementing all types of programs for

California Non-Residential Standard Performance Contract (NSPC) Program

The California NSPC program is targeted at customer efficiency projects and is managed on a statewide basis by PG&E, SCE, and San Diego Gas & Electric. Program administrators offer fixed-price incentives (by end use) to project sponsors for measured kilowatt-hour energy savings achieved by the installation of energy efficiency measures. The fixed price per kWh, performance measurement protocols, payment terms, and other operating rules of the program are specified in a standard contract. This program has helped to stimulate the energy services market in the state. **In program year 2003, the California NSPC served 540 customers and saved 336 gigawatt-hours and 6.54 million therms.**

Source: Quantum Consulting Inc., 2004

utilities and projects for all types of customers across the country" (NAESCO, 2005). These firms can quickly get a program up and running, as they have the expertise, processes, and infrastructure to handle program activities. New program administrators can contract with these organizations to deliver energy efficiency program design, delivery, and/or implementation support in their service territory.

Fort Collins Utilities was able to achieve early returns for its Lighting with a Twist program (discussed on page 6-39) by hiring an experienced implementation contractor through a competitive solicitation process and negotiating cooperative marketing agreements with national retail chains and manufacturers, as well as local hardware stores.

The Building Owners & Managers Association (BOMA) Energy Efficiency Program

The BOMA Foundation, in partnership with the ENERGY STAR program, has created an innovative operational excellence program to teach property owners and managers how to reduce energy consumption and costs with proven no- and low-cost strategies for optimizing equipment, people and practices. The BOMA Energy Efficiency Program consists of six Web-assisted audio seminars (as well as live offerings at the BOMA International Convention). The courses are taught primarily by real estate professionals who speak in business vernacular about the process of improving performance. The courses are as follows:

- Introduction to Energy Performance
- How to Benchmark Energy Performance
- Energy-Efficient Audit Concepts & Economic Benefits
- No- and Low-Cost Operational Adjustments to Improve Energy Performance
- Valuing Energy Enhancement Projects & Financial Returns
- Building an Energy Awareness Program

The commercial real estate industry spends approximately $24 billion annually on energy and contributes 18 percent of the U.S. CO_2 emissions. According to EPA and ENERGY STAR Partner observations, a 30 percent reduction is readily achievable simply by improving operating standards.

Fort Collins Utilities Lighting With a Twist

Fort Collins Utilities estimates annual savings of 2,023 MWh of electricity with significant winter peak demand savings of 1,850 kW at a total resource cost of $0.018/kWh from its Lighting with a Twist program, which uses ENERGY STAR as a platform. The program was able to get off to quick and successful start by hiring an experienced implementation contractor and negotiating cooperative marketing agreements with retailers and manufacturers—facilitating the sale of 78,000 compact fluorescent light bulbs through six retail outlets from October to December 2005 (Fort Collins Utilities, et al., 2005).

Start Simply With Demonstrated Program Models: Build Infrastructure for the Future

Utilities starting out or expanding programs should look to other programs in their region and throughout the country to leverage existing and emerging best programs. After more than a decade of experience running energy efficiency programs, many successful program models have emerged and are constantly being refined to achieve even more cost-effective results.

While programs must be adapted to local realities, utilities and state utility commissions can dramatically reduce their learning curve by taking advantage of the wealth of data and experience from other organizations around the country. The energy efficiency and services community has numerous resources and venues for sharing information and formally recognizing best practice programs. The Association of Energy Service Professionals (*www.aesp.org*), the Association of Energy Engineers (*www.aeecenter.org*), and the American Council for an Energy Efficient Economy (*www.aceee.org*) are a few of these resources. Opportunities for education and information sharing are also provided via national federal programs such as ENERGY STAR (*www.energystar.gov*) and the Federal Energy Management Program (*www.eere.energy.gov/femp*). Additional resources will be provided in *Energy Efficiency Best Practices Resources and Expertise* (a forthcoming product of the Leadership Group). Leveraging these resources will reduce the time and expense of going to market with new efficiency programs. This will also increase the quality and value of the programs implemented.

Start With Demonstrated Program Approaches That Can Easily Be Adapted to New Localities

Particularly for organizations that are new to energy efficiency programming or have not had substantial energy efficiency programming for many years, it is best to start with tried and true programs that can easily be transferred to new localities, and be up and running quickly to achieve near term results. ENERGY STAR lighting and appliance programs that are coordinated and delivered through retail sales channels are a good example of this approach on the residential side. On the commercial side, prescriptive incentives for technologies such as lighting, packaged unitary heating and cooling equipment, commercial food service equipment, and motors are good early targets. While issues related to installation can emerge, such as design issues for lighting, and proper sizing issues for packaged unitary heating and cooling equipment, these technologies can deliver savings independent from how well the building's overall energy system is managed and controlled. In the early phase of a program, offering prescriptive rebates is simple and can garner supplier interest in programs, but as programs progress, rebates might need to be reduced or transitioned to other types of incentives (e.g., cooperative marketing approaches, customer referrals) or to more comprehensive approaches to achieving energy savings. If the utility or state is in a tight supply situation, it might make sense to start with proven larger scale programs that address critical load growth drivers such as increased air conditioning load from both increased central air conditioning in new construction and increased use of room air conditioners.

Determine the Right Incentives and Levels

There are many types of incentives that can be used to spur increased investment in energy-efficient products and services. With the exception of education and

Table 6-11. Types of Financial Incentives

Financial Incentives	Description
Prescriptive Rebate	Usually a predetermined incentive payment per item or per kW or kWh saved. Can be provided to the customer or a trade ally.
Custom Rebate	A rebate that is customized by the type of measures installed. Can be tied to a specific payback criteria or energy savings. Typically given to the customer.
Performance Contracting Incentive	A program administrator provides an incentive to reduce the risk premium to the ESCO installing the measures.
Low Interest Financing	A reduced interest rate loan for efficiency projects. Typically provided to the customer.
Cooperative Advertising	Involves providing co-funding for advertising or promoting a program or product. Often involves a written agreement.
Retailer Buy Down	A payment to the retailer per item that reduces the price of the product.
MW Auction	A program administrator pays a third party per MW and/or per MWh for savings.

training programs, most programs offer some type of financial incentive. Table 6-11 shows some of the most commonly used financial incentives. Getting incentives right, and at the right levels, ensures program success and efficient use of resources by ensuring that programs do not "overpay" to achieve results. The market assessment and stakeholder input process can help inform initial incentives and levels. Ongoing process and impact evaluation (discussed below) and reassessment of cost-effectiveness can help inform when incentives need to be changed, reduced, or eliminated.

Invest in the Service Industry Infrastructure

Ultimately, energy efficiency is implemented by people—home performance contractors, plumbers, electricians, architects, ESCOs, product manufacturers, and others—who know how to plan for, and deliver, energy efficiency to market.

While it is a best practice to incorporate whole house and building performance into programs, these programs cannot occur unless the program administrator has a skilled, supportive community of energy service professionals to call upon to deliver these services to market. In areas of the country lacking these talents, development of these markets is a key goal and critical part of the program design.

In many markets—even those with well established efficiency programs—it is often this lack of infrastructure or supply of qualified workers that prevents wider deployment of otherwise cost-effective energy efficiency programs. Energy efficiency program administrators often try to address this lack of infrastructure through various program strategies, including pilot testing programs that foster demand for these services and help create the business case for private sector infrastructure development, and vocational training and outreach to universities, with incentives or business referrals to spur technician training and certification.

Examples of programs that have leveraged the ESCO industry were provided previously. One program with an explicit goal of encouraging technical training for the residential marketplace is Home Performance with ENERGY STAR, which is an emerging program model being implemented in a number of states including Wisconsin, New York, and Texas (see box on page 6-41 for an example). The program can be applied in the gas or electric context, and is effective at reducing peak load, because the program captures improvements in heating and cooling performance.

Austin Energy: Home Performance with ENERGY STAR

In Texas, Austin Energy's Home Performance with ENERGY STAR program focuses on educating customers, and providing advanced technical training for professional home performance contractors to identify energy efficiency opportunities, with an emphasis on safety, customer comfort, and energy savings. Participating Home Performance contractors are given the opportunity to receive technical accreditation through the Building Performance Institute.

Qualified contractors perform a top-to-bottom energy inspection of the home and make customized recommendations for improvements. These improvements might include measures such as air-sealing, duct sealing, adding insulation, installing energy efficient lighting, and installing new HVAC equipment or windows, if needed. In 2005, Austin Energy served more than 1,400 homeowners, with an average savings per customer of $290 per year. **Collectively, Austin Energy customers saved an estimated $410,000 and more than 3 MW through the Home Performance with ENERGY STAR program.**

Source: Austin Energy, 2006

Evolve to More Comprehensive Programs

A sample of how program approaches might evolve over time is presented in Table 6-12. As this table illustrates, programs typically start with proven models and often simpler approaches, such as providing prescriptive rebates for multiple technologies in commercial/industrial existing building programs. In addition, early program options are offered for all customer classes, and all of the programs deliver capacity benefits in addition to energy efficiency. Ultimately, the initial approach taken by a program administrator will depend on how quickly the program needs to ramp up, and on the availability of service industry professionals who know how to plan for, and deliver, energy efficiency to market.

As program administrators gain internal experience and a greater understanding of local market conditions, and regulators and stakeholders gain greater confidence in the value of the energy efficiency programs being offered, program administrators can add complexity to the programs provided and technologies addressed. The early and simpler programs will help establish internal relationships (across utility or program provider departments) and external relationships (between program providers, trade allies and other stakeholders). Both the program provider and trade allies will better understand roles and relationships, and trade allies will develop familiarity with program processes and develop trust in the programs. Additional complexity can include alternative financing approaches (e.g., performance contracting), the inclusion of custom measures, bidding programs, whole buildings and whole home approaches, or additional cutting edge technologies. In addition, once programs are proven within one subsector, they can often be offered with slight modification to other sectors; for example, some proven residential program offerings might be appropriate for multi-family or low-income customers, and some large commercial and industrial offerings might be appropriate for smaller customers or multifamily applications. Many of the current ENERGY STAR market-based lighting and appliance programs that exist in many parts of the country evolved from customer-based lighting rebates with some in-store promotion. Many of the more complex commercial and industrial programs, such at NSTAR and National Grid's Energy Initiative program evolved from lighting, HVAC, and motor rebate programs.

The Wisconsin and Xcel Energy programs discussed on page 6-43 are also good examples of programs that have become more complex over time.

Change Measures Over Time

Program success, changing market conditions, changes in codes, and changes in technology require reassessing the measures included in a program. High saturations in the market, lower incremental costs, more rigid codes, or

Table 6-12. Sample Progression of Program Designs

Sector	Program Ramp Up: Early (6 Months -2 YRS)	Program Ramp Up: Midterm (2-3 YRS)	Program Ramp Up: Longer Term (3 To 7 YRS)	Energy & Environmental Co-Benefits (In Addition to kWh): Other Fuels	Peak (S = Summer, W = Winter)	Water Savings	Other
Residential: Existing Homes	Market-based lighting & appliance program			X	S, W	X	Bill savings and reduced emissions
	Home performance with ENERGY STAR pilot	Home performance with ENERGY STAR		X	S, W		
		HVAC rebate	Add HVAC practices	X	S		
Residential: New Construction	ENERGY STAR Homes pilot (in areas without existing infrastructure)	ENERGY STAR Homes		X	S, W	X	Bill savings and reduced emissions
			Add ENERGY STAR Advanced Lighting Package		S, W		
Low-Income	Education and coordination with weatherization programs			X	W		Bill savings and reduced emissions
		Direct install		X	S, W	X	Improved bill payment
			Add home repair				Improved comfort
Multifamily	Lighting, audits				S, W		Bill savings and reduced emissions
		Direct install		X	S, W		
Commercial: Existing Buildings	Lighting, motors, HVAC, pumps, refrigeration, food service equipment prescriptive rebates				S, W		Bill savings and reduced emissions
		Custom measures			S, W	X	
	ESCO-type program		Comprehensive approach				
Commercial: New Construction	Lighting, motors, HVAC, pumps, refrigeration, food service equipment prescriptive rebates				S, W		Bill savings and reduced emissions
		Custom measures and design assistance			S, W	X	
Small Business	Lighting and HVAC rebates				S, W		Bill savings and reduced emissions
		Direct install			S, W		

the availability of newer, more efficient technologies are all reasons to reassess what measures are included in a program. Changes can be incremental, such as limiting incentives for a specific measure to specific markets or specific applications. As barriers hindering customer investment in a measure are reduced, it might be appropriate to lower or eliminate financial incentives altogether. It is not uncommon, however, for programs to continue

Wisconsin Focus on Energy: Comprehensive Commercial Retrofit Program

Wisconsin Focus on Energy's Feasibility Study Grants and Custom Incentive Program encourages commercial customers to implement comprehensive, multi-measure retrofit projects resulting in the long-term, in-depth energy savings. Customers implementing multi-measure projects designed to improve the whole building might be eligible for an additional 30 percent payment as a comprehensive bonus incentive. **The Comprehensive Commercial Retrofit Program saved 70,414,701 kWh, 16.4 MW, and 2 million therms from 2001 through 2005.**

Sources: Thorne-Amann and Mendelsohn, 2005; Wisconsin, 2006.

Xcel Energy Design Assistance

Energy Design Assistance offered by Xcel, targets new construction and major renovation projects. The program goal is to improve the energy efficiency of new construction projects by encouraging the design team to implement an integrated package of energy efficient strategies. The target markets for the program are commercial customers and small business customers, along with architectural and engineering firms. The program targets primarily big box retail, public government facilities, grocery stores, healthcare, education, and institutional customers. The program offers three levels of support depending on project size. For projects greater than 50,000 square feet, the program offers custom consulting. For projects between 24,000 and 50,000 square feet, the program offers plan review. Smaller projects get a standard offering. The program covers multiple HVAC, lighting, and building envelope measures. The program also addresses industrial process motors and variable speed drives. **Statewide, the Energy Design Assistance program saved 54.3 GWh and 15.3 MW at a cost of $5.3 million in 2003.**

Source: Minnesota Office of Legislative Auditor, 2005; Quantum Consulting Inc., 2004

monitoring product and measure uptake after programs have ceased or to support other activities, such as continued education, to ensure that market share for products and services are not adversely affected once financial incentives are eliminated.

Pilot New Program Concepts

New program ideas and delivery approaches should be initially offered on a pilot basis. Pilot programs are often very limited in duration, geographic area, sector or technology, depending upon what is being tested. There should be a specific set of questions and objectives that the pilot program is designed to address. After the pilot period, a quick assessment of the program should be conducted to determine successful aspects of the program and any problem areas for improvement, which can then be addressed in a more full-scale program. The NSTAR program shown below is a recent example of an emerging program type that was originally started as a pilot.

Table 6-13 provides a summary of the examples provided in this section.

NSTAR Electric's ENERGY STAR Benchmarking Initiative

NSTAR is using the ENERGY STAR benchmarking and portfolio manager to help its commercial customers identify and prioritize energy efficiency upgrades. NSTAR staff assist the customer in using the ENERGY STAR tools to rate their building relative to other buildings of the same type, and identify energy efficiency upgrades. Additional support is provided through walk-through energy audits and assistance in applying for NSTAR financial incentive programs to implement efficiency measures.

Ongoing support is available as participants monitor the impact of the energy efficiency improvements on the building's performance.

Table 6-13. Program Examples for Key Customer Segments

Customer Segment	Program	Program Administrator	Program Description/ Strategies	Program Model: Proven	Program Model: Emerging	Key Best Practices
All	Training and certification components	KeySpan	KeySpan's programs include a significant certification and training component. This includes building operator certification, building code training and training for HVAC installers. Strategies include training and certification.		X	Don't underinvest in education, training, and outreach. Solicit stakeholder input. Use utilities channels and brand.
Commercial, Industrial	Non-residential performance contracting program	California Utilities	This program uses a standard contract approach to provide incentives for measured energy savings. The key strategy is the provision of financial incentives.	X		Build upon ESCO and other financing program options. Add program complexity over time. Keep participation simple.
Commercial, Industrial, New Construction	Energy design assistance	XCEL	This program targets new construction and major renovation projects. Key strategies are incentives and design assistance for electric saving end uses.	X		Keep participation simple. Add complexity over time.
Commercial, Industrial	Custom incentive program	Wisconsin Focus on Energy	This program allows commercial and industrial customers to implement a wide array of measures. Strategies include financial assistance and technical assistance.	X		Keep participation simple. Add complexity over time.
Large Commercial, Industrial	NY Performance Contracting Program	NYSERDA	Comprehensive Performance Contracting Program provides incentives for measures and leverages the energy services sector. The predominant strategies are providing incentives and using the existing energy services infrastructure.	X	Does allow for technologies to be added over time	Leverage customer contact to sell additional measures. Add program complexity over time. Keep participation simple. Build upon ESCO and other financing options.
Large Commercial, Industrial	ENERGY STAR Benchmarking	NSTAR	NSTAR uses EPA's ENERGY STAR benchmarking and Portfolio Manager to assist customers in rating their buildings.	X		Coordinate with other programs. Keep participation simple. Use utility channels and brand. Leverage ENERGY STAR.
Small Commercial	Smart business	Seattle City Light	This program has per unit incentives for fixtures and is simple to participate in. It also provides a list of prequalified contractors.	X		Use utility channels and brand. Leverage customer contact to sell additional measures. Keep funding consistent.
Residential	Flex Your Power	California IOU's	This is an example of the CA utilities working together on a coordinated campaign to promote ENERGY STAR products. Lighting and appliances were among the measures promoted. Strategies include incentives and advertising.	X		Don't underinvest in education, training, and outreach. Solicit stakeholder input. Use utilities channels and brand. Coordinate with other programs. Leverage manufacturer and retailer resources. Keep participation simple. Leverage ENERGY STAR.
Residential - Low Income	Residential affordability program	LIPA	Comprehensive low-income program that installs energy saving measures and also provides education. Strategies are incentives and education.	X		Coordinate with other programs. Keep participation simple. Leverage customer contact to sell additional measures.

Table 6-13. Program Examples for Key Customer Segments (continued)

Customer Segment	Program	Program Administrator	Program Description/ Strategies	Program Model		Key Best Practices
				Proven	Emerging	
Residential Existing Homes	Home Performance with ENERGY STAR	Austin Energy	Whole house approach to existing homes. Measures include: air sealing, insulation, lighting, duct-sealing, and replacing HVAC.		X	Start with proven models. Use utilities channels and brand. Coordinate with other programs.
Residential New Construction	ENERGY STAR Homes	Efficiency Vermont	Comprehensive new construction program based on a HERS rating system. Measures include HVAC, insulation lighting, windows, and appliances.	X		Don't underinvest in education, training, and outreach. Solicit stakeholder input. Leverage state and federal tax credits. Leverage ENERGY STAR.
Residential Existing Homes	Residential program	Great River Coop	Provides rebates to qualifying appliances and technologies. Also provides training and education to customers and trade allies. Is a true dual-fuel program.	X		Start with proven models. Use utilities channels and brand. Coordinate with other programs.
Residential Existing Homes	New Jersey Clean Energy Program	New Jersey BPU	Provides rebates to qualifying appliances and technologies. Also provides training and education to customers and trade allies. Is a true dual-fuel program.	X		Start with proven models. Coordinate with other programs.
Commercial Existing	Education and training	BOMA	Designed to teach members how to reduce energy consumption and costs through no- and low-cost strategies.		X	Leverage organizations and outside education and training opportunities. Leverage ENERGY STAR.

Ensuring Energy Efficiency Investments Deliver Results

Program evaluation informs ongoing decision-making, improves program delivery, verifies energy savings claims, and justifies future investment in energy efficiency as a reliable energy resource. Engaging in evaluation during the early stages of program development can save time and money by identifying program inefficiencies, and suggesting how program funding can be optimized. It also helps ensure that critical data are not lost.

The majority of organizations reviewed for this paper have formal evaluation plans that address both program processes and impacts. The evaluation plans, in general, are developed consistent with the evaluation budget cycle and allocate evaluation dollars to specific programs and activities. Process and impact evaluations are performed for each program early in program cycles. As programs and portfolios mature, process evaluations are less frequent than impact evaluations. Over the maturation period, impact evaluations tend to focus on larger programs (or program components), and address more complex impact issues.

Most programs have an evaluation reporting cycle that is consistent with the program funding (or budgeting) cycle. In general, savings are reported individually by sector and totaled for the portfolio. Organizations use evaluation results from both process and impact evaluations to improve programs moving forward, and adjust their portfolio of energy efficiency offerings based on evaluation findings and other factors. Several organizations have adopted the International Performance Measurement and Verification Protocol (IPMVP) to provide guidelines for evaluation approaches. California has its own set of formal protocols that address specific program types. Key methods used by organizations vary based on program type and can include billing analysis, engineering analysis, metering, sales data tracking, and market effects studies.

Table 6-14 summarizes the evaluation practices of a subset of the organizations reviewed for this study.

Table 6-14. Evaluation Approaches

	NYSERDA (NY)	Efficiency Vermont (VT)	Electric Utilities NSTAR (MA)	WI Department of Administration (WI)	CA Utilities (CA)	MN Electric and Gas Investor-Owned Utilities (MN)	Bonneville Power Administration (ID, MT, OR , WA)
Policy Model	SBC w/state administration	SBC w/3rd party administration	SBC w/utility administration	SBC w/state administration	SBC w/utility administration	IRP and Conservation Improvement Program	Regional Planning Model
Program Funding Source	Annual appropriation. 8-year renewable portfolio standard program. 5-year public benefit programs.	Not available	SBC	SBC – electric ratepayers	Not available	Utilities, by order of state legislature, to spend a percent of revenues on efficiency programs.	Not available
Program Budgeting Cycle	Annual	3 years	Annual from SBC	Annual	Current funding cycle is 3 years. Previous periods were only 2 years.	Currently a 2-year cycle, but a 4-year cycle is recommended. Natural gas submits plans 1 year; electricity the next.	Dependent upon rate case, can be every 2 to 5 years. Generally amortized annually.
Evaluation Funding Cycle	Annual	Not available	Annual; evaluation is a line item in budgeting process.	Annual	Ongoing, every year. Upcoming contracts will be 3 year evaluation with annual reporting.	Funded as needed	Evaluation funded periodically when necessary. Starting to do more frequent evaluations than in previous years.
Evaluation Reporting Cycle	Quarterly and annually	Annually and as needed	Annually but not every program every year	Twice per year	Annual	Annual status reports	Not available
Role of Deemed Savings (i.e., pre-determined savings)	Estimate savings. Program planning and goals.	Estimate savings.	DOER for report to legislature. Program planning and design.	Estimate savings. Program planning and goals.	Planning. Inputs for TRC analysis. Adjusted regularly based on evaluation results.	Not available	Determine payment schedule for efficiency measures with established savings records.
Report Gross Savings (usually kWh, kW)	No	No	Yes	Yes	Yes	Not available	Yes. Gross savings forms basis for regional power plans.
Report Net Savings (usually kWh, kW)	Yes	Yes	Yes	Yes	Yes	Not available	Yes. Used to evaluate the efficiency of measures and fine-tune programs. Savings netted out depends upon program.
Net Savings Components							
Installation Verification	Yes		Yes	Yes	Yes		Not available
Engineering Review	Yes		Yes	Yes	Yes		Not available
Free Ridership	Yes	Yes	Yes	Yes	Yes	Yes	Not available
Spillover or Market Effects	Yes	Yes	Yes	Yes	Yes		Not available
Retention	Yes	Yes	Yes	Yes			Not available
Non-Energy Benefits	Yes					Yes	Not available
Other Not Specified						Yes	

Table 6-14. Evaluation Approaches (continued)

	NYSERDA (NY)	Efficiency Vermont (VT)	Electric Utilities NSTAR (MA)	WI Department of Administration (WI)	CA Utilities (CA)	MN Electric and Gas Investor-Owned Utilities (MN)	Bonneville Power Administration (ID, MT, OR , WA)
Education and Training in EE Budget	Yes	Not available	Yes	Not available	Yes	Not available	Yes
Education and Training Evaluated	Yes	Not available	Depends on program	Initial years only	Yes	Not available	No
Evaluation Funding as Percent of Program Budget	Not available	<1%	2%	8% increase from 4.25%	No more than 3% of minimum efficiency spending requirement.	<1%	
Evaluation Budget	Not available	Not available	Varies annually dependent upon project portfolio and other demands.	Not Available	$160MM over 3 years.	Not available	$1MM
Financial Evaluation	Internal State Comptroller CPA	CPA	Internal CPA	CPA	Not avaiable	Internal. Reviewed by Department of Commerce. Reviewed by Legislature.	Internal
Cost-Effectiveness Analysis	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Timing	Annually	Triennially	Varies annually dependent upon project portfolio and other demands.	Periodically (less frequent than funding cycle)	Not available	2 years	Periodically
Test Used (RIM, TRC, Utility, Other)	TRC; Other	Utility Cost Test and Societal Cost-Benefit Test	TRC	Societal; also includes economic impacts	TRCPAC (program administrator test)	Societal; Utility; Participant; Ratepayer	TRC
Who Evaluates	Independent evaluators	Independent experts under contract to DPS	Utilities manage independent evaluators through RFP process	One independent team of evaluators	Independent evaluators hired for each program via RFP process	Department of Commerce Legislature Audit Commission, if deemed necessary	Independent evaluators
Oversight of evaluation	NYSERDA provides ongoing oversight. Public Utilities Commission final audience.	Department of Public Service	Evaluations are reviewed in collaborative and filed with the Massachusetts Department of Telecommunications and Energy	WI Department of Administration	California Public Utilities Commission and CEC	Department of Commerce	Power Council
Protocols	IPMVP	Not available	Not available	None	Has had statewide protocols for many years. New protocols were recently adopted.	Not available	IPMVP as reference

Best practices for program evaluation that emerge from review of these organizations include the following:

- Budget, plan, and initiate evaluation from the onset.
- Formalize and document evaluation plans.
- Develop program tracking systems that are compatible with needs identified in evaluation plans.
- Conduct process evaluations to ensure that programs are working efficiently.
- Conduct impact evaluations to ensure that mid- and long-term goals are being met.
- Communicate evaluation results.

Budget, Plan, and Initiate Evaluation From the Onset

A well-designed evaluation plan addresses program process and impact issues. *Process evaluations* address issues associated with program delivery such as marketing, staffing, paperwork flow, and customer interactions, to understand how they can be improved to better meet program objectives. *Impact evaluations* are designed to determine the energy or peak savings from the program. Sometimes evaluations address other program benefits such as non-energy benefits to consumers, water savings, economic impacts, or emission reductions. Market research is often included in evaluation budgets to assist in assessing program delivery options, and for establishing baselines. An evaluation budget of 3 to 6 percent of program budget is a reasonable spending range. Often evaluation spending is higher in the second or third year of a program. Certain evaluation activities such as establishing baselines are critical to undertake from the onset to ensure that valuable data are not lost.

> "We should measure the performance of DSM programs in much the same way and with the same competence and diligence that we monitor the performance of power plants."
>
> **—Eric Hirst (1990), Independent Consultant and Former Corporate Fellow, Oak Ridge National Laboratory**

Develop Program and Project Tracking Systems That Support Evaluation Needs

A well-designed tracking system should collect sufficiently detailed information needed for program evaluation and implementation. Data collection can vary by program type, technologies addressed, and customer segment; however, all program tracking systems should include:

- *Participating customer information.* At a minimum, create an unique customer identifier that can be linked to the utility's Customer Information System (CIS). Other customer or site specific information might be valuable.
- *Measure specific information.* Record equipment type, equipment size or quantity, efficiency level and estimated savings.
- *Program tracking information.* Track rebates or other program services provided (for each participant) and key program dates.
- *All program cost information.* Include internal staffing and marketing costs, subcontractor and vendor costs, and program incentives.

Efficiency Vermont's tracking system incorporates all of these features in a comprehensive, easy-to-use relational database that includes all program contacts including, program allies and customers, tracks all project savings and costs, shows the underlying engineering estimates for all measures, and includes billing data from all of the Vermont utilities.

Conduct Process Evaluations to Ensure Programs Are Working Efficiently

Process evaluations are a tool to improve the design and delivery of the program and are especially important for newer programs. Often they can identify improvements to program delivery that reduce program costs, expedite program delivery, improve customer satisfaction, and better focus program objectives. Process evaluation can also address what technologies get rebates or determine rebate levels. Process evaluations use a variety of qualitative and quantitative approaches including review of program documents, in-depth interviews, focus groups, and surveys. Customer research in general, such as regular customer and vendor surveys, provides program administrators with continual feedback on how the program is working and being received by the market.

Conduct Impact Evaluations to Ensure Goals Are Being Met

Impact evaluations measure the change in energy usage (kWh, kW, and therms) attributable to the program. They use a variety of approaches to quantify energy savings including statistical comparisons, engineering estimation, modeling, metering, and billing analysis. The impact evaluation approach used is a function of the budget available, the technology(ies) addressed, the certainty of the original program estimates, and the level of estimated savings. The appliance recycling example shown at right is an example of how process and impact evaluations have improved a program over time.

Measurement and Verification (M&V)

The term "measurement and verification" is often used in regard to evaluating energy efficiency programs. Sometimes this term refers to ongoing M&V that is incorporated into program operations, such as telephone confirmation of installations by third-party installers or measurement of savings for selected projects. Other times, it refers to external (program operations) evaluations to document savings.

California Residential Appliance Recycling Program (RARP)

The California RARP was initially designed to remove older, inefficient second refrigerators from participant households. As the program matured, evaluations showed that the potential for removing old second refrigerators from households had decreased substantially as a result of the program. The program now focuses on pick-up of older refrigerators that are being replaced, to keep these refrigerators out of the secondary refrigerator market.

Organizations are beginning to explore the use of the EPA Energy Performance Rating System to measure the energy performance at the whole-building level, complement traditional M&V measures, and go beyond component-by-component approaches that miss the interactive impacts of design, sizing, installation, controls, and operation and maintenance.

While most energy professionals see inherent value in providing energy education and training (lack of information is often identified as a barrier to customer and market actor adoption of energy efficiency products and practices), few programs estimate savings directly as a result of education efforts. Until 2004, California assigned a savings estimate to the Statewide Education and Training Services program based on expenditures.

Capturing the energy impacts of energy education programs has proven to be a challenge for evaluators for several reasons. First, education and training efforts are often integral to specific program offerings. For example, training of HVAC contractors on sizing air conditioners might be integrated into a residential appliance rebate program. Second, education and training are often a small part of a program in terms of budget and estimated savings. Third, impact evaluation efforts might be expensive compared to the education and training budget and anticipated savings. Fourth, education and training efforts are not always designed to achieve direct benefits. They are often designed to inform participants or market actors of program opportunities, simply to familiarize them with energy efficiency options. Most evaluations of

Best Practices in Evaluation

- Incorporating an overall evaluation plan and budget into the program plan.
- Adopting a more in-depth evaluation plan each program year.
- Prioritizing evaluation resources where the risks are highest. This includes focusing impact evaluation activities on the most uncertain outcomes and highest potential savings. New and pilot programs have the most uncertain outcomes, as do newer technologies.
- Allowing evaluation criteria to vary across some program types to allow for education, outreach, and innovation.
- Conducting ongoing verification as part of the program process.
- Establishing a program tracking system that includes necessary information for evaluation.
- Matching evaluation techniques to the situation in regards to the costs to evaluate, the level of precision required, and feasibility.
- Maintaining separate staff for evaluation and for program implementation. Having outside review of evaluations (e.g., state utility commission), especially if conducted by internal utility staff.
- Evaluating regularly to refine programs as needed (changing market conditions often require program changes).

energy education and training initiatives have focused on process issues. Recently, there have been impact evaluations of training programs, especially those designed to produce direct energy savings, such as Building Operator Certification.

In the future, energy efficiency will be part of emissions trading initiatives (such as the Regional Greenhouse Gas Initiative [RGGI]) and is likely to be eligible for payments for reducing congestion and providing capacity value such as in the ISO-NE capacity market settlement. These emerging opportunities will require that evaluation methods become more consistent across states and regions, which might necessitate adopting consistent protocols for project-level verification for large projects, and standardizing sampling approaches for residential measures such as compact fluorescent lighting. This is an emerging need and should be a future area of collaboration across states.

Communicate Evaluation Results to Key Stakeholders

Communicating the evaluation results to program administrators and stakeholders is essential to enhancing program effectiveness. Program administrators need to understand evaluation approaches, findings, and especially recommendations to improve program processes and increase (or maintain) program savings levels. Stakeholders need to see that savings from energy efficiency programs are realized and have been verified independently.

Evaluation reports need to be geared toward the audiences reviewing them. Program staff and regulators often prefer reports that clearly describe methodologies, limitations, and findings on a detailed and program level. Outside stakeholders are more likely to read shorter evaluation reports that highlight key findings at the customer segment or portfolio level. These reports must be written in a less technical manner and highlight the impacts of the program beyond energy or demand savings. For example, summary reports of the Wisconsin Focus on Energy programs highlight energy, demand, and therm savings by sector, but also discuss the environmental benefits of the program and the impacts of energy savings on the Wisconsin economy. Because the public benefits budget goes through the state legislature, the summary reports include maps of Wisconsin showing where Focus on Energy projects were completed. Examples of particularly successful investments, with the customer's permission, should be part of the evaluation. These case studies can be used to make the success more tangible to stakeholders.

Recommendations and Options

The National Action Plan for Energy Efficiency Leadership Group offers the following recommendations as ways to promote best practice energy efficiency programs, and provides a number of options for consideration by utilities, regulators, and stakeholders.

Recommendation: Recognize energy efficiency as a high-priority energy resource. Energy efficiency has not been consistently viewed as a meaningful or dependable resource compared to new supply options, regardless of its demonstrated contributions to meeting load growth. Recognizing energy efficiency as a high priority energy resource is an important step in efforts to capture the benefits it offers and lower the overall cost of energy services to customers. Based on jurisdictional objectives, energy efficiency can be incorporated into resource plans to account for the long-term benefits from energy savings, capacity savings, potential reductions of air pollutants and greenhouse gases, as well as other benefits. The explicit integration of energy efficiency resources into the formalized resource planning processes that exist at regional, state, and utility levels can help establish the rationale for energy efficiency funding levels and for properly valuing and balancing the benefits. In some jurisdictions, existing planning processes might need to be adapted or new planning processes might need to be created to meaningfully incorporate energy efficiency resources into resource planning. Some states have recognized energy efficiency as the resource of first priority due to its broad benefits.

Option to Consider:

- Quantifying and establishing the value of energy efficiency, considering energy savings, capacity savings, and environmental benefits, as appropriate.

Recommendation: Make a strong, long-term commitment to cost-effective energy efficiency as a resource. Energy efficiency programs are most successful and provide the greatest benefits to stakeholders when appropriate policies are established and maintained over the long-term. Confidence in long-term stability of the program will help maintain energy efficiency as a dependable resource compared to supply-side resources, deferring or even avoiding the need for other infrastructure investments, and maintains customer awareness and support. Some steps might include assessing the long-term potential for cost-effective energy efficiency within a region (i.e., the energy efficiency that can be delivered cost-effectively through proven programs for each customer class within a planning horizon); examining the role for cutting-edge initiatives and technologies; establishing the cost of supply-side options versus energy efficiency; establishing robust M&V procedures; and providing for routine updates to information on energy efficiency potential and key costs.

Options to Consider:

- Establishing appropriate cost-effectiveness tests for a portfolio of programs to reflect the long-term benefits of energy efficiency.
- Establishing the potential for long-term, cost-effective energy efficiency savings by customer class through proven programs, innovative initiatives, and cutting-edge technologies.
- Establishing funding requirements for delivering long-term, cost-effective energy efficiency.
- Developing long-term energy saving goals as part of energy planning processes.
- Developing robust M&V procedures.
- Designating which organization(s) is responsible for administering the energy efficiency programs.
- Providing for frequent updates to energy resource plans to accommodate new information and technology.

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), 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 plan requires funding. Further, education is necessary on the impact that energy efficiency programs can have in concert with other energy efficiency policies such as building codes, appliance standards, and tax incentives.

Options to Consider:

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

- Communicating the role of building codes, appliance standards, tax and other incentives.

Recommendation: Provide sufficient and stable program funding to deliver energy efficiency where cost-effective. Energy efficiency programs require consistent and long-term funding to effectively compete with energy supply options. Efforts are necessary to establish this consistent long-term funding. A variety of mechanisms have been, and can be, used based on state, utility, and other stakeholder interests. It is important to ensure that the efficiency programs providers have sufficient program funding to recover energy efficiency program costs and implement the energy efficiency that has been demonstrated to be available and cost-effective. A number of states are now linking program funding to the achievement of energy savings.

Option to Consider:

- Establishing funding for multi-year periods.

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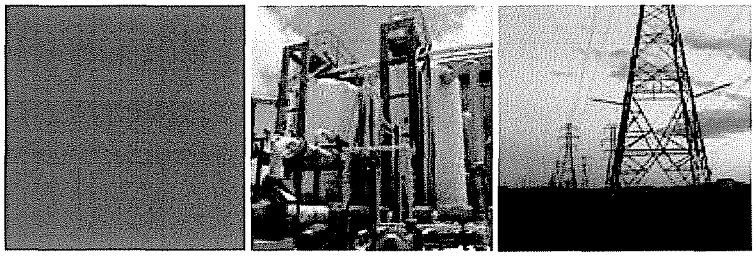
7: Report Summary



This report presents a variety of policy, planning, and program approaches that can be used to help natural gas and electric utilities, utility regulators, and partner organizations pursue the National Action Plan for Energy Efficiency recommendations and meet their commitments to energy efficiency. This chapter summarizes these recommendations and the energy efficiency key findings discussed in this report.

Overview

This National Action Plan for Energy Efficiency (Action Plan) is a call to action to bring diverse stakeholders together at the national, regional, state, or utility level, as appropriate, to foster the discussions, decision-making, and commitments necessary to take investment in energy efficiency to a new level. The overall goal is to create a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations.

Based on the policies, practices, and efforts of many organizations previously discussed in this report, the Leadership Group offers five recommendations as ways to overcome many of the barriers that have limited greater investment in programs to deliver energy efficiency to customers of electric and gas utilities (Figure 7-1). These recommendations may be pursued through a number of different options, depending on state and utility circumstances.

As part of the Action Plan, leading organizations are committing to aggressively pursue energy efficiency opportunities in their organizations and to assist others who want to increase the use of energy efficiency in their regions. The commitments pursued under the Action Plan have the potential to save Americans many billions of dollars on energy bills over the next 10 to 15 years, contribute to energy security, and improve the environment.

Recommendations and Options to Consider

The Action Plan Report provides information on the barriers that limit greater investment in programs to deliver energy efficiency to customers of electric and gas utilities. Figure 7-2 illustrates the key barriers and how they relate to policy structure, utility resource planning, and program implementation.

Figure 7-1. National Action Plan for Energy Efficiency Recommendations

- **Recognize energy efficiency as a high-priority energy resource.**
- **Make a strong, long-term commitment to implement cost-effective energy efficiency as a resource.**
- **Broadly communicate the benefits of and opportunities for energy efficiency.**
- **Promote sufficient, timely, and stable program funding to deliver energy efficiency where cost-effective.**
- **Modify policies to align utility incentives with the delivery of cost-effective energy efficiency and modify ratemaking practices to promote energy efficiency investments.**

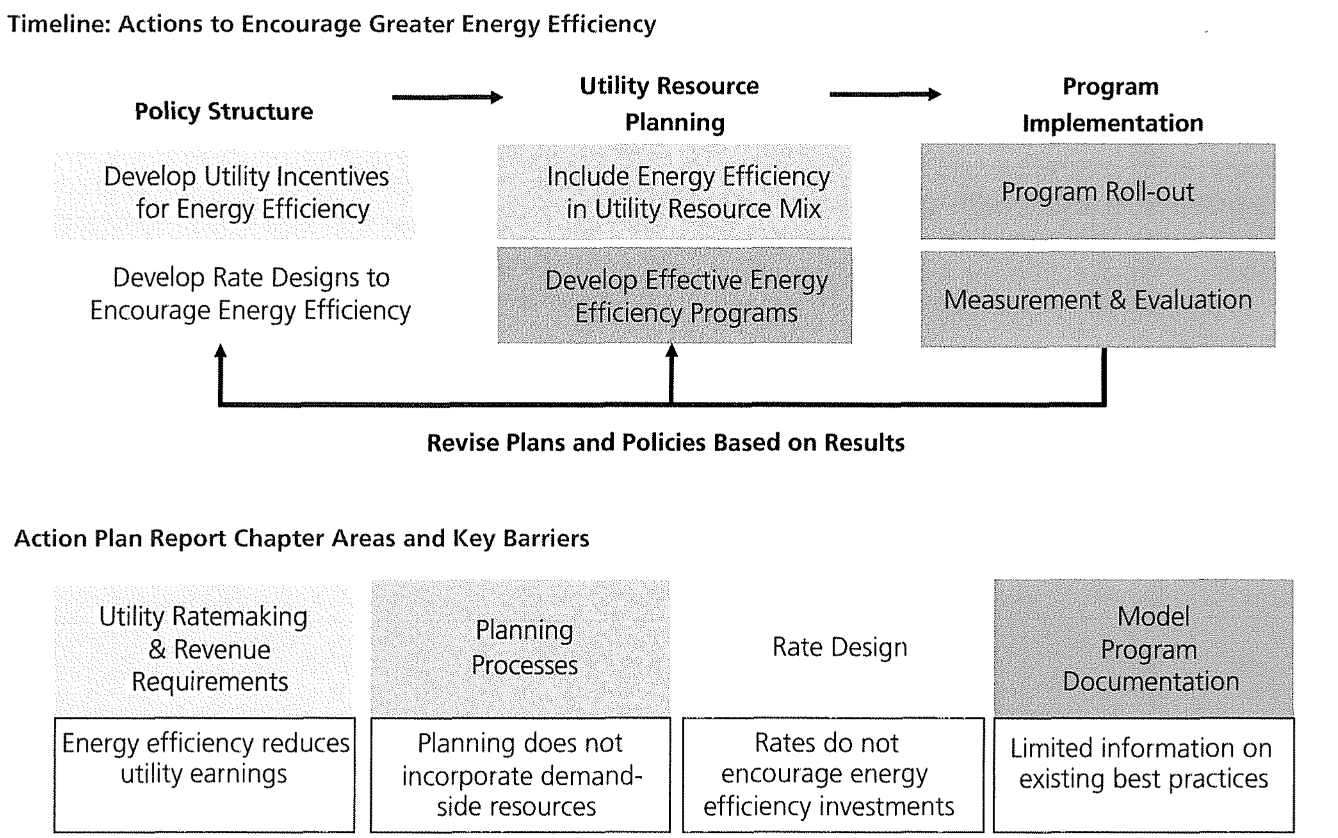
Several options exist for utilities, regulators, and partner organizations to overcome these barriers and pursue the Action Plan recommendations. Different state and utility circumstances affect which options are pursued. Table 7-1 provides a list of the Leadership Group recommendations along with sample options to consider. The table also provides a cross reference to supporting discussions in Chapters 2 through 6 of this report.

Key Findings

The key finding of the Action Plan Report is that energy efficiency can be a cost-effective resource and can provide multiple benefits to utilities, customers, and society. These benefits, also discussed in more detail in Chapter 1: Introduction and Background,[1] include:

- Lower energy bills, greater customer control, and greater customer satisfaction.
- Lower cost than only supplying new generation from new power plants.
- Advantages from being modular and quick to deploy.
- Significant energy savings.
- Environmental benefits.
- Economic development opportunities.
- Energy security.

Figure 7-2: National Action Plan for Energy Efficiency Report Addresses Actions to Encourage Greater Energy Efficiency



1 Chapter 6: Energy Efficiency Program Best Practices also provides more information on these benefits

Table 7-1. Leadership Group Recommendations and Options to Consider, by Chapter

Leadership Group Recommendations (With Options To Consider)	**Chapter 2: Utility Ratemaking & Revenue Requirements**	**Chapter 3: Energy Resource Planning Processes**	**Chapter 4: Business Case for Energy Efficiency**	**Chapter 5: Rate Design**	**Chapter 6: Energy Efficiency Program Best Practices**
Recognize energy efficiency as a high priority energy resource.		**X**			**X**
Establishing policies to establish energy efficiency as a priority resource.		X			
Integrating energy efficiency into utility, state, and regional resource planning activities.		X			
Quantifying and establishing the value of energy efficiency, considering energy savings, capacity savings, and environmental benefits, as appropriate.		X			X
Make a strong, long-term commitment to cost effective energy efficiency as a resource.	**X**	**X**			**X**
Establishing appropriate cost-effectiveness tests for a portfolio of programs to reflect the long-term benefits of energy efficiency.		X			X
Establishing the potential for long-term, cost effective energy efficiency savings by customer class through proven programs, innovative initiatives, and cutting-edge technologies.		X			X
Establishing funding requirements for delivering long-term, cost-effective energy efficiency.	X	X			X
Developing long-term energy saving goals as part of energy planning processes.		X			X
Developing robust measurement and verification (M&V) procedures.		X			X
Designating which organization(s) is responsible for administering the energy efficiency programs.	X	X			X
Providing for frequent updates to energy resource plans to accommodate new information and technology.		X			X
Broadly communicate the benefits of, and opportunities for, energy efficiency.	**X**	**X**	**X**	**X**	**X**
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.	X	X	X		
Communicating the role of energy efficiency in lowering customer energy bills and system costs and risks over time.	X	X	X	X	X
Communicating the role of building codes, appliance standards, and tax and other incentives.					X

Table 7-1. Leadership Group Recommendations and Options to Consider, by Chapter (continued)

Leadership Group Recommendations (With Options To Consider)	**Chapter 2: Utility Ratemaking & Revenue Requirements**	**Chapter 3: Energy Resource Planning Processes**	**Chapter 4: Business Case for Energy Efficiency**	**Chapter 5: Rate Design**	**Chapter 6: Energy Efficiency Program Best Practices**
Provide sufficient, timely, and stable program funding to deliver energy efficiency where cost-effective.	**X**	**X**			**X**
Deciding on and committing to a consistent way for program administrators to recover energy efficiency costs in a timely manner.	X	X			
Establishing funding mechanisms for energy efficiency from among the available options such as revenue requirement or resource procurement funding, system benefits charges, rate-basing, shared-savings, incentive mechanisms, etc.	X	X			
Establishing funding for multi-year periods.	X	X			X
Modify policies to align utility incentives with the delivery of cost-effective energy efficiency and modify ratemaking practices to promote energy efficiency investments.	**X**			**X**	
Addressing the typical utility throughput incentive and removing other regulatory and management disincentives to energy efficiency.	X				
Providing utility incentives for the successful management of energy efficiency programs.	X				
Including the impact on adoption of energy efficiency as one of the goals of retail rate design, recognizing that it must be balanced with other objectives.				X	
Eliminating rate designs that discourage energy efficiency by not increasing costs as customers consume more electricity or natural gas.				X	
Adopting rate designs that encourage energy efficiency by considering the unique characteristics of each customer class and including partnering tariffs with other mechanisms that encourage energy efficiency, such as benefit sharing programs and on-bill financing.				X	

As discussed in Chapter 2: Utility Ratemaking & Revenue Requirements, financial disincentives exist that hinder utilities from pursuing energy efficiency, even when cost-effective. Many states have experience in addressing utility financial disincentives in the following areas:

- Overcoming the throughput incentive.
- Providing reliable means for utilities to recover energy efficiency costs.
- Providing a return on investment for efficiency programs that is competitive with the return utilities earn on new generation.
- Addressing the risk of program costs being disallowed, along with other risks.
- Recognizing the full value of energy efficiency to the utility system.

Chapter 3: Energy Resource Planning Processes found that there are many approaches to navigate and overcome the barriers to incorporating energy efficiency in planning processes. Common themes across approaches include:

- Cost and savings data for energy efficiency measures are readily available.
- Energy, capacity, and non-energy benefits can justify robust energy efficiency programs.
- A clear path to funding is needed to establish a budget for energy efficiency resources.
- Parties should integrate energy efficiency early in the resource planning process.

Based on the eight cases examined using the Energy Efficiency Benefits Calculator in Chapter 4: Business Case for Energy Efficiency, energy efficiency investments were found to provide consistently lower costs over time for both utilities and customers, while providing positive net benefits to society. Key findings include:

- Ratemaking policies to address utility financial barriers to energy efficiency maintain utility health while comprehensive, cost-effective energy efficiency programs are implemented.
- The costs of energy efficiency and the reduction in utility sales volume initially raise gas or electricity bills due to slightly higher rates, but efficiency gains will reduce average customer bills by 2 to 9 percent over a 10-year period.
- Energy efficiency investments yielded net societal benefits on the order of hundreds of millions of dollars for each of the eight small- to medium-sized utility cases examined.

Chapter 5: Rate Design found that recognizing the promotion of energy efficiency is an important factor to balance along with the numerous regulatory and legislative goals addressed during the complex rate design process. Additional key findings include:

- Several rate design options exist to encourage customers to invest in efficiency and to participate in new programs that provide innovative technologies (e.g., smart meters).
- Utility rates that are designed to promote sales or maximize stable revenues tend to lower customer incentives to adopt energy efficiency.
- Some rate forms, like declining block rates or rates with large fixed charges, reduce the savings that customers can attain from adopting energy efficiency.
- Appropriate rate designs should consider the unique characteristics of each customer class.
- Energy efficiency can be promoted through non-tariff mechanisms that reach customers through their utility bill.
- More effort is needed to communicate the benefits and opportunities for energy efficiency to customers, regulators, and utility decision-makers.

Chapter 6: Energy Efficiency Program Best Practices provided a summary of best practices, as well as general program key findings. The best practice strategies for program planning, design, implementation, and evaluation are found to be independent of the policy model in which the program operates. These best practices, organized by four major groupings, are provided below:

- Making Energy Efficiency A Resource

— Require leadership at multiple levels.

— Align organizational goals.

— Understand the efficiency resource.

- Developing An Energy Efficiency Plan

— Offer programs for all key customer classes.

— Align goals with funding.

— Use cost-effectiveness tests that are consistent with long-term planning.

— Consider building codes and appliance standards when designing programs.

— Plan to incorporate new technologies.

— Consider efficiency investments to alleviate transmission and distribution constraints.

— Create a roadmap of key program components, milestones, and explicit energy use reduction goals.

- Designing and Delivering Energy Efficiency Programs

— Begin with the market in mind.

— Leverage private sector expertise, external funding, and financing.

— Start with demonstrated program models—build infrastructure for the future.

- Ensuring Energy Efficiency Investments Deliver Results

— Budget, plan, and initiate evaluation.

— Develop program and project tracking systems.

— Conduct process evaluations.

— Conduct impact evaluations.

— Communicate evaluation results to key stakeholders.

The key program findings in Chapter 6 are drawn from the programs reviewed for this report.[2] These findings include:

- Energy efficiency resources are being acquired on average at about one-half the cost of typical new power sources and about one-third of the cost of natural gas supply in many cases—contributing to an overall lower-cost energy system for rate-payers (EIA, 2006).

- Many energy efficiency programs are being delivered at a total program cost of about $0.02 to $0.03 per lifetime kilowatt-hour (kWh) saved and $1.30 to $2.00 per lifetime million British thermal units (MMBtu) saved. These costs are less than the avoided costs seen in most regions of the country. Funding for the majority of programs reviewed ranges from about 1 to 3 percent of electric utility revenue and 0.5 to 1 percent of gas utility revenue.

- Even low energy cost states, such as those in the Pacific Northwest, have reason to invest in energy efficiency because energy efficiency provides a low-cost, reliable resource that reduces customer utility bills. Energy efficiency also costs less than constructing new generation and provides a hedge against market, fuel, and environmental risks (NWPCC, 2005).

- Well-designed energy efficiency programs provide opportunities for customers of all types to adopt energy saving measures and reduce their energy bills. These programs can help customers make sound energy-use decisions, increase control over their energy bills, and empower them to manage their energy usage. Customers can experience significant savings depending on their own habits and the program offered.

- Consistently funded, well-designed efficiency programs are cutting electricity and natural gas load—providing annual savings for a given program year of 0.15 to 1 percent of energy sales. These savings typically will

[2] See Chapter 6: Energy Efficiency Program Best Practices, Tables 6-2 and 6-3, for more information on energy efficiency programs reviewed.

accrue at this level for 10 to 15 years. These programs are helping to offset 20 to 50 percent of expected energy growth in some regions without compromising end-user activity or economic well being.

- Research and development enables a continuing source of new technologies and methods for improving energy efficiency and helping customers control their energy bills.

- Many state and regional studies have found that pursuing economically attractive, but as yet untapped, energy efficiency could yield more than 20 percent savings in total electricity demand nationwide by 2025. These savings could help cut load growth by half or more compared to current forecasts. Savings in direct use of natural gas could similarly provide a 50 percent or greater reduction in natural gas demand growth. Energy savings potential varies by customer segment, but there are cost-effective opportunities for all customer classes.

- Energy efficiency programs are being operated successfully across many different contexts: regulated and unregulated markets; utility, state, or third-party administration; investor-, publicly-, and cooperatively-owned utilities; and gas and electric utilities.

- Energy efficiency resources are being acquired through a variety of mechanisms including system benefits charges (SBC), energy efficiency portfolio standards (EEPS), and resource planning (or cost-of-service) efforts.

- Cost-effective energy efficiency programs exist for electricity and natural gas, including programs that can be specifically targeted to reduce peak load.

- Effective models exist for delivering gas and electric energy efficiency programs to all customer classes. Models might vary for some programs based on whether a utility is in the initial stages of energy efficiency programming or has been implementing programs for years.

- Energy efficiency programs, projects, and policies benefit from established and stable regulations, clear goals, and comprehensive evaluation.

- Energy efficiency programs benefit from committed program administrators and oversight authorities, as well as strong stakeholder support.

- Most large-scale energy efficiency programs have improved productivity, enabling job growth in the commercial and industrial sectors.

- Large-scale energy efficiency programs can reduce wholesale market prices.

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Appendix A: Additional Guidance on Removing the Throughput Incentive

The National Action Plan for Energy Efficiency provides policy recommendations and options to support a strong commitment to cost-effective energy efficiency in the United States. One policy that receives a great deal of attention is reducing or eliminating the financial incentive for a utility to sell more energy—the throughput incentive. Options exist to address the throughput incentive, as discussed in more detail in this appendix.

Overview

In order to eliminate the conflict between the public service objectives of least-cost service on the one hand, and a utility's profitability objectives on the other hand, it is necessary to remove the throughput incentive. Some options for removing the throughput incentive are generally called decoupling because these options "decouple" profits from sales volume. In its simplest form, decoupling is accomplished by periodically adjusting tariff prices so that the utility's revenues (and hence its profits) are, on a total company basis, held relatively constant in the face of changes in customer consumption.

This appendix explains options to address the throughput incentive by changing regulations and the way utilities make money, to ensure that utility net income and coverage of fixed costs are not affected solely by sales volume.

Types of Decoupling

Utilities and regulators have implemented a variety of different approaches to remove the throughput incentive. Regardless of which approach is used, a frame of reference is created, and used to compare with actual results. Periodic tariff price adjustments true up actual results to the expected results and are critical to the decoupling approach.

- *Average revenue-per-customer.* This approach is often considered for utilities, where their underlying costs during the period between rate adjustments do not vary with consumption. Such can be the case for a wires-only distribution company, where the majority of investments are in the wires and transformers used to deliver the commodity.

- *Forecast revenues over a period of time and use a balancing account.* This approach is often considered for utilities where a significant portion of the costs (primarily fuel) vary with consumption. For these cases, it might be best to use a price-based decoupling mechanism for the commodity portion of electric service (which gives the utility the incentive to reduce fuel and other variable costs), while using a revenue-per-customer approach for the "wires" costs. Alternatively, regulators can use traditional tariffs for the commodity portion and apply decoupling only to the wires portion of the business.

Sample Approach to Removing the Throughput Incentive[1]

Implementing decoupling normally begins with a traditional revenue requirement rate case. Decoupling can also be overlaid on existing tariffs where there is a high confidence that those tariffs continue to represent the utility's underlying revenue requirements.

Under traditional rate of return regulation:

Price (Rates) = Revenue Requirement/Sales
(test year or forecasted)

[1] In this section, the revenue per customer approach is discussed, but can be easily adapted to a revenue forecast approach.

The revenue requirement as found in the rate case will not change again until the next rate case. Note that the revenue requirement contains an allowance for profit and debt coverage. Despite all the effort in the rate case to calculate the revenue requirement, what really matters after the rate case is the price the consumer pays for electricity.

After the rate case:

$$\text{Actual revenues} = \text{Price} * \text{Actual Sales}$$

And

$$\text{Actual Profit} = \text{Actual Revenue} - \text{Actual Costs}$$

Based on the rate case "test year" data, an average revenue-per-customer value can then be calculated for each rate class.

$$\text{Revenue Requirement } t_0 \text{ /number of customers } t_0 = \text{revenue per customer (RPC)}$$

Thus, at time "zero"(t_0), the company's revenues equal its number of customers multiplied by the revenues per customer, while the prices paid by customers equal the revenues to be collected divided by customers' consumption units (usually expressed as $/kW for metered demand and $/kWh for metered energy). Looking forward, as the number of customers changes, the revenue to be collected changes.

$$\text{Revenue Requirement } t_n = \text{RPC} * \text{number of customers } t_n$$

For each future period (t_1, t_2..., t_n), the new revenue to be collected is then divided by the expected consumption to periodically derive a new price, the true-up.

$$\text{Price (Rates) } t_n = \text{Revenue Requirement } t_n \text{ / Sales } t_n$$

$$\text{True up} = \text{Price } t_n - \text{Price } t_0$$

Prices can also be trued-up based on deviations between revenue and cost forecasts and actual results, where a forecast approach is used. Note that no redesign of rates is necessary as part of decoupling. Rate redesign might be desirable for other reasons (for more information on changes that promote energy efficiency, see Chapter 5: Rate Design), and decoupling does not interfere with those reasons.

The process can be augmented by various features that, for example, explicitly factor in utility productivity, exogenous events (events of financial significance, out of control of the utility), or factors that might change RPC over time.

Timing of Adjustments

Rates can be adjusted monthly, quarterly, or annually (magnitude of any t_n). By making the adjustments more often, the magnitude of any price change is minimized. However, frequent adjustments will impose some additional administrative expense. A plan that distinguishes commodity cost from other costs could have more frequent adjustments for more volatile commodities (if these are not already being dealt with by an adjustment clause). Because the inputs used for these adjustments are relatively straight-forward, coming directly from the utility's billing information, each filing should be largely administrative and not subject to a significant controversy or litigation. This process can be further streamlined through the use of "deadbands," which allow for small changes in either direction in revenue or profits with no adjustment in rates.

Changes to Utility Incentives

With decoupling in place, a prudently managed utility will receive revenue from customers that will cover its fixed costs, including profits. If routine costs go up, the utility will absorb those costs. A reduction in costs produces the opportunity for additional earnings. The primary driver for profitability growth, however, will be the addition of new customers, and the greatest contribution to profits will be from customers who are more efficient—that is, whose incremental costs are the lowest.

An effective decoupling plan should lower utility risk to some degree. Reduced risk should be reflected in the cost of capital and, for investor-owned utilities, can be realized through either an increase in the debt/equity ratio, or a decrease in the return on equity investment. For all utilities, these changes will flow through to debt ratings and credit requirements.

In addition, decoupling can be combined with performance indicators to ensure that service quality is maintained, and that cost reductions are the result of gains in efficiency and not a decline in the level of service. Other exogenous factors, such as inflation, taxes, and economic conditions, can also be combined with decoupling; however, these factors do not address the primary purpose of removing the disincentive to efficiency. Also, if there is a distinct productivity for the electric utility as compared with the general economy, a factor accounting for it can be woven into the revenue per customer calculations over time.

Allocation of Weather Risk

One specific factor that is implicit in any regulatory approach (whether it be traditional regulation or decoupling) is the allocation of weather risk between utilities and their customers. Depending on the policy position of the regulatory agency, the risk of weather changes can be allocated to either customers or the utility. This decision is inherent to the rate structure, even if the regulatory body makes no cognizant choice.

Under traditional regulation, weather risk is usually largely borne by the utility, which means that the utility can suffer shortfalls if the weather is milder than normal. At the same time, it can enjoy windfalls if the weather is more extreme than normal. These scenarios result because, while revenues will change with weather, the underlying cost structure typically does not. These situations translate directly into greater earnings variability, which implies a higher required cost of capital. In order to allocate the weather risk to the utility, the "test year" information used to compute the base revenue-per-customer values should be weather normalized. Thereafter, with each adjustment to prices, the consumption data would weather normalize as well.

Potential Triggers and Special Considerations in Decoupling Mechanisms

Because decoupling is a different way of doing business for regulators and utilities, it is prudent to consider off-ramps or triggers that can avoid unpleasant surprises. The following are some of the approaches that might be appropriate to consider:

- *Banding of rate adjustments.* To minimize the magnitude of adjustments, the decoupling mechanism could be premised on a "dead band" within which no adjustment would be made. The effect would be to reduce the number of tariff changes and possibly, but not necessarily, the associated periodic filings.

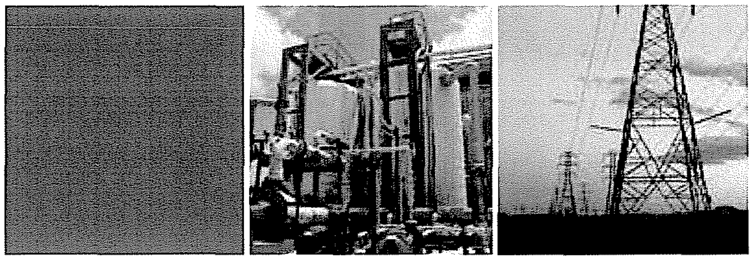
  The plan can also cap the amount of any single rate adjustment. To the extent it is based on reasonable costs otherwise recoverable under the plan, the excess could be set aside in a regulatory account for later recovery.

- *Banding of earnings.* To control the profit level of the regulated entity within some bounds, earnings greater and/or less than certain limits can be shared with customers. For example, consider a scenario in which the earnings band is 1 percent on return on equity (either way) compared to the allowed return found in the most recent rate case. If the plan would share results outside the band 50-50, then if the utility earns +1.5 percent of the target, an amount equal to 0.25 percent of earnings (half the excess) is returned to consumers through a price adjustment. If the utility earns -1.3 percent of the target, however, an amount equal 0.15 percent of earnings (half the deficiency) is added to the price. Designing this band should leave the utility with ample incentive to make and benefit from process engineering improvements during the plan, recognizing that a subsequent rate case might result in the benefits accruing in the long run to consumers. While the illustration is "symmetrical," in practice, the band can be asymmetrical in size and sharing proportion to assure the proper balance between consumer and utility interests.

- *Course corrections for customer count changes, major changes for unique major customers, and large changes in revenues-per-customer.* Industrial consumers might experience more volatility in average use per customer calculations because there are typically a small number of these customers and they can be quite varied. For example, the addition or deletion of one large customer (or of a work shift for a large customer) might make a significant difference in the revenue per customer values for that class, or result in appropriate shifting of revenues among customers. To address this problem, some trigger or off-ramp might be appropriate to review such unexpected and significant changes, and to modify the decoupling calculation to account for them. In some cases, a new rate case might be warranted from such a change.

- *Accounting for utilities whose marginal revenues per customer are significantly different than their embedded average revenue per customer.* If a utility's revenue per customer has been changing rapidly over time, imposition of a revenue-per-customer decoupling mechanism will have the effect of changing its profit growth path. For example, if incremental revenues per customer are growing rapidly, decoupling will have the effect of lowering future earnings, although not necessarily below the company's allowed rate of return. On the other hand, if incremental revenues per customer are declining, decoupling will have the effect of increasing future earnings. Where these trends are strong and there is a desire to make decoupling "earnings neutral," vis-à-vis the status quo earning path, the revenue-per-customer value can be tied to an upward or downward growth rate. This type of adjustment is more oriented toward maintaining neutrality than reflecting any underlying economic principle. Care should be taken to exclude recent growth in revenues per customer that are driven by inefficient consumption (usually tied to the utility having a pro-consumption marketing program).

Appendix B: Business Case Details



To help natural gas and electric utilities, utility regulators, and partner organizations communicate the business case for energy efficiency, the National Action Plan for Energy Efficiency provides an Energy Efficiency Benefits Calculator (Calculator available at *www.epa.gov/cleanenergy/eeactionplan.htm*). This Calculator examines the financial impact of energy efficiency on major stakeholders, and was used to develop the eight cases discussed in Chapter 4: Business Case for Energy Efficiency. Additional details on these eight cases are described in this appendix.

Overview

A business case is an analysis that shows the benefits of energy efficiency to the utility, customers, and society within an approach that can lead to actions by utilities, regulators, and other stakeholders. Making the business case for energy efficiency programs requires a different type of analysis than that required for traditional supply-side resources. Because adoption of energy efficiency reduces utility sales and utility size, traditional metrics such as impact on rates and total earnings do not measure the benefits of energy efficiency. However, by examining other metrics, such as customer bills and utility earnings per share, the benefits to all stakeholders of adopting energy efficiency can be demonstrated. These benefits include reduced customer bills, decreased cost per unit of energy provided, increased net resource savings, decreased emissions, and decreased reliance on energy supplies.

This appendix provides more detailed summary and interpretation of results for the eight cases discussed in Chapter 4: Business Case for Energy Efficiency. All results are from the Energy Efficiency Benefits Calculator's interpretation tab.

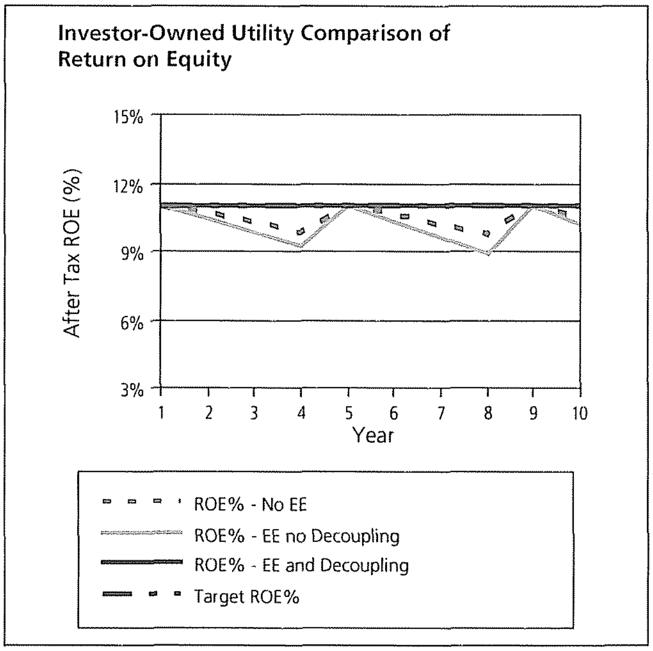
Case 1: Low-Growth Electric and Gas Utility

Utility Perspective

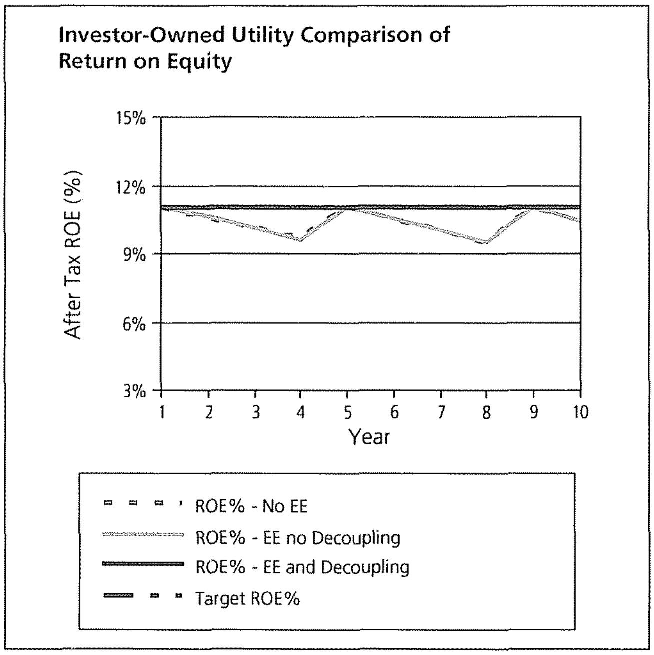
Utility Financial Health – Small Changes

The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility, the measure of financial health changes. Investor-owned utility health is measured by return on equity (ROE), while publicly or cooperatively owned utility health is measured by cash position or debt coverage ratio.

Electric

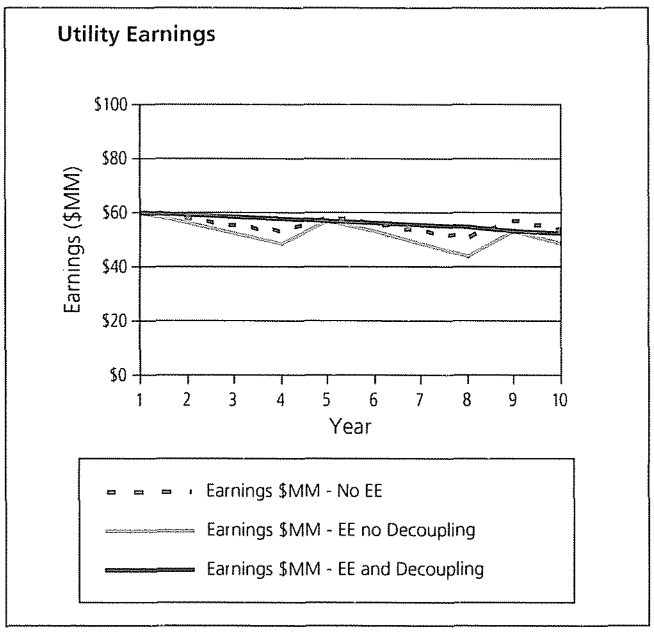


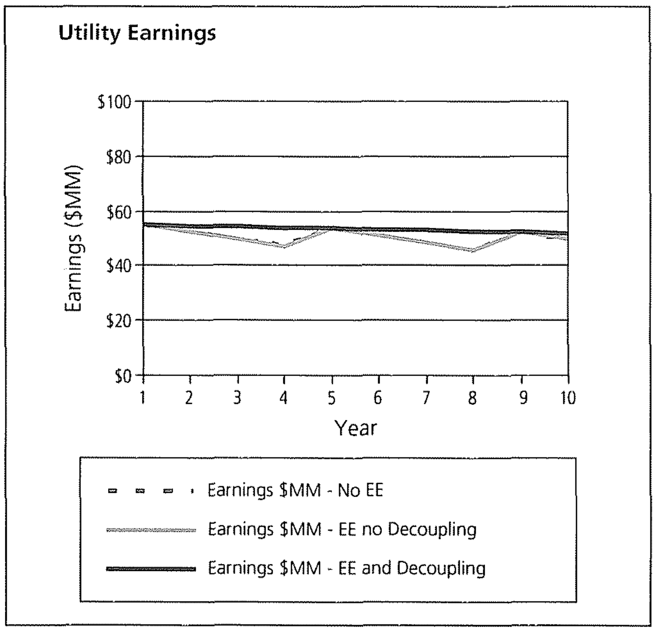
Gas



Utility Earnings – Results Vary

Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If energy efficient (EE) reduces capital investment, the earnings will be lower in the EE case, unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be affected.



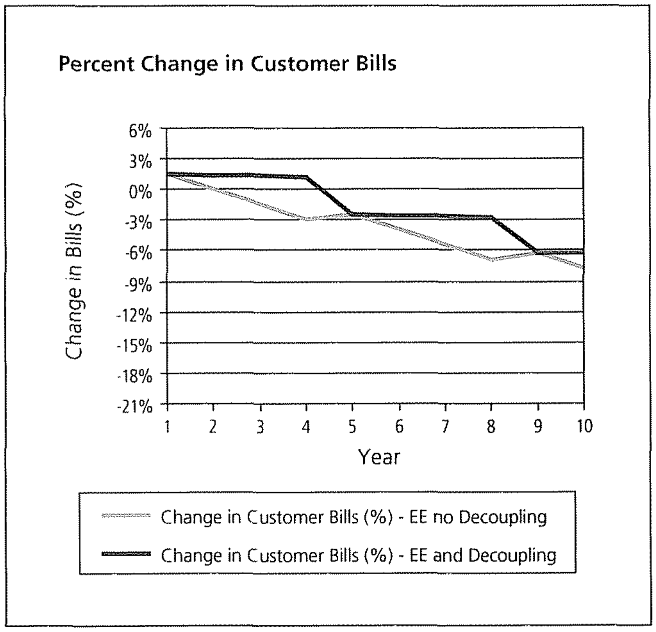


Customer Perspective

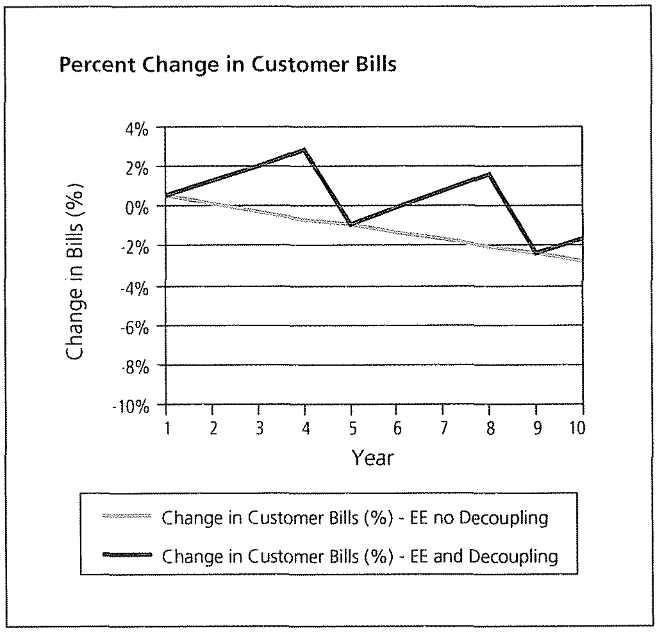
Customer Bills – Decrease

In the first year, customer utility bills increase because the cost of the EE program has not yet produced savings. Total customer bills decline over time, usually within the first three years, indicating customer savings resulting from lower energy consumption.

Electric

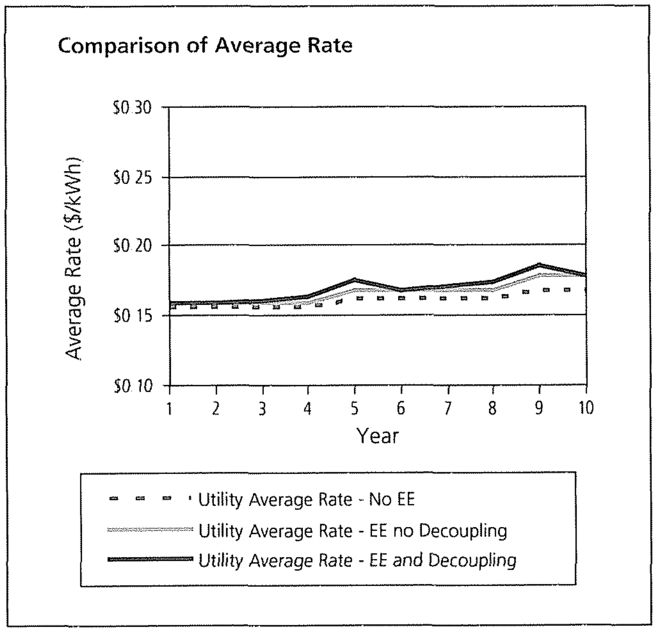


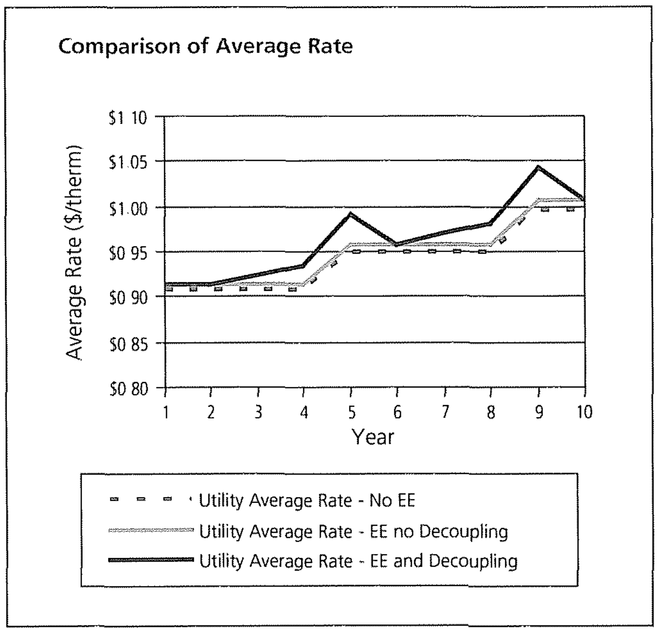
Gas



Utility Rates – Mild Increase

The rates customers pay ($/kWh, $/therm) increase when avoided costs are less than retail rates, which is typically the case for most EE programs. Rates increase because revenue requirements increase more quickly than sales.



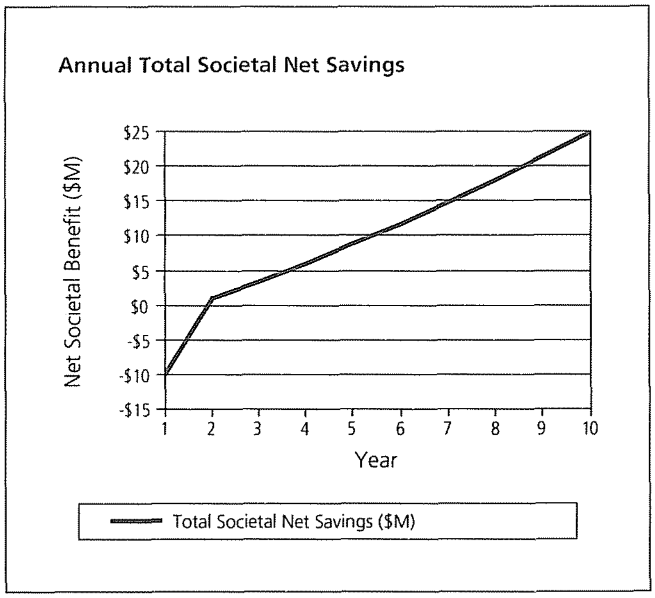


Societal Perspective

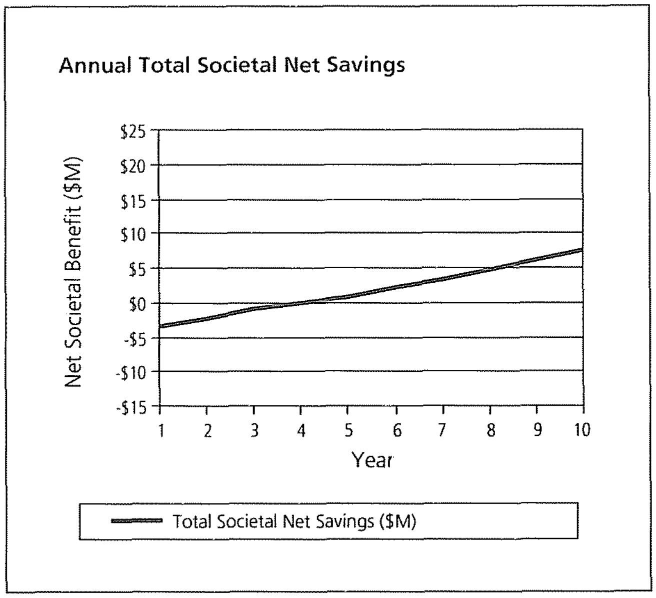
Societal Net Savings – Increase

The net savings are the difference of total utility costs, including EE program costs, with EE and without EE. In the first year, the cost of the EE program is a cost to society. Over time, cumulative EE savings lead to a utility production cost savings that is greater than the EE program cost. The graph shape is therefore upward sloping. Total Societal Net Savings is the same with and without decoupling; therefore, only one line is shown.

Electric

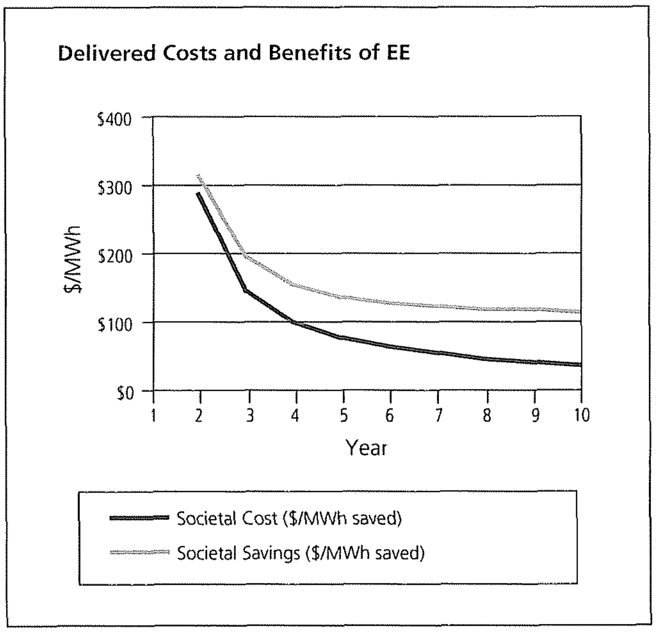


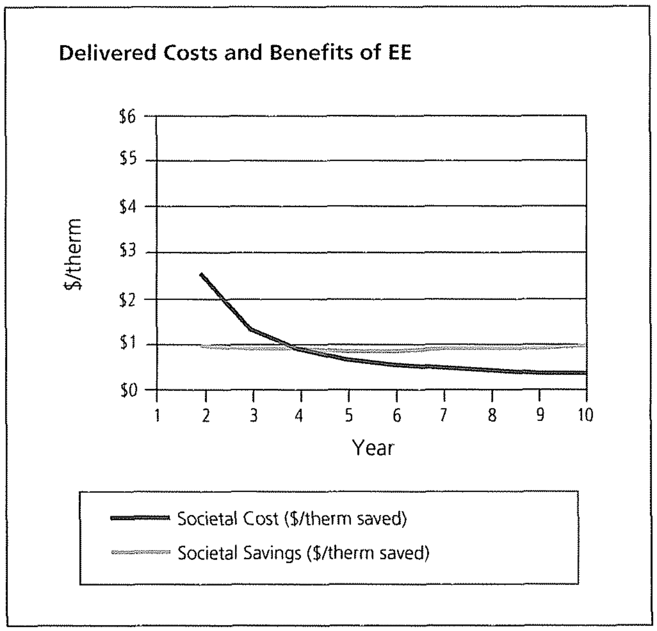
Gas



Total Societal Cost Per Unit – Declines

Total cost of providing each unit of energy (MWh, therm) declines over time because of the impacts of energy savings, decreased peak load requirements, and decreased costs during peak periods. Well-designed EE programs can deliver energy at an average cost less than that of new power sources. When the two lines cross, the annual cost of EE equals the annual savings resulting from EE. The Societal Cost and Societal Savings are the same with and without decoupling.

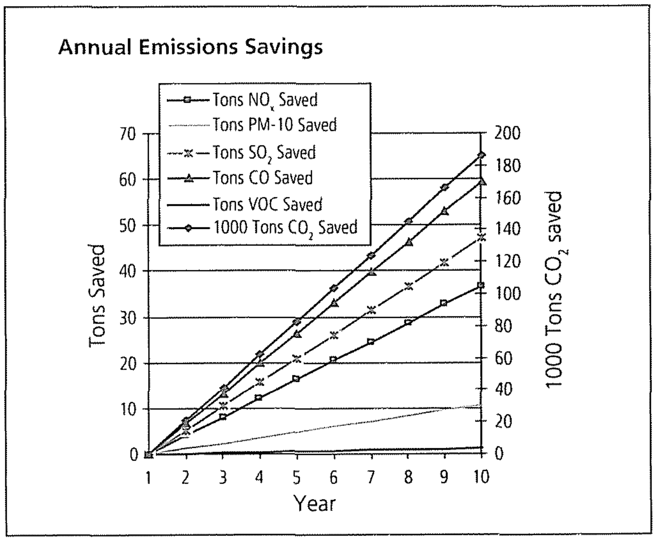




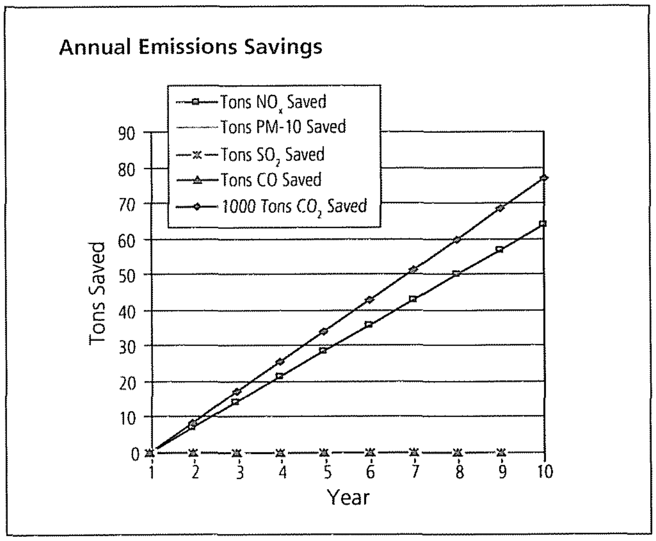
Emissions and Cost Savings – Increase

Annual tons of emissions saved increases. Emissions cost savings increases when emissions cost is monetized. Emissions costs and savings are the same with and without decoupling.

Electric

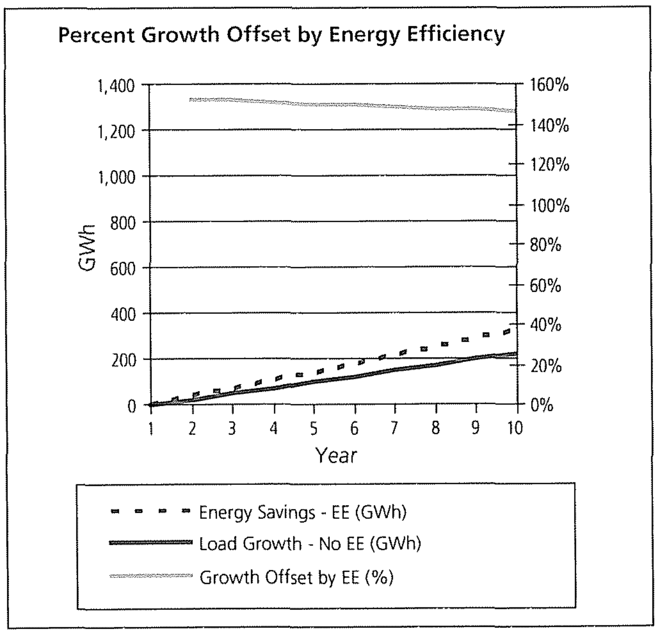


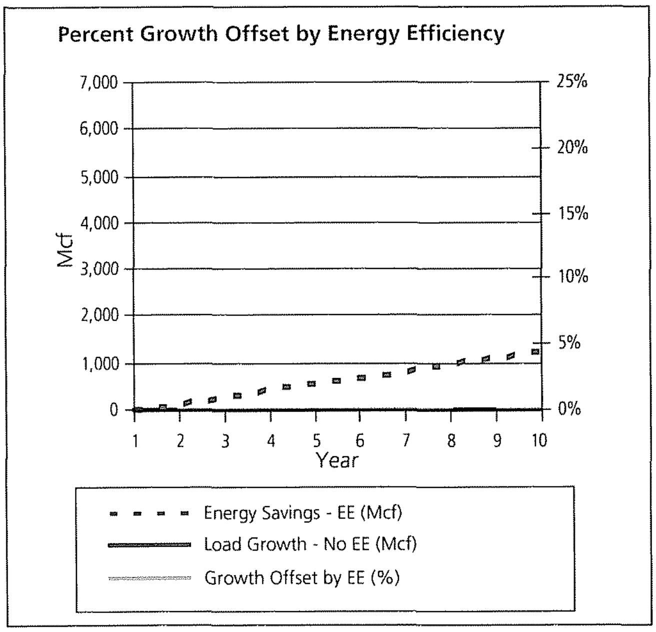
Gas



Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without EE, and illustrates the amount of EE relative to load growth. Load growth and energy savings are not impacted by decoupling. With load growth assumed at zero, no load or percent growth offset shown.

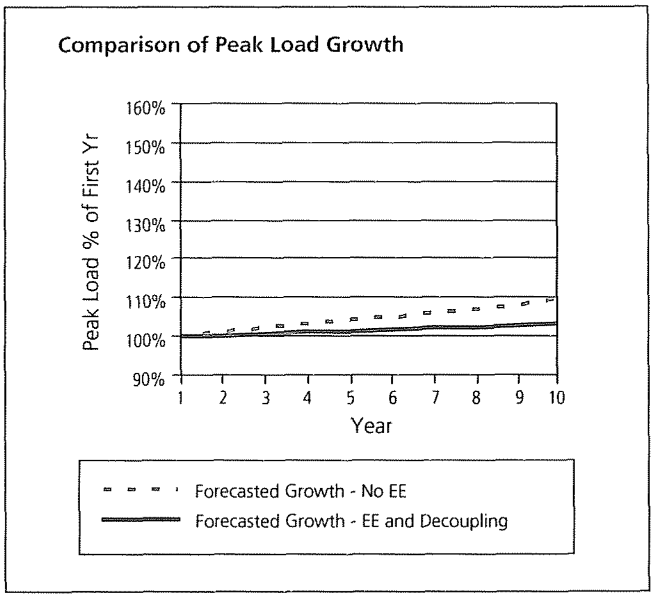




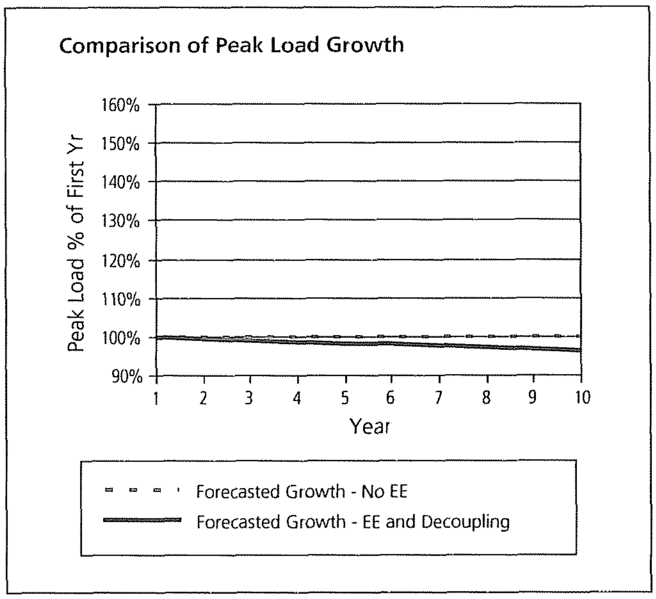
Peak Load Growth – Decrease

Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling.

Electric



Gas



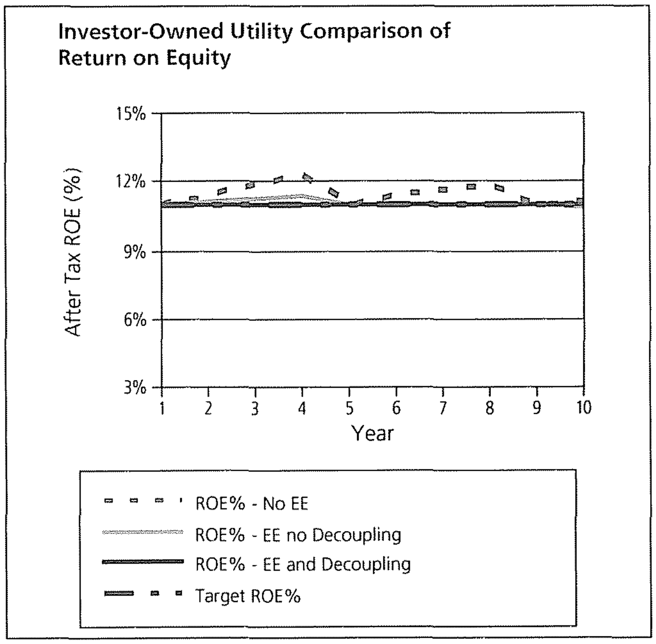
Case 2: High-Growth Electric and Gas Utility

Utility Perspective

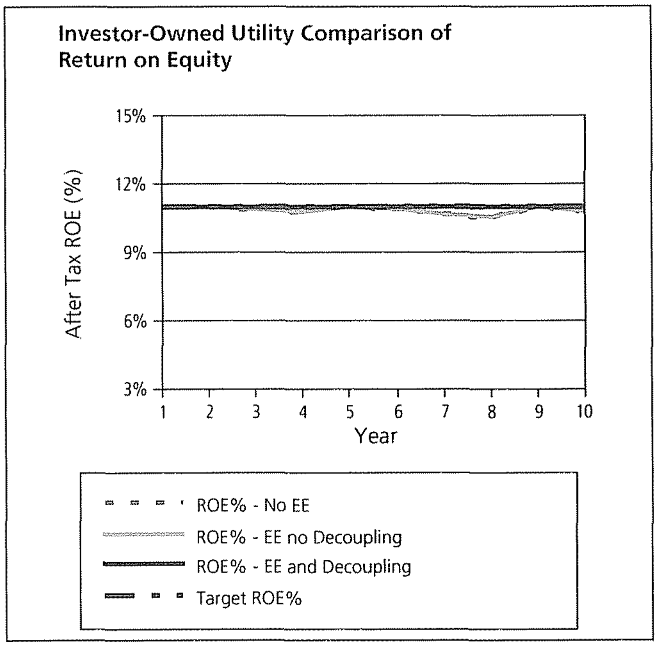
Utility Financial Health – Small Changes

The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility, the measure of financial health changes. Investor-owned utility health is measured by ROE, while publicly or cooperatively owned utility health is measured by cash position or debt coverage ratio.

Electric

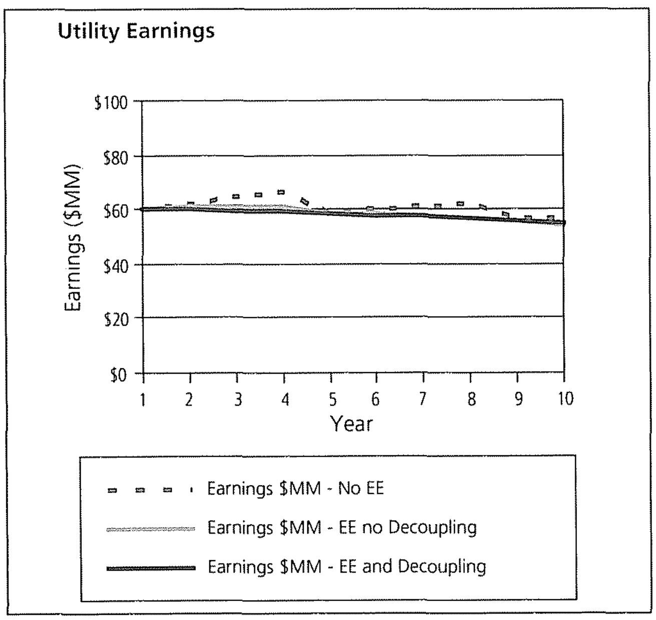


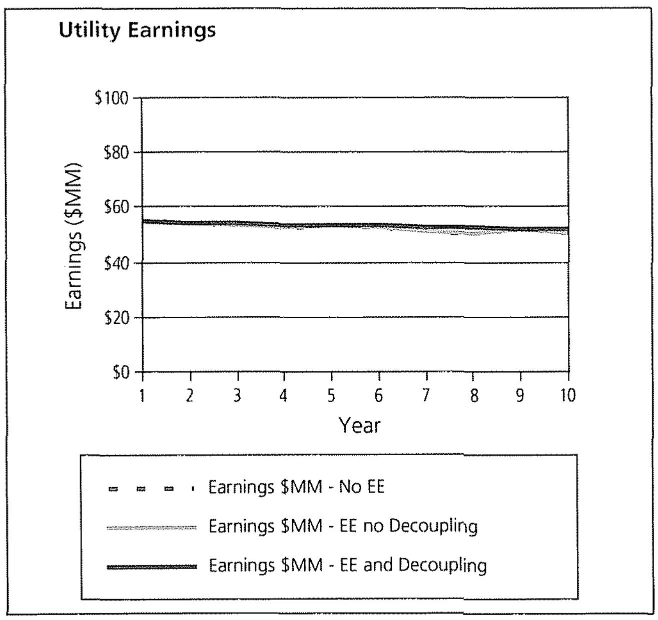
Gas



Utility Earnings – Results Vary

Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If EE reduces capital investment, the earnings will be lower in the EE case, unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be affected.



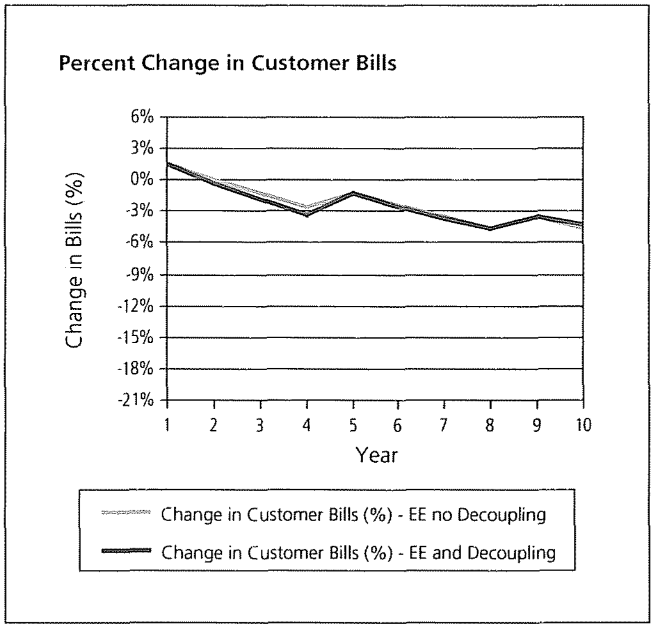


Customer Perspective

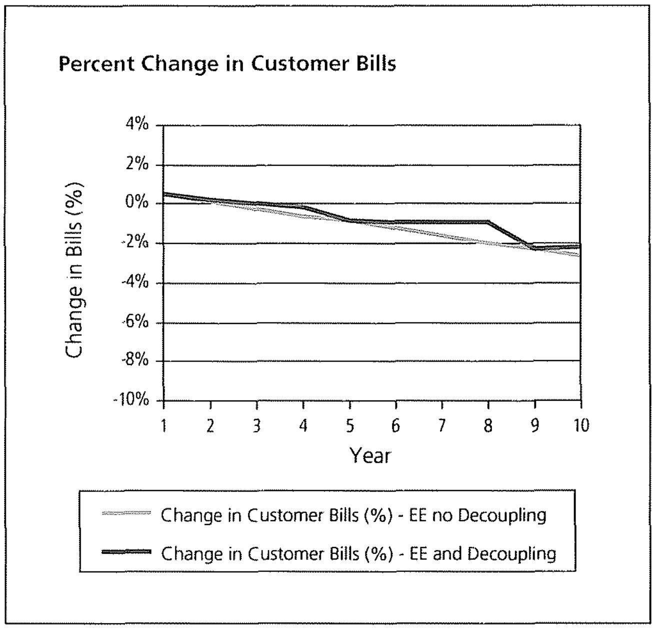
Customer Bills – Decrease

In the first year, customer utility bills increase because the cost of the EE program has not yet produced savings. Total customer bills decline over time, usually within the first three years, indicating customer savings resulting from lower energy consumption.

Electric

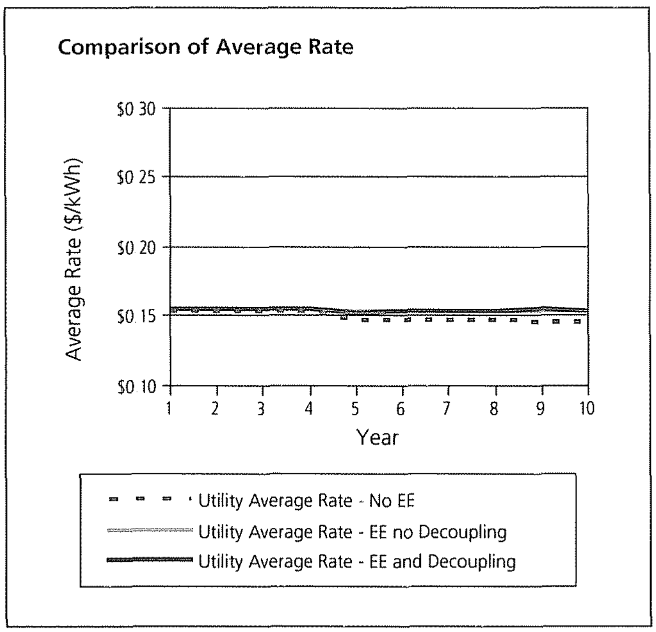


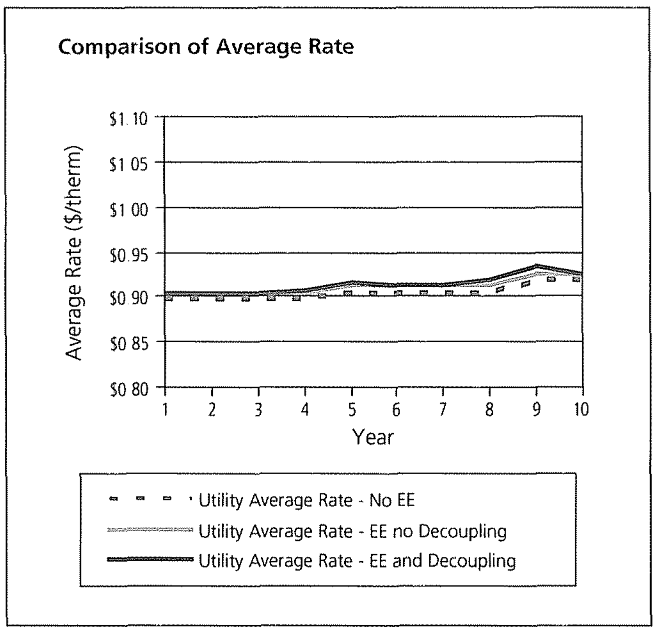
Gas



Utility Rates – Mild Increase

The rates customers pay ($/kWh, $/therm) increase when avoided costs are less than retail rates, which is typically the case for most EE programs. Rates increase because revenue requirements increase more quickly than sales.



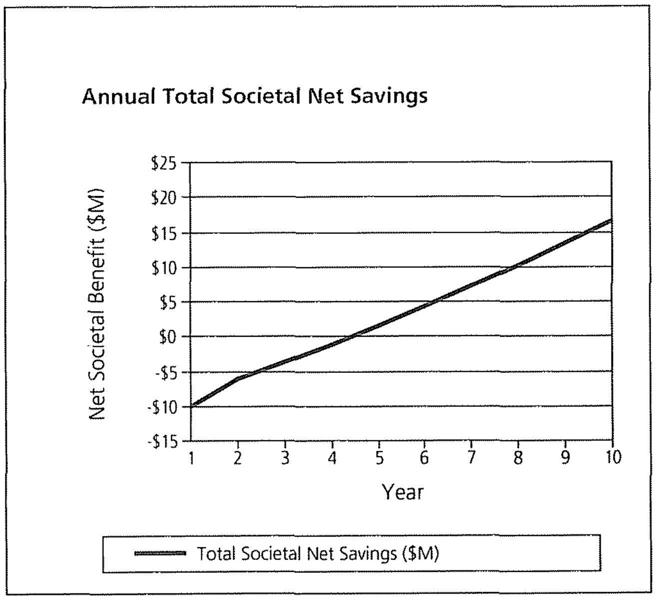


Societal Perspective

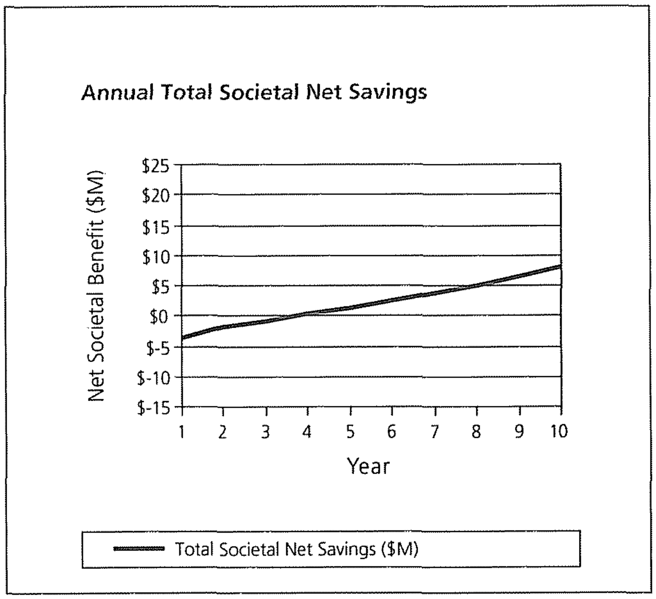
Societal Net Savings – Increase

The net savings are the difference of total utility costs, including EE program costs, with EE and without EE. In the first year, the cost of the EE program is a cost to society. Over time, cumulative EE savings lead to a utility production cost savings that is greater than the EE program cost. The graph shape is therefore upward sloping. Total Societal Net Savings is the same with and without decoupling; therefore, only one line is shown.

Electric

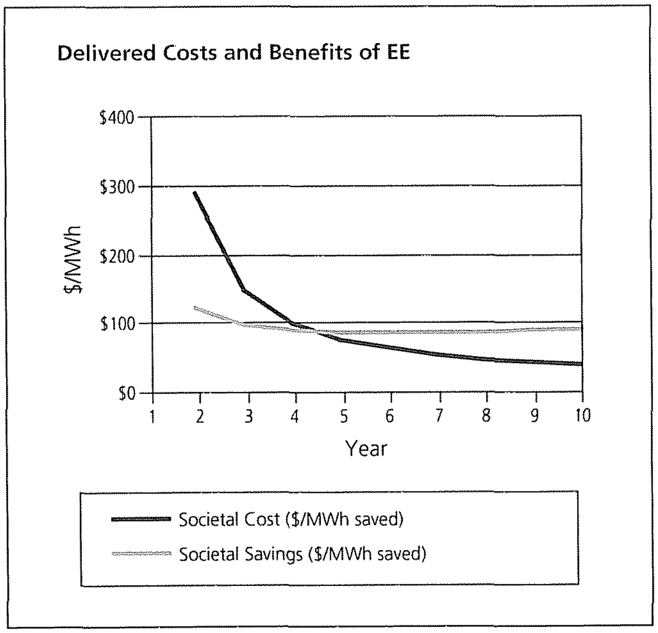


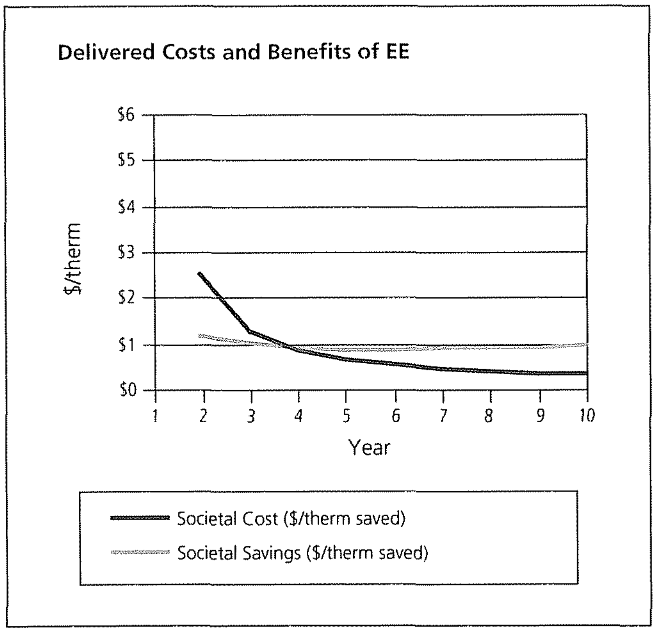
Gas



Total Societal Cost Per Unit – Declines

Total cost of providing each unit of energy (MWh, therm) declines over time because of the impacts of energy savings, decreased peak load requirements, and decreased costs during peak periods. Well-designed EE programs can deliver energy at an average cost less than that of new power sources. When the two lines cross, the annual cost of EE equals the annual savings resulting from EE. The Societal Cost and Societal Savings are the same with and without decoupling.

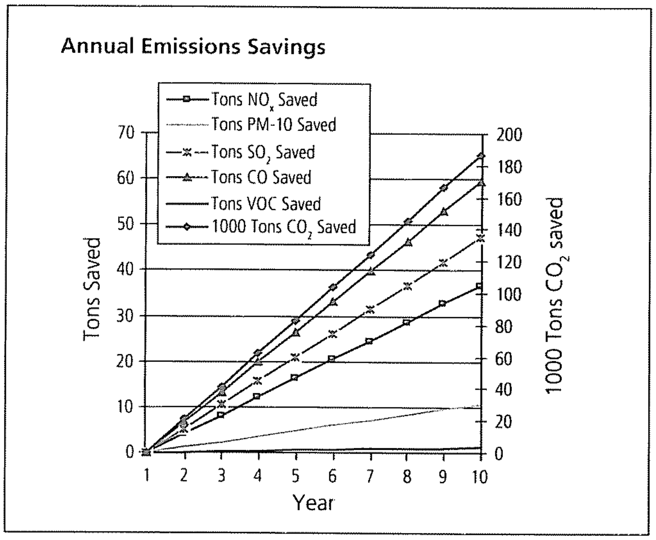




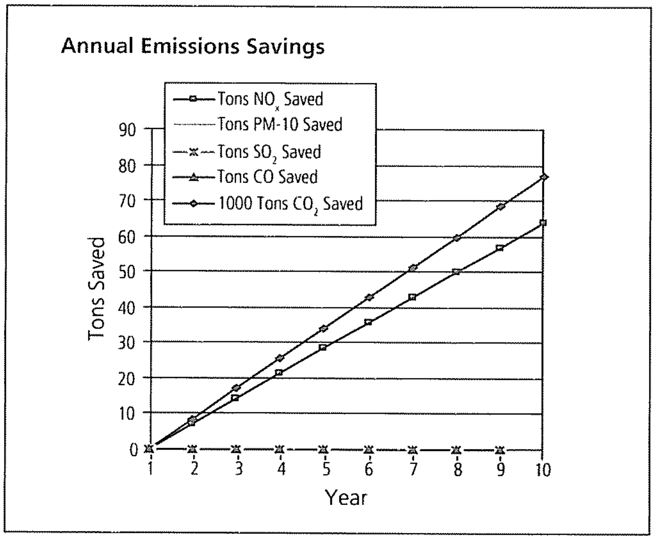
Emissions and Cost Savings – Increase

Annual tons of emissions saved increases. Emissions cost savings increases when emissions cost is monetized. Emissions costs and savings are the same with and without decoupling.

Electric

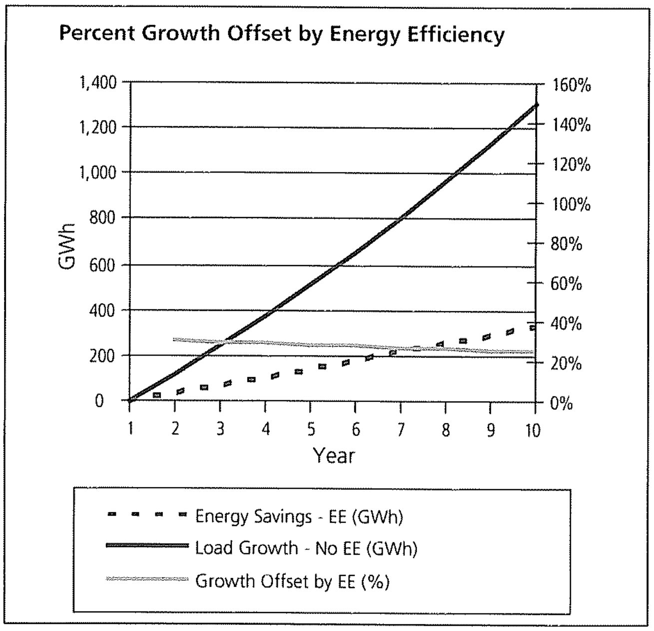


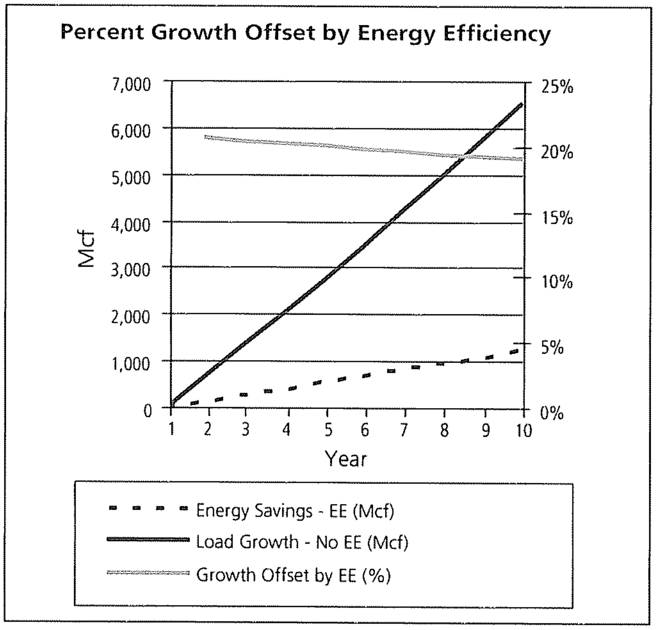
Gas



Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without EE, and illustrates the amount of EE relative to load growth. Load growth and energy savings are not impacted by decoupling. With load growth assumed at zero, no load or percent growth offset shown.

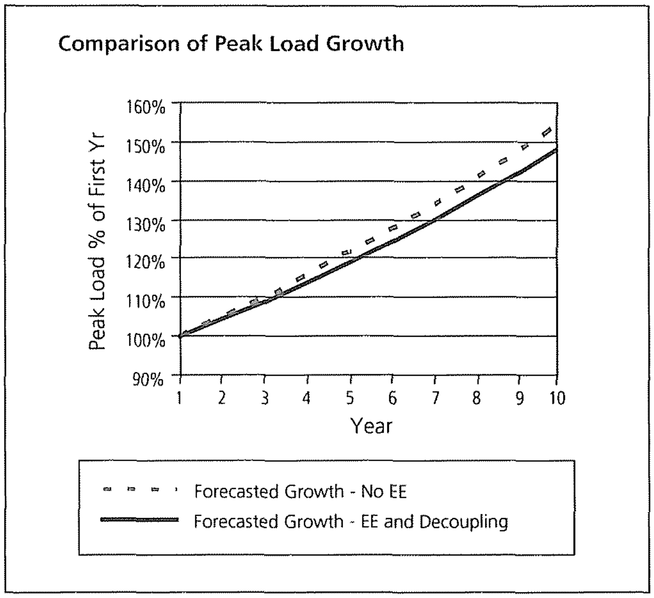




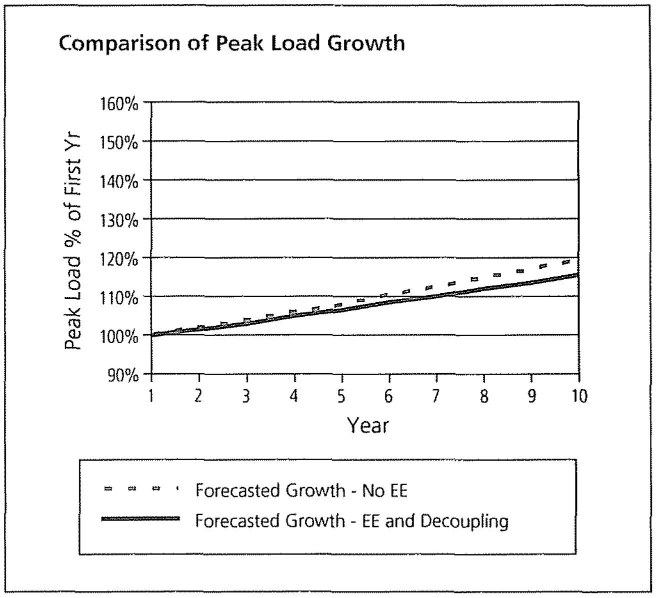
Peak Load Growth – Decrease

Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling.

Electric



Gas



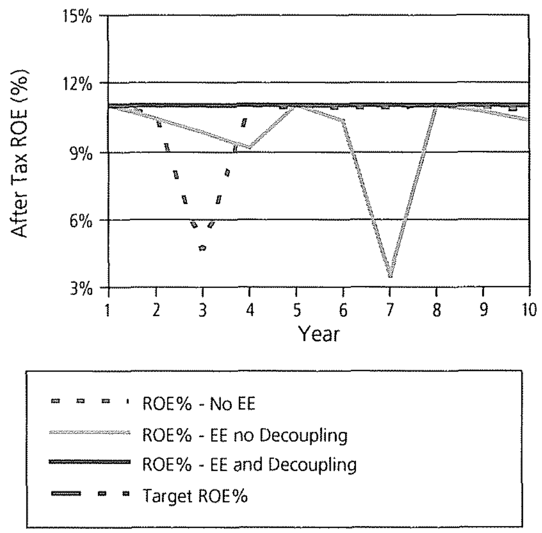
Case 3: Low-Growth with Power Plant Deferral

Utility Perspective

Utility Financial Health – Small Changes

The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility, the measure of financial health changes. Investor-owned utility health is measured by ROE, while publicly or cooperatively owned utility health is measured by cash position or debt coverage ratio.

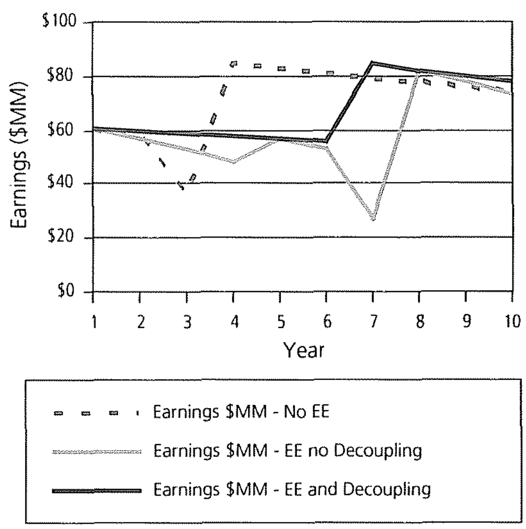
Investor-Owned Utility Comparison of Return on Equity



Utility Earnings – Results Vary

Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If EE reduces capital investment, the earnings will be lower in the EE case, unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be affected.

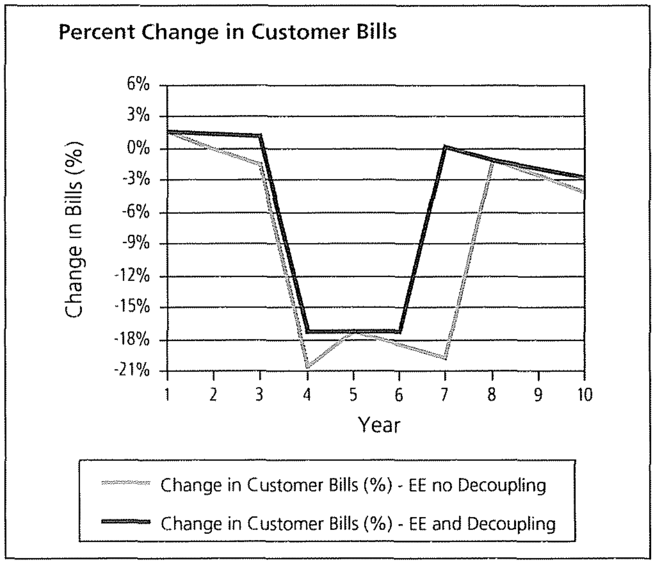
Utility Earnings



Customer Perspective

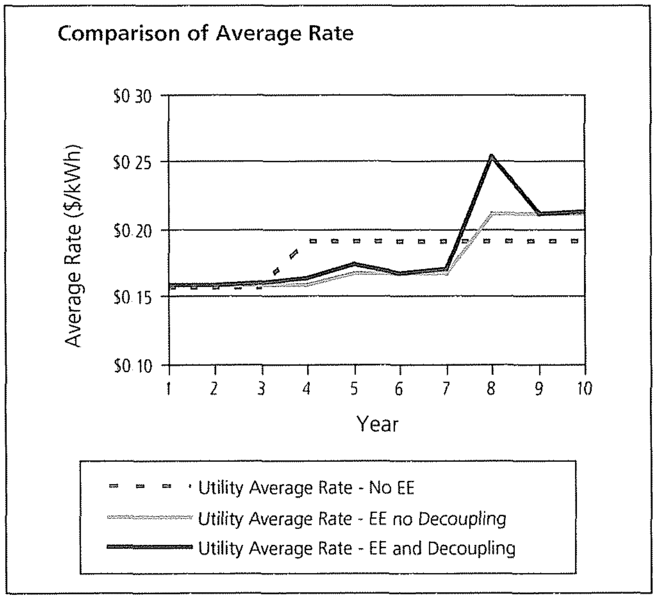
Customer Bills – Decrease

In the first year, customer utility bills increase because the cost of the EE program has not yet produced savings. Total customer bills decline over time, usually within the first three years, indicating customer savings resulting from lower energy consumption.



Utility Rates – Mild Increase

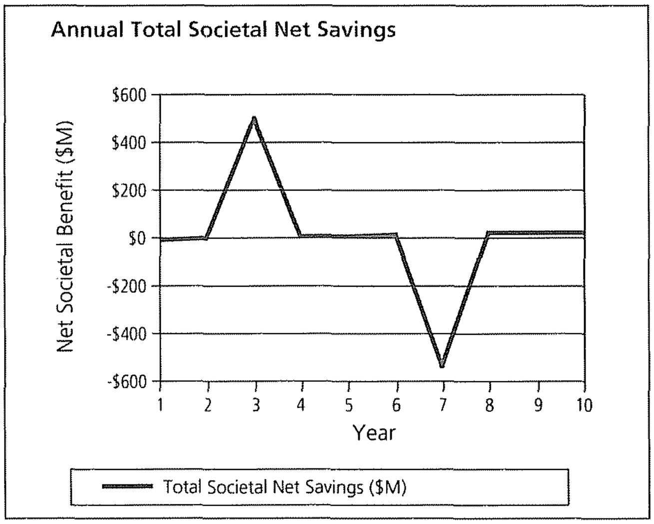
The rates customers pay ($/kWh) increase when avoided costs are less than retail rates, which is typically the case for most EE programs. Rates increase because revenue requirements increase more quickly than sales.



Societal Perspective

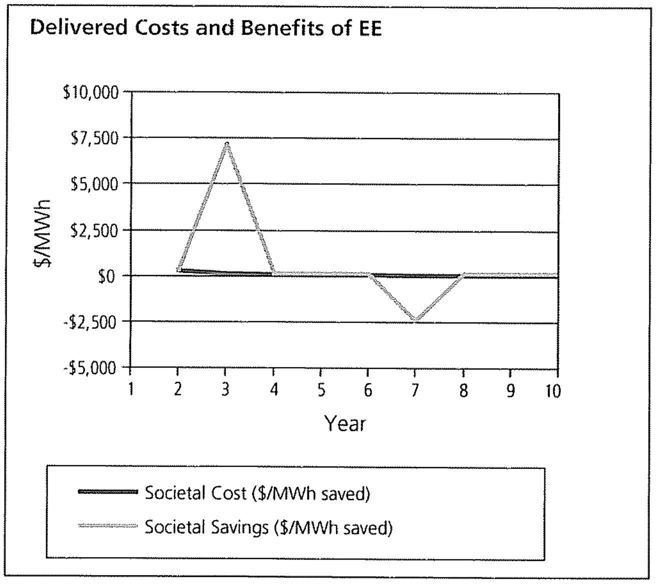
Societal Net Savings – Increase

The net savings are the difference of total utility costs, including EE program costs, with EE and without EE. In the first year, the cost of the EE program is a cost to society. Over time, cumulative EE savings lead to a utility production cost savings that is greater than the EE program cost. The graph shape is therefore upward sloping. Total Societal Net Savings is the same with and without decoupling; therefore, only one line is shown.



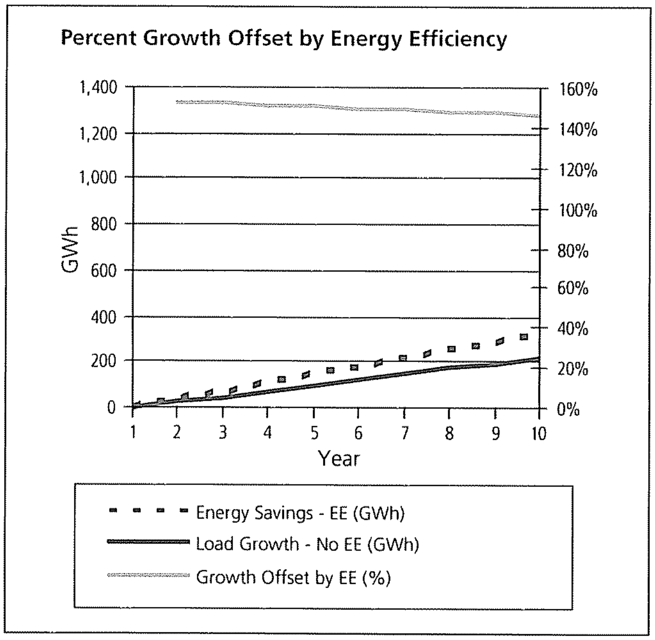
Total Societal Cost Per Unit – Declines

Total cost of providing each unit of energy (MWh) declines over time because of the impacts of energy savings, decreased peak load requirements, and decreased costs during peak periods. Well-designed EE programs can deliver energy at an average cost less than that of new power sources. Societal savings increase when an infrastructure project is delayed and then decrease when built. When the two lines cross, the annual cost of EE equals the annual savings resulting from EE.



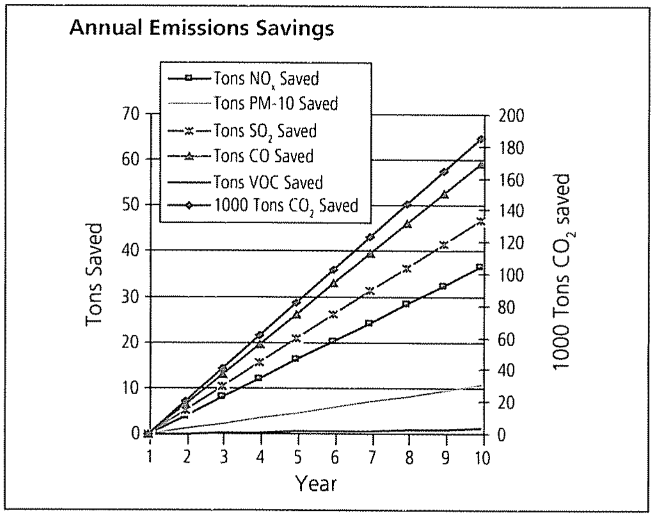
Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without EE, and illustrates the amount of EE relative to load growth. Load growth and energy savings are not impacted by decoupling. With load growth assumed at zero, no load or percent growth offset shown.



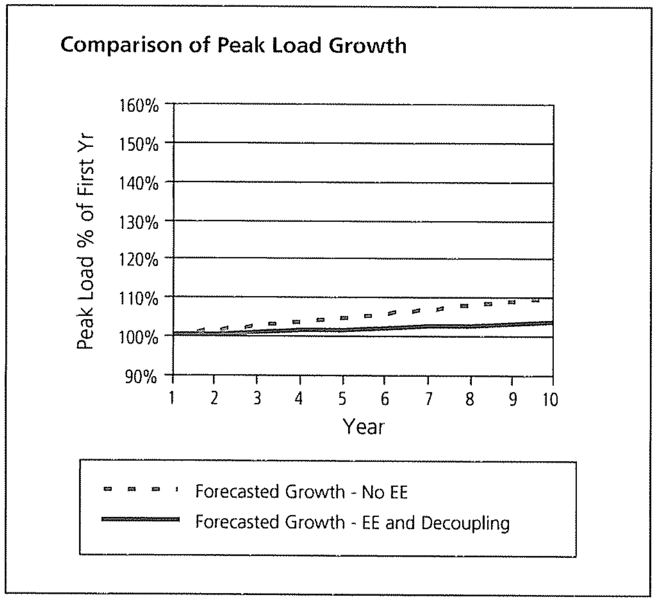
Emissions and Cost Savings - Increase

Annual tons of emissions saved increases. Emissions cost savings increases when emissions cost is monetized. Emissions costs and savings are the same with and without decoupling.



Peak Load Growth – Decrease

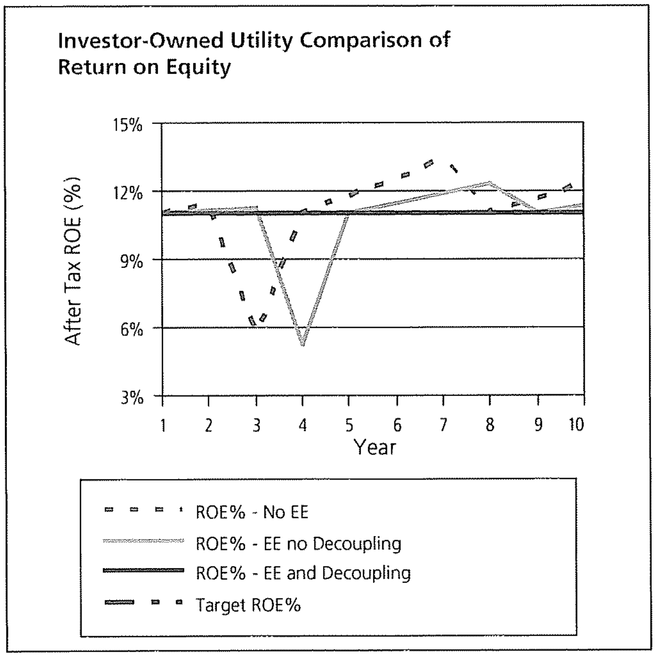
Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling.



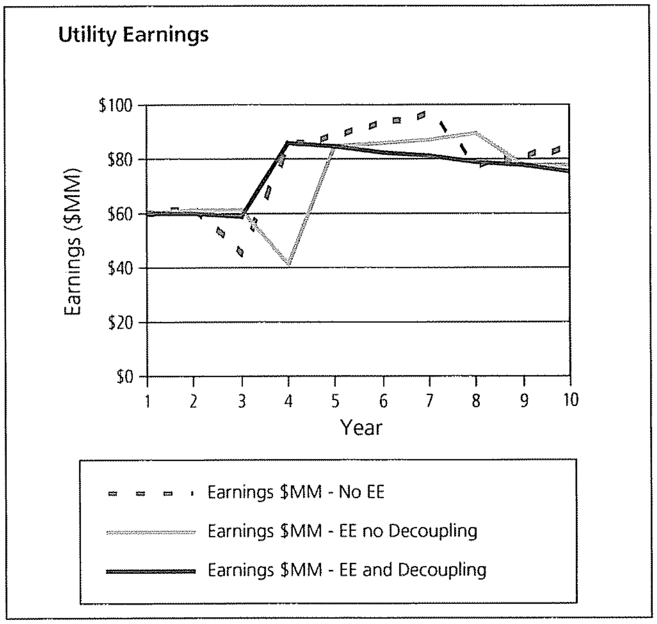
Case 4: High-Growth With Power Plant Deferral

Utility Perspective

Utility Financial Health – Small Changes
The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility, the measure of financial health changes. Investor-owned utility health is measured by ROE, while publicly or cooperatively owned utility health is measured by cash position or debt coverage ratio.



Utility Earnings – Results Vary
Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If EE reduces capital intvestment, the earnings will be lower in the EE case, unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be affected.

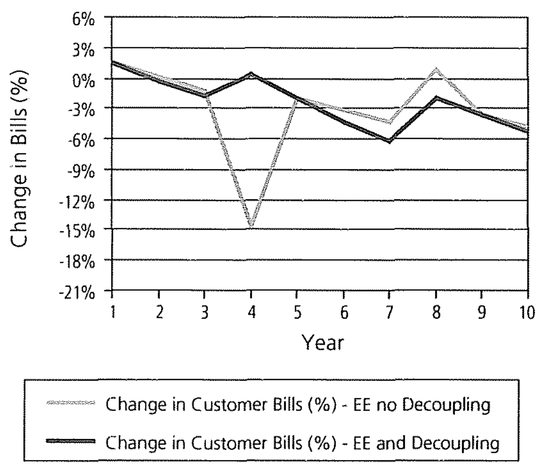


Customer Perspective

Customer Bills – Decrease

In the first year, customer utility bills increase because the cost of the EE program has not yet produced savings. Total customer bills decline over time, usually within the first three years, indicating customer savings resulting from lower energy consumption.

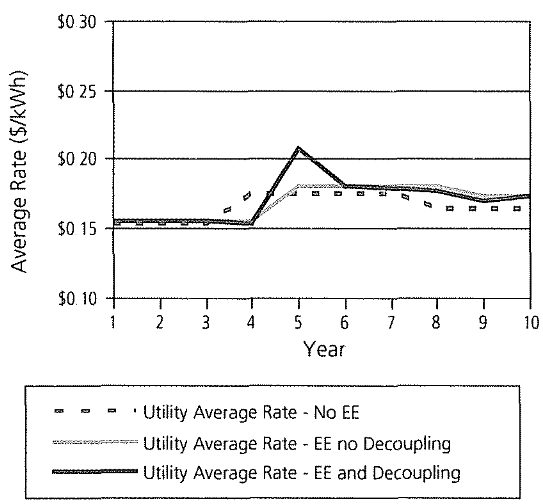
Percent Change in Customer Bills



Utility Rates – Mild Increase

The rates customers pay ($/kWh) increase when avoided costs are less than retail rates, which is typically the case for most EE programs. Rates increase because revenue requirements increase more quickly than sales.

Comparison of Average Rate

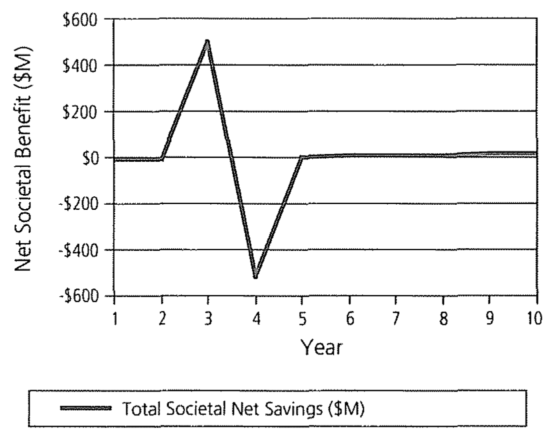


Societal Perspective

Societal Net Savings – Increase

The net savings are the difference of total utility costs, including EE program costs, with EE and without EE. In the first year, the cost of the EE program is a cost to society. Over time, cumulative EE savings lead to a utility production cost savings that is greater than the EE program cost. The graph shape is therefore upward sloping. Total Societal Net Savings is the same with and without decoupling; therefore, only one line is shown.

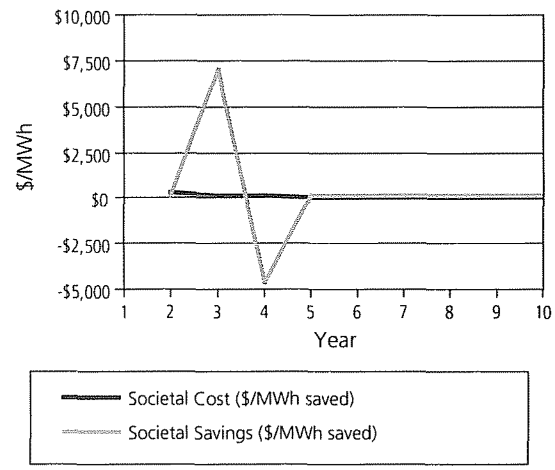
Annual Total Societal Net Savings



Total Societal Cost Per Unit – Declines

Total cost of providing each unit of energy (MWh) declines over time because of the impacts of energy savings, decreased peak load requirements, and decreased costs during peak periods. Well-designed EE programs can deliver energy at an average cost less than that of new power sources. Societal savings increase when an infrastructure project is delayed and then decrease when built. When the two lines cross, the annual cost of EE equals the annual savings resulting from EE.

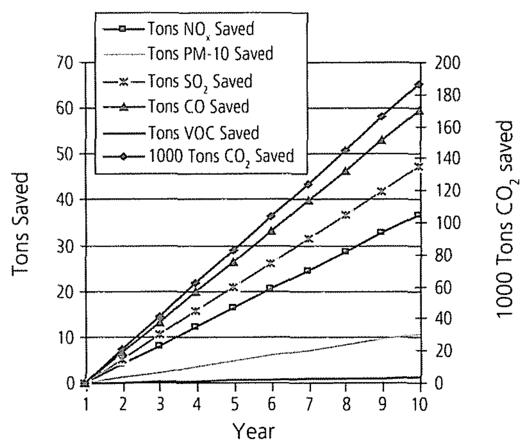
Delivered Costs and Benefits of EE



Emissions and Cost Savings – Increase

Annual tons of emissions saved increases. Emissions cost savings increases when emissions cost is monetized. Emissions costs and savings are the same with and without decoupling.

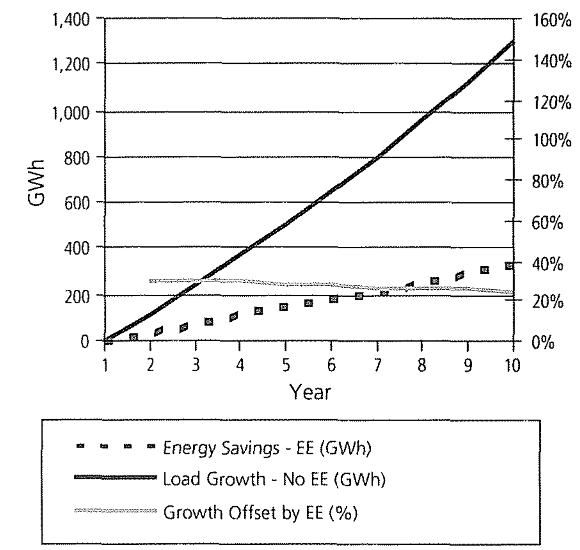
Annual Emissions Savings



Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without EE, and illustrates the amount of EE relative to load growth. Load growth and energy savings are not impacted by decoupling. With load growth assumed at zero, no load or percent growth offset shown.

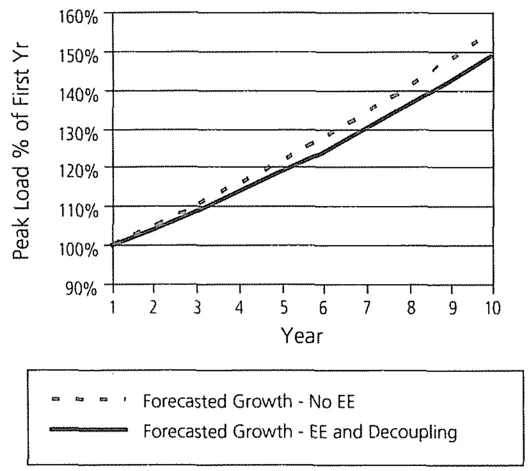
Percent Growth Offset by Energy Efficiency



Peak Load Growth – Decrease

Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling.

Comparison of Peak Load Growth

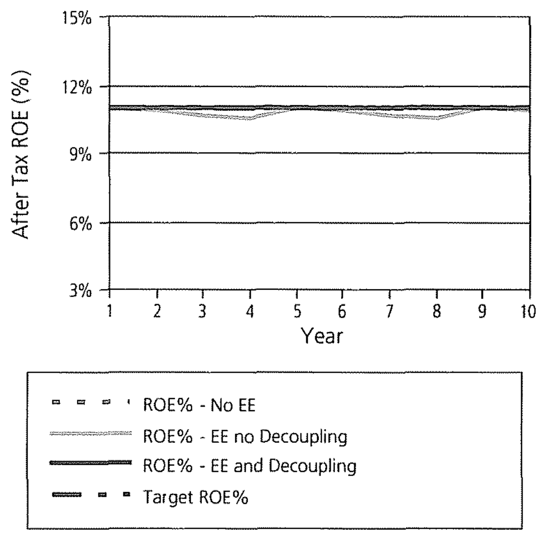


Case 5: Vertically Integrated Utility

Utility Perspective

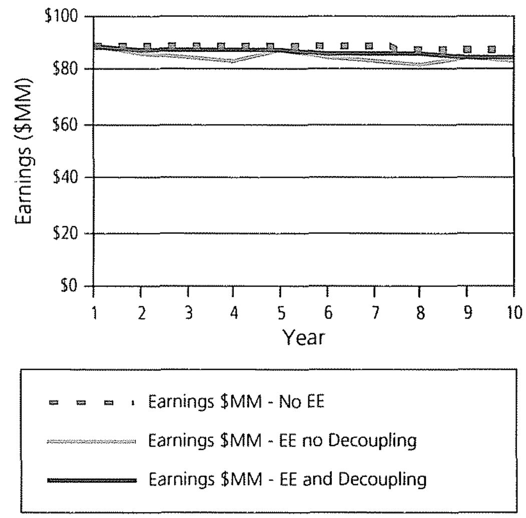
Utility Financial Health – Small Changes
The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility, the measure of financial health changes. Investor-owned utility health is measured by ROE, while publicly or cooperatively owned utility health is measured by cash position or debt coverage ratio.

Investor-Owned Utility Comparison of Return on Equity



Utility Earnings – Results Vary
Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If EE reduces capital investment, the earnings will be lower in the EE case, unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be affected.

Utility Earnings

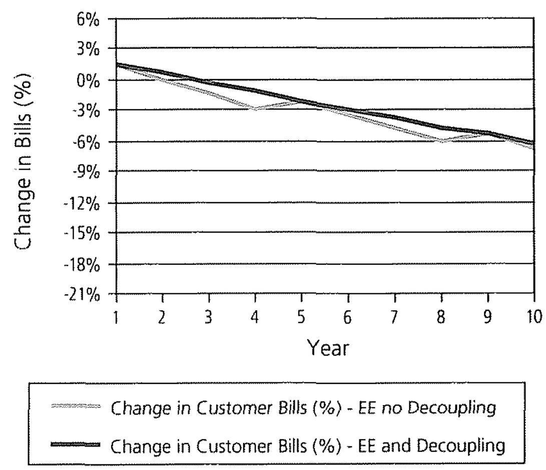


Customer Perspective

Customer Bills – Decrease

In the first year, customer utility bills increase because the cost of the EE program has not yet produced savings. Total customer bills decline over time, usually within the first three years, indicating customer savings resulting from lower energy consumption.

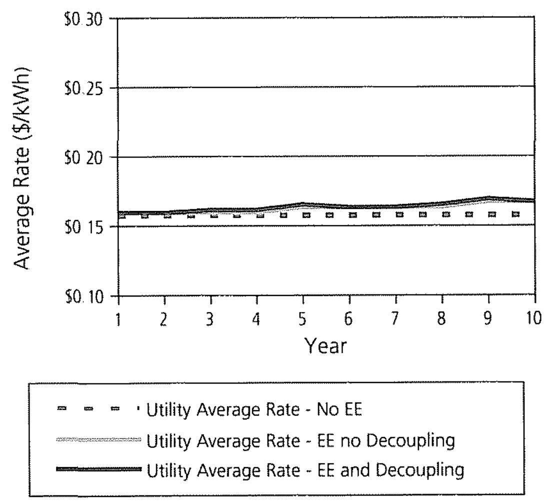
Percent Change in Customer Bills



Utility Rates – Mild Increase

The rates customers pay ($/kWh) increase when avoided costs are less than retail rates, which is typically the case for most EE programs. Rates increase because revenue requirements increase more quickly than sales.

Comparison of Average Rate

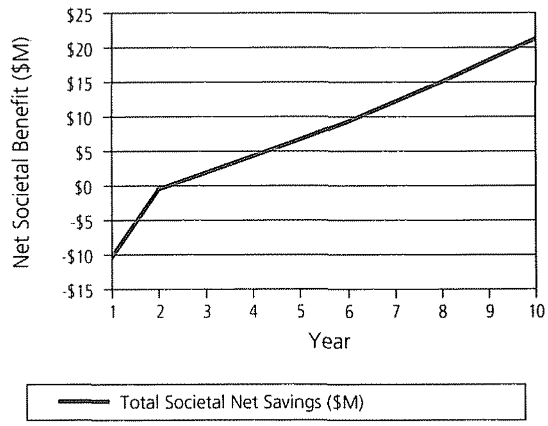


Societal Perspective

Societal Net Savings – Increase

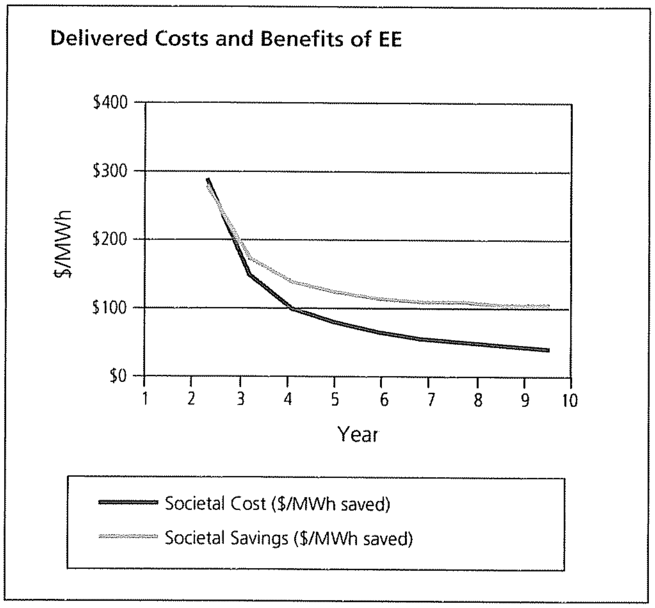
The net savings are the difference of total utility costs, including EE program costs, with EE and without EE. In the first year, the cost of the EE program is a cost to society. Over time, cumulative EE savings lead to a utility production cost savings that is greater than the EE program cost. The graph shape is therefore upward sloping. Total Societal Net Savings is the same with and without decoupling; therefore, only one line is shown.

Annual Total Societal Net Savings



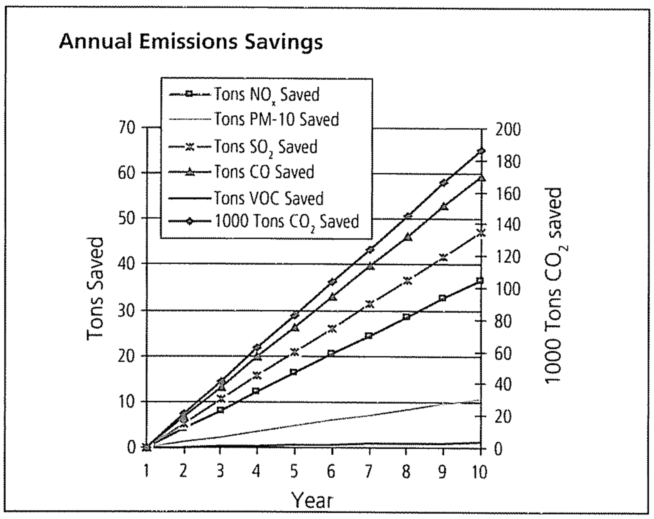
Total Societal Cost Per Unit – Declines

Total cost of providing each unit of energy (MWh) declines over time because of the impacts of energy savings, decreased peak load requirements, and decreased costs during peak periods. Well-designed EE programs can deliver energy at an average cost less than that of new power sources. When the two lines cross, the annual cost of EE equals the annual savings resulting from EE. The Societal Cost and Societal Savings are the same with and without decoupling.



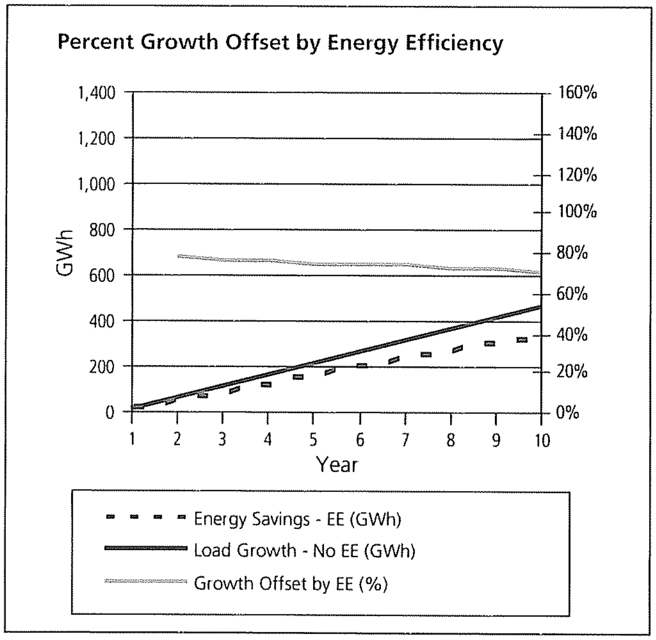
Emissions and Cost Savings – Increase

Annual tons of emissions saved increases. Emissions cost savings increases when emissions cost is monetized. Emissions costs and savings are the same with and without decoupling.



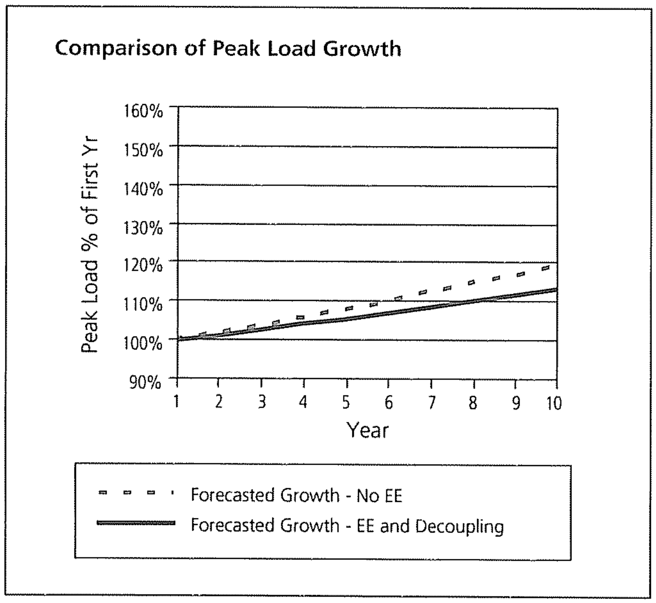
Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without EE, and illustrates the amount of EE relative to load growth. Load growth and energy savings are not impacted by decoupling. With load growth assumed at zero, no load or percent growth offset shown.



Peak Load Growth – Decrease

Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling.

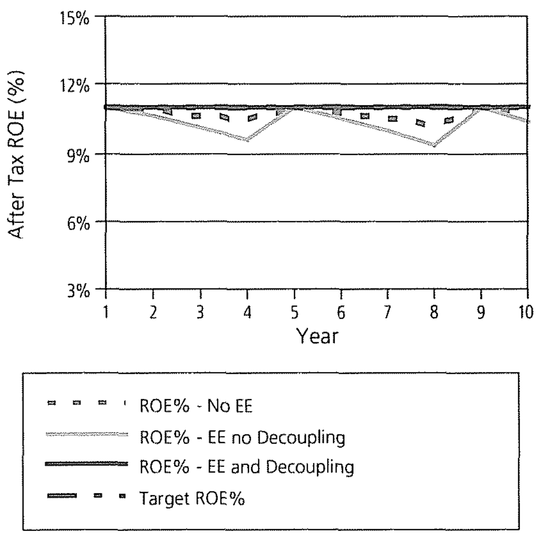


Case 6: Restructured Delivery-Only Utility

Utility Perspective

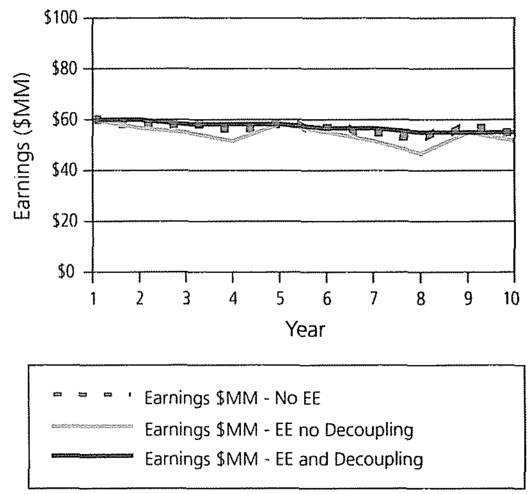
Utility Financial Health – Small Changes
The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility, the measure of financial health changes. Investor-owned utility health is measured by ROE, while publicly or cooperatively owned utility health is measured by cash position or debt coverage ratio.

Investor-Owned Utility Comparison of Return on Equity



Utility Earnings – Results Vary
Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If EE reduces capital investment, the earnings will be lower in the EE case, unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be affected.

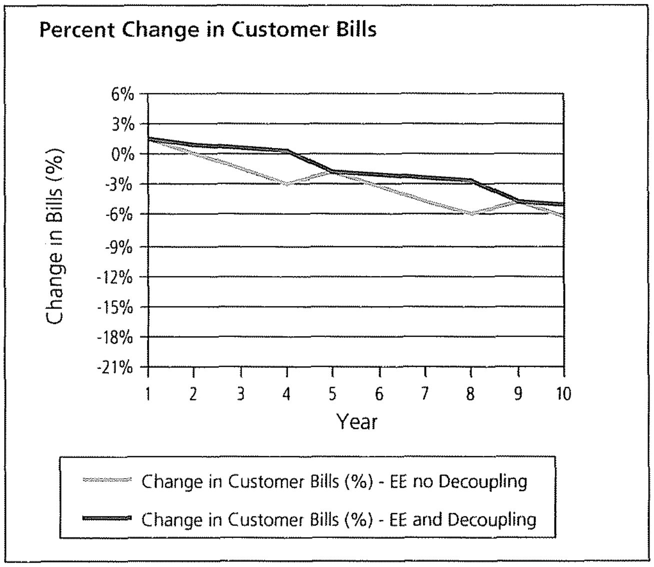
Utility Earnings



Customer Perspective

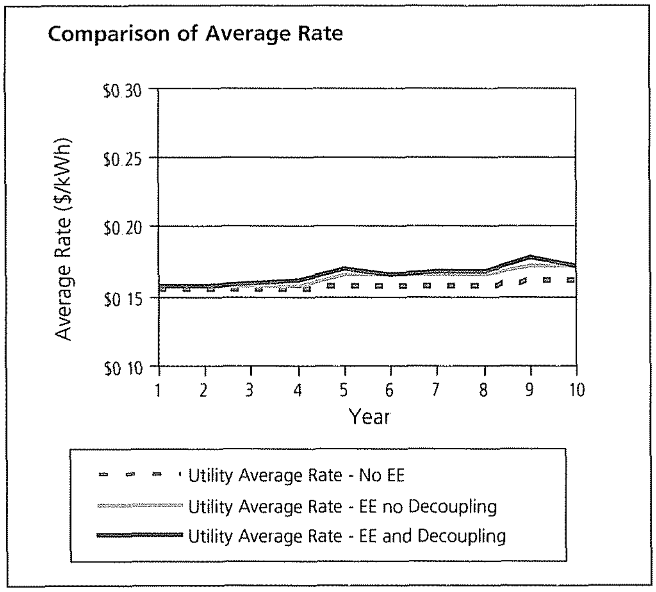
Customer Bills – Decrease

In the first year, customer utility bills increase because the cost of the EE program has not yet produced savings. Total customer bills decline over time, usually within the first three years, indicating customer savings resulting from lower energy consumption.



Utility Rates – Mild Increase

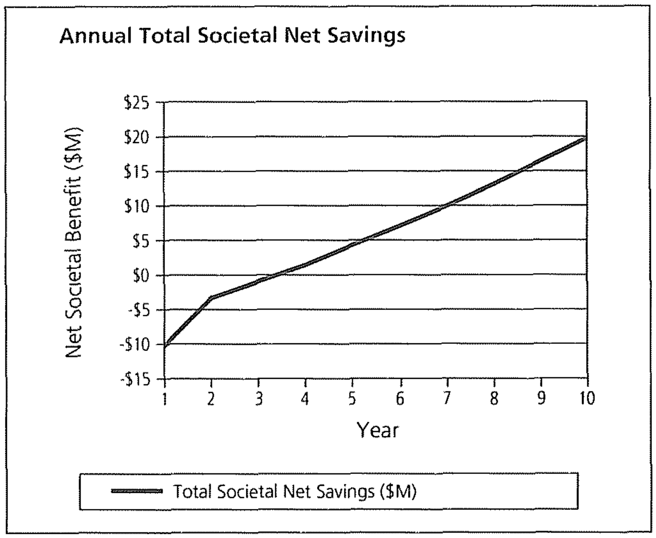
The rates customers pay ($/kWh) increase when avoided costs are less than retail rates, which is typically the case for most EE programs. Rates increase because revenue requirements increase more quickly than sales.



Societal Perspective

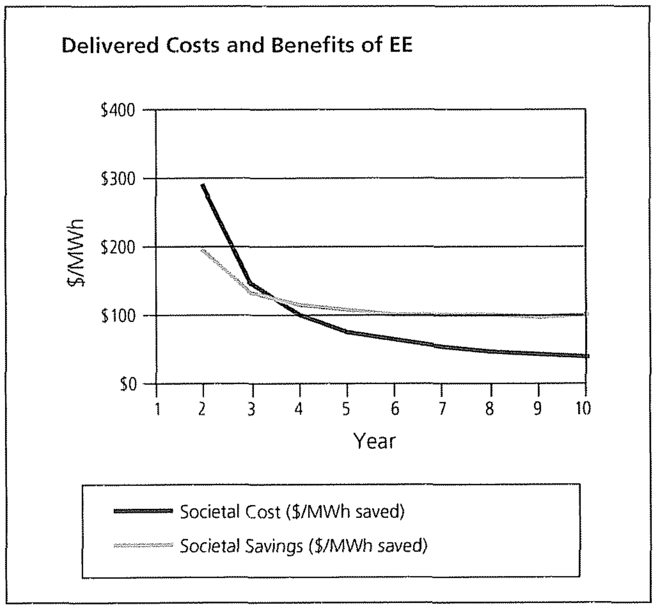
Societal Net Savings – Increase

The net savings are the difference of total utility costs, including EE program costs, with EE and without EE. In the first year, the cost of the EE program is a cost to society. Over time, cumulative EE savings lead to a utility production cost savings that is greater than the EE program cost. The graph shape is therefore upward sloping. Total Societal Net Savings is the same with and without decoupling; therefore, only one line is shown.



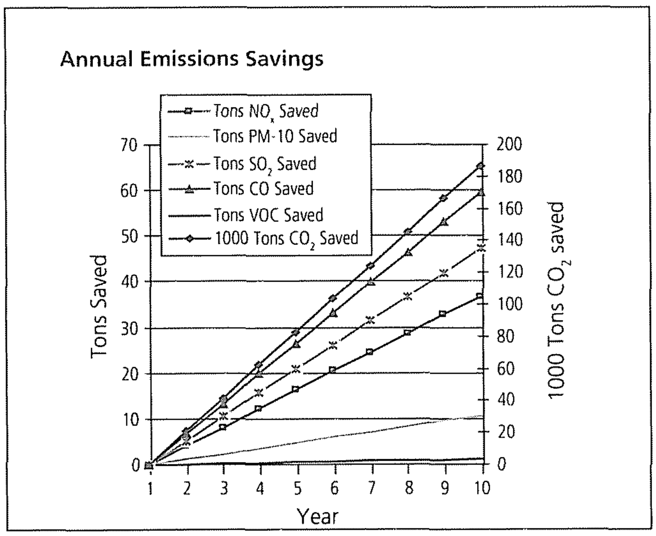
Total Societal Cost Per Unit – Declines

Total cost of providing each unit of energy (MWh) declines over time because of the impacts of energy savings, decreased peak load requirements, and decreased costs during peak periods. Well-designed EE programs can deliver energy at an average cost less than that of new power sources. When the two lines cross, the annual cost of EE equals the annual savings resulting from EE. The Societal Cost and Societal Savings are the same with and without decoupling.



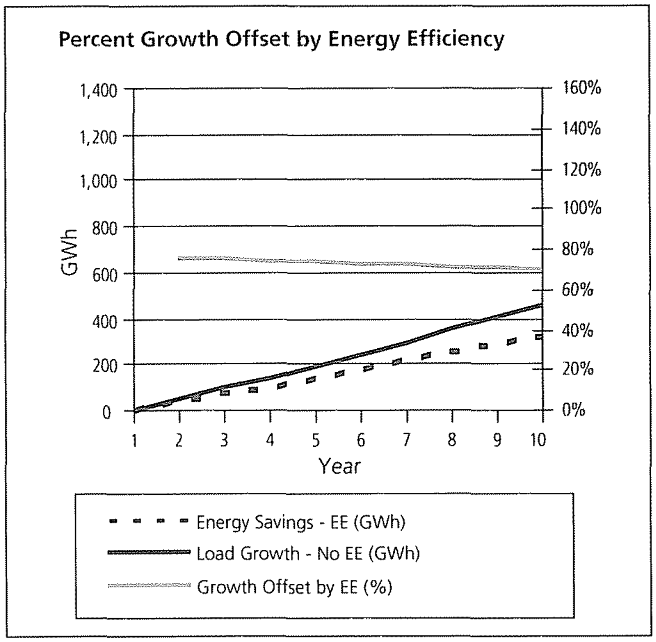
Emissions and Cost Savings – Increase

Annual tons of emissions saved increases. Emissions cost savings increases when emissions cost is monetized. Emissions costs and savings are the same with and without decoupling.



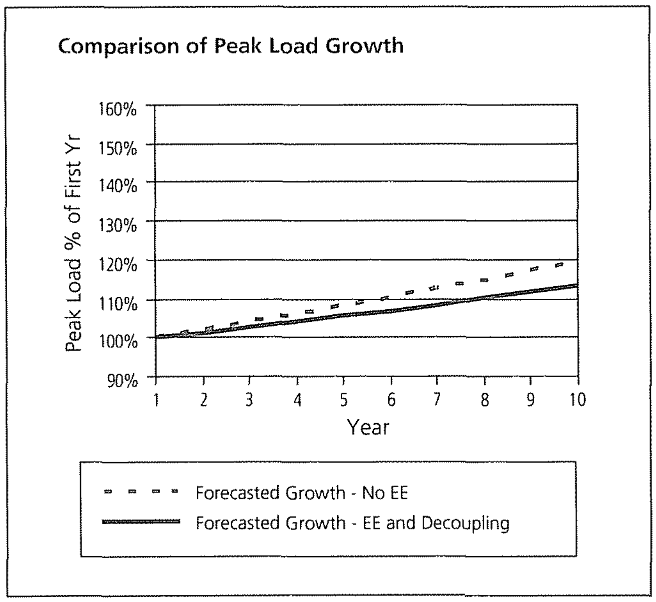
Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without EE, and illustrates the amount of EE relative to load growth. Load growth and energy savings are not impacted by decoupling. With load growth assumed at zero, no load or percent growth offset shown.



Peak Load Growth – Decrease

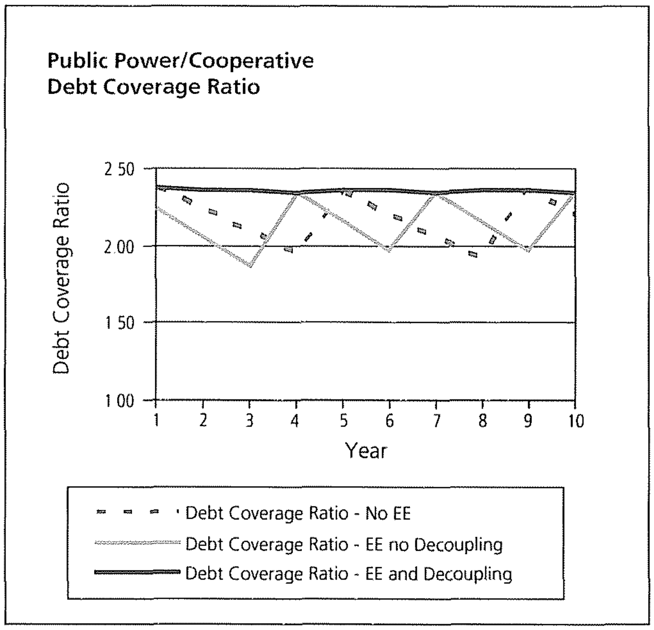
Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling.



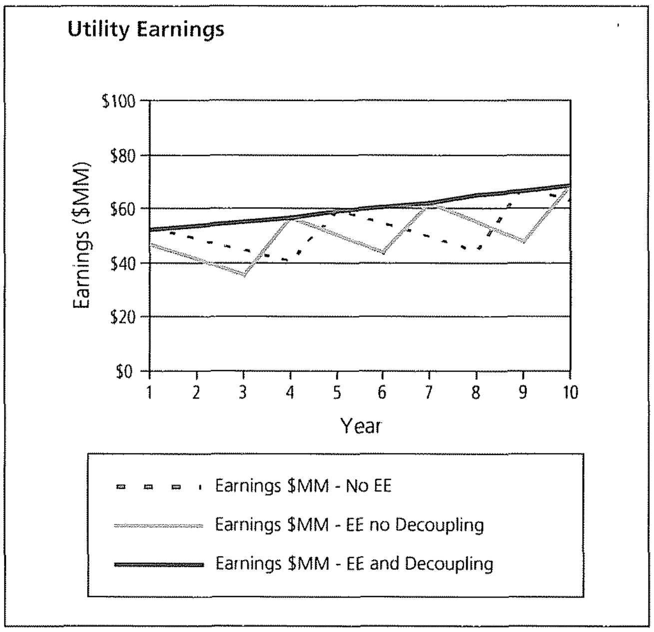
Case 7: Electric Publicly and Cooperatively Owned Debt Coverage Ratio

Utility Perspective

Utility Financial Health – Small Changes
The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility, the measure of financial health changes. Investor-owned utility health is measured by ROE, while publicly or cooperatively owned utility health is measured by cash position or debt coverage ratio.



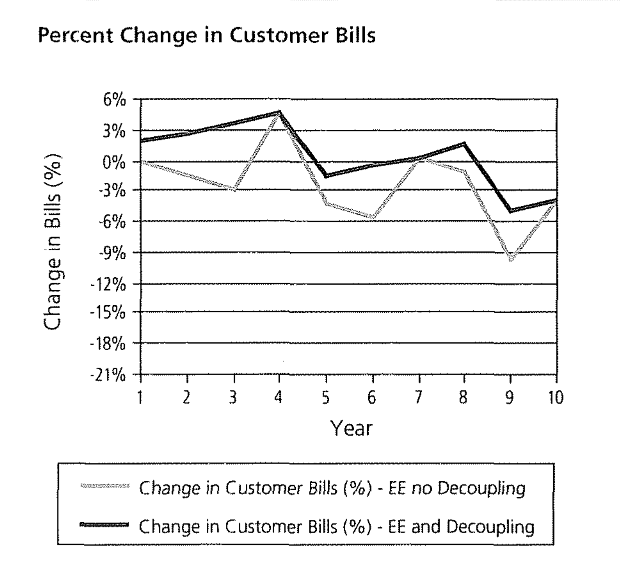
Utility Earnings – Results Vary
Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If EE reduces capital investment, the earnings will be lower in the EE case, unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be affected.



Customer Perspective

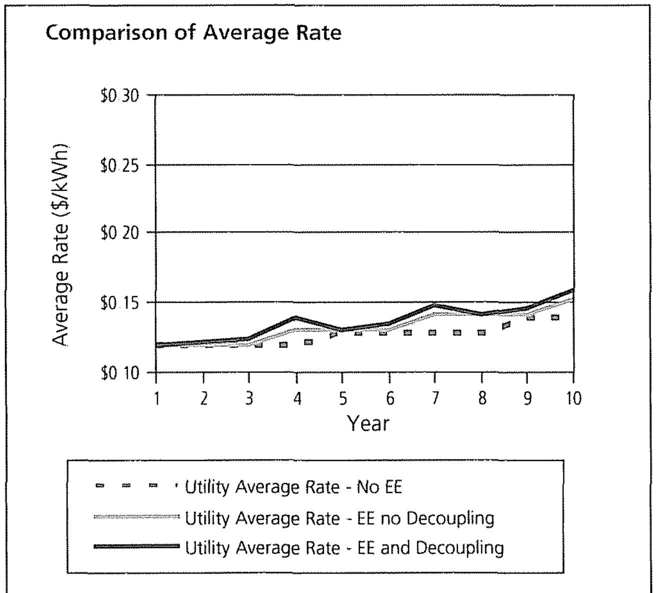
Customer Bills – Decrease

In the first year, customer utility bills increase because the cost of the EE program has not yet produced savings. Total customer bills decline over time, usually within the first three years, indicating customer savings resulting from lower energy consumption.



Utility Rates – Mild Increase

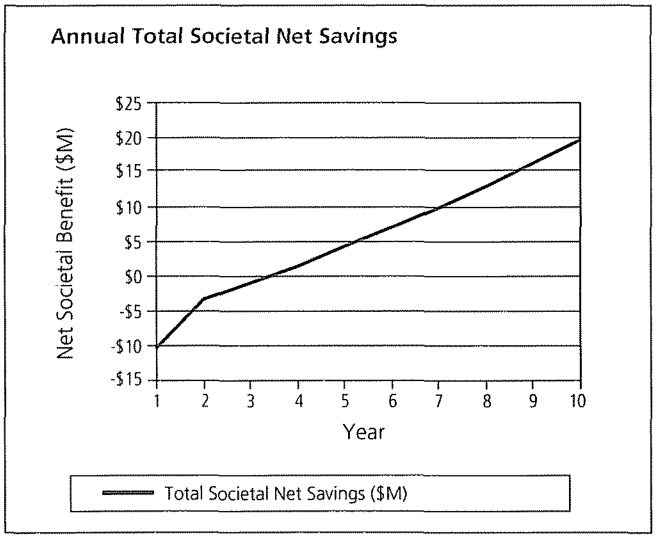
The rates customers pay ($/kWh) increase when avoided costs are less than retail rates, which is typically the case for most EE programs. Rates increase because revenue requirements increase more quickly than sales.



Societal Perspective

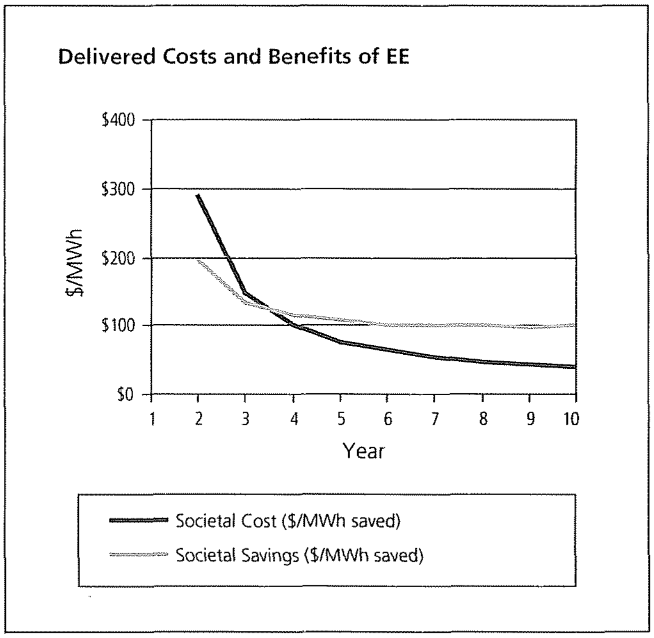
Societal Net Savings – Increase

The net savings are the difference of total utility costs, including EE program costs, with EE and without EE. In the first year, the cost of the EE program is a cost to society. Over time, cumulative EE savings lead to a utility production cost savings that is greater than the EE program cost. The graph shape is therefore upward sloping. Total Societal Net Savings is the same with and without decoupling; therefore, only one line is shown.



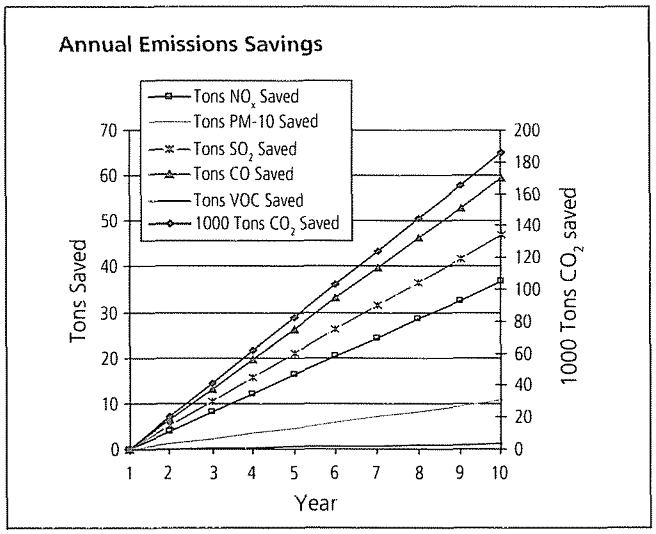
Total Societal Cost Per Unit – Declines

Total cost of providing each unit of energy (MWh) declines over time because of the impacts of energy savings, decreased peak load requirements, and decreased costs during peak periods. Well-designed EE programs can deliver energy at an average cost less than that of new power sources. When the two lines cross, the annual cost of EE equals the annual savings resulting from EE. The Societal Cost and Societal Savings are the same with and without decoupling.



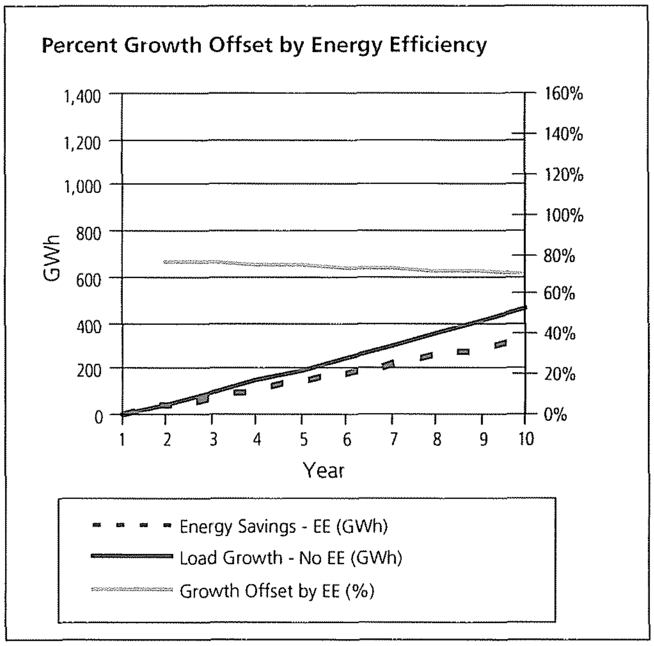
Emissions and Cost Savings – Increase

Annual tons of emissions saved increases. Emissions cost savings increases when emissions cost is monetized. Emissions costs and savings are the same with and without decoupling.



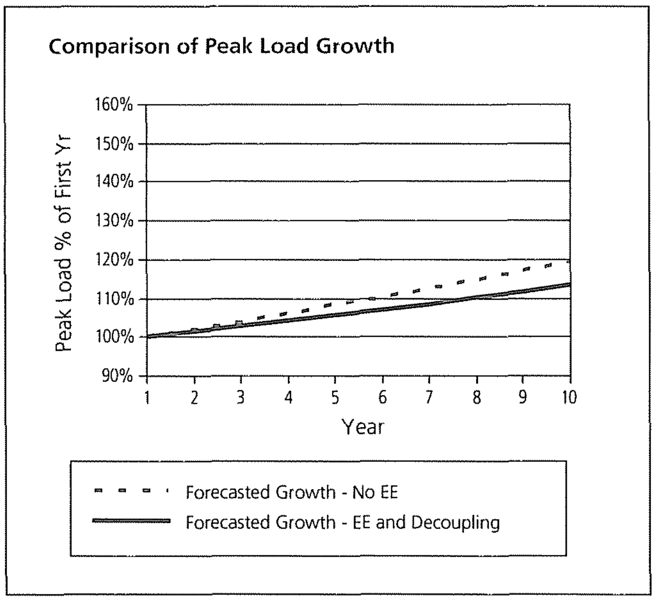
Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without EE, and illustrates the amount of EE relative to load growth. Load growth and energy savings are not impacted by decoupling. With load growth assumed at zero, no load or percent growth offset shown.



Peak Load Growth – Decrease

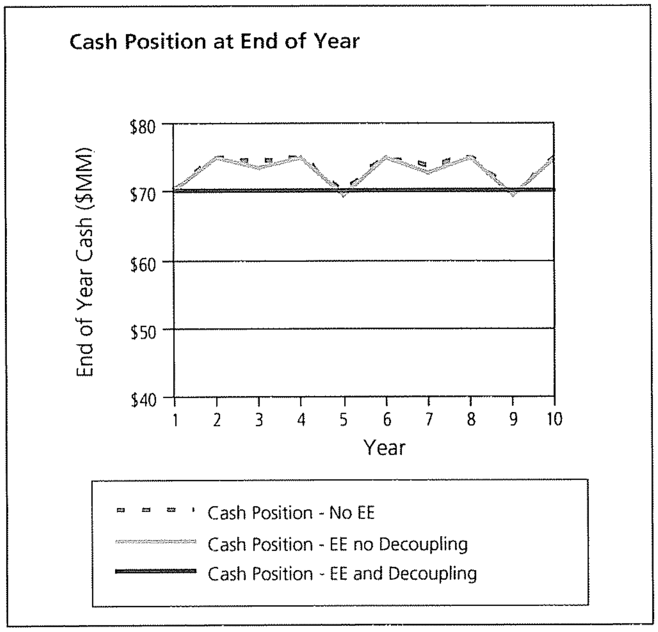
Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling.



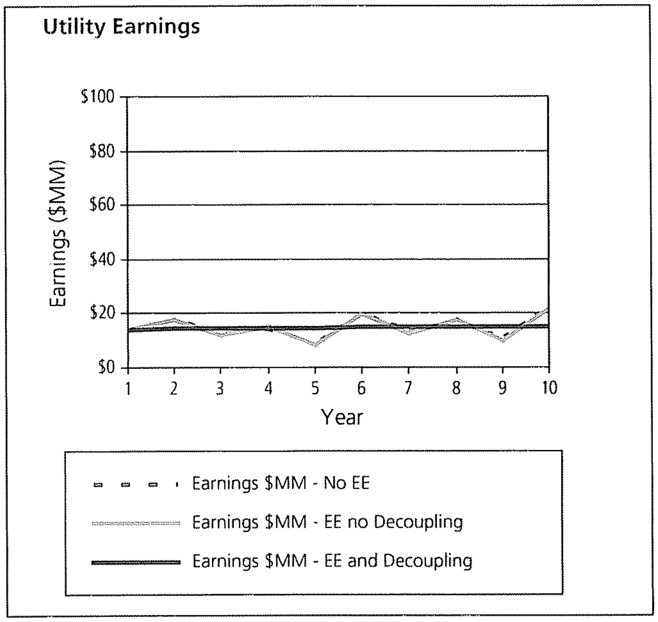
Case 8: Electric Publicly and Cooperatively Owned Cash Position

Utility Perspective

Utility Financial Health – Small Changes
The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility, the measure of financial health changes. Investor-owned utility health is measured by ROE, while publicly or cooperatively owned utility health is measured by cash position or debt coverage ratio.



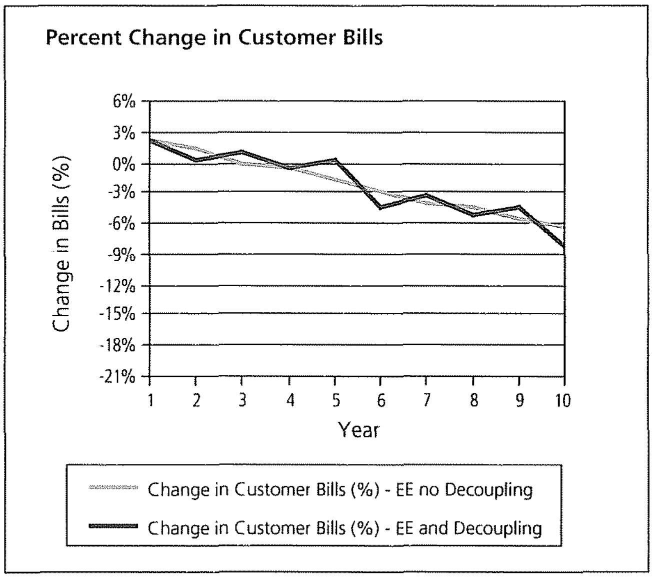
Utility Earnings – Results Vary
Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If EE reduces capital investment, the earnings will be lower in the EE case, unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be affected.



Customer Perspective

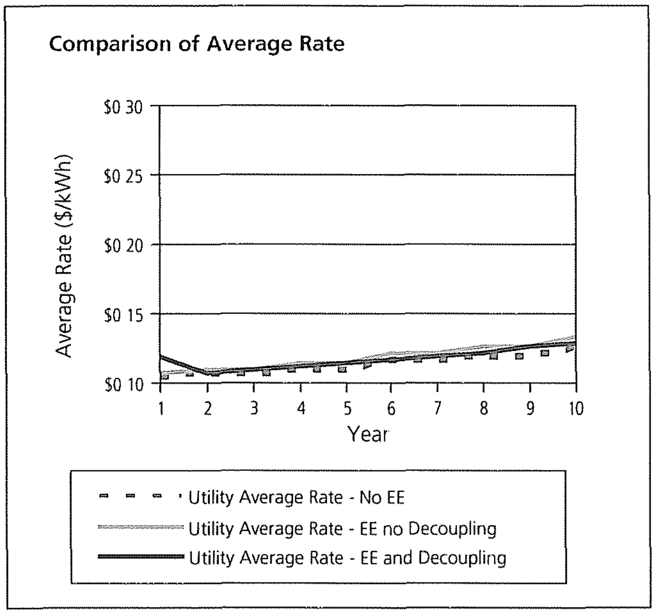
Customer Bills – Decrease

In the first year, customer utility bills increase because the cost of the EE program has not yet produced savings. Total customer bills decline over time, usually within the first three years, indicating customer savings resulting from lower energy consumption.



Utility Rates – Mild Increase

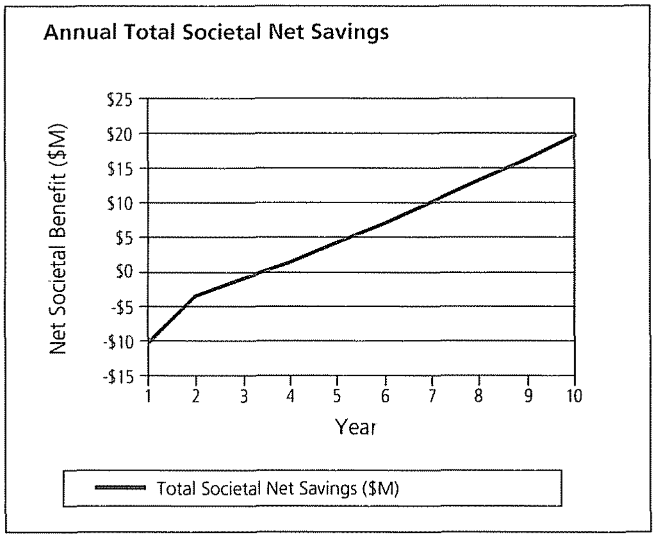
The rates customers pay ($/kWh) increase when avoided costs are less than retail rates, which is typically the case for most EE programs. Rates increase because revenue requirements increase more quickly than sales.



Societal Perspective

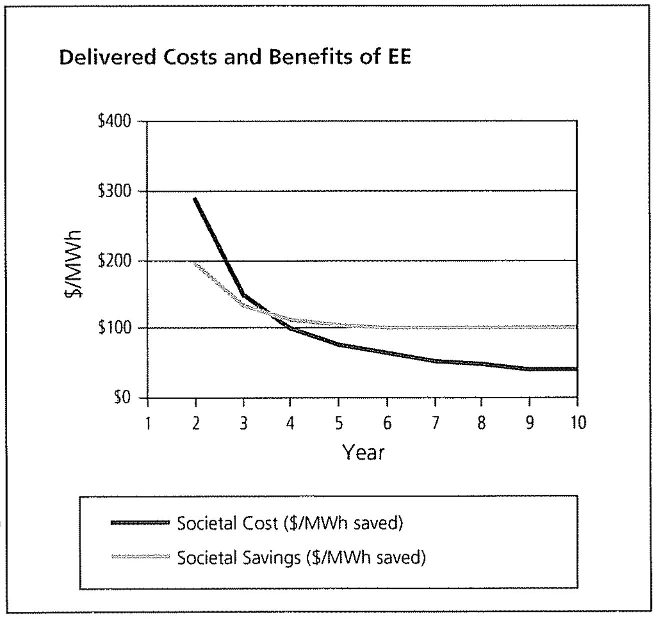
Societal Net Savings – Increase

The net savings are the difference of total utility costs, including EE program costs, with EE and without EE. In the first year, the cost of the EE program is a cost to society. Over time, cumulative EE savings lead to a utility production cost savings that is greater than the EE program cost. The graph shape is therefore upward sloping. Total Societal Net Savings is the same with and without decoupling; therefore, only one line is shown.



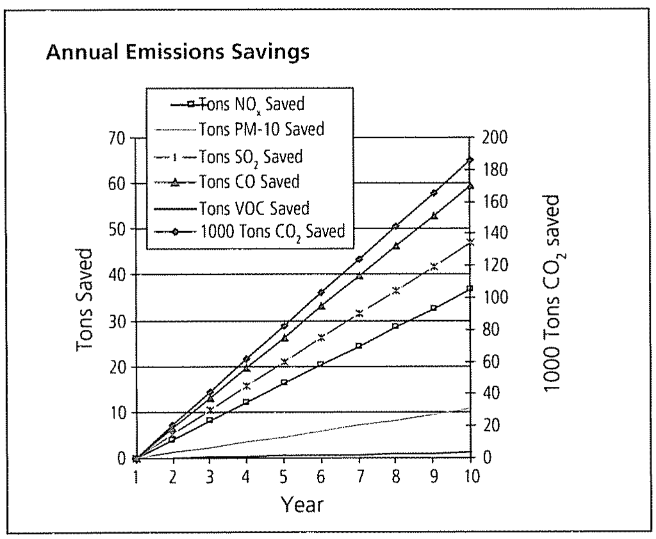
Total Societal Cost Per Unit – Declines

Total cost of providing each unit of energy (MWh) declines over time because of the impacts of energy savings, decreased peak load requirements, and decreased costs during peak periods. Well-designed EE programs can deliver energy at an average cost less than that of new power sources. When the two lines cross, the annual cost of EE equals the annual savings resulting from EE. The Societal Cost and Societal Savings are the same with and without decoupling.



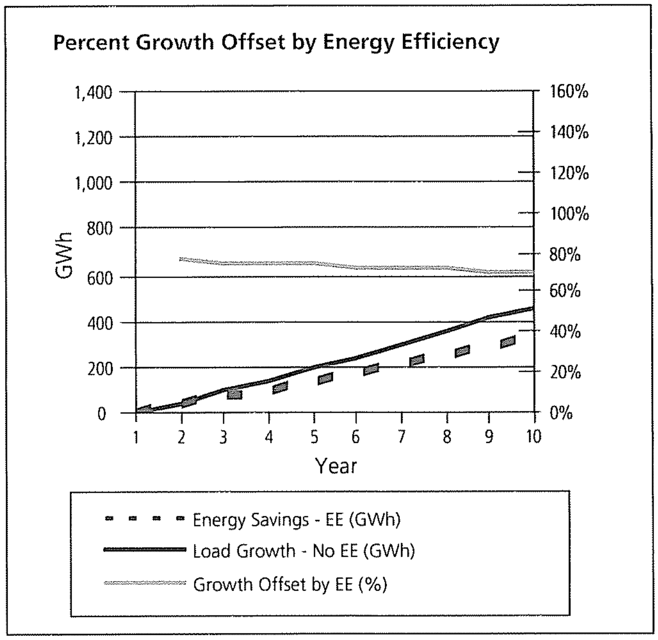
Emissions and Cost Savings – Increase

Annual tons of emissions saved increases. Emissions cost savings increases when emissions cost is monetized. Emissions costs and savings are the same with and without decoupling.



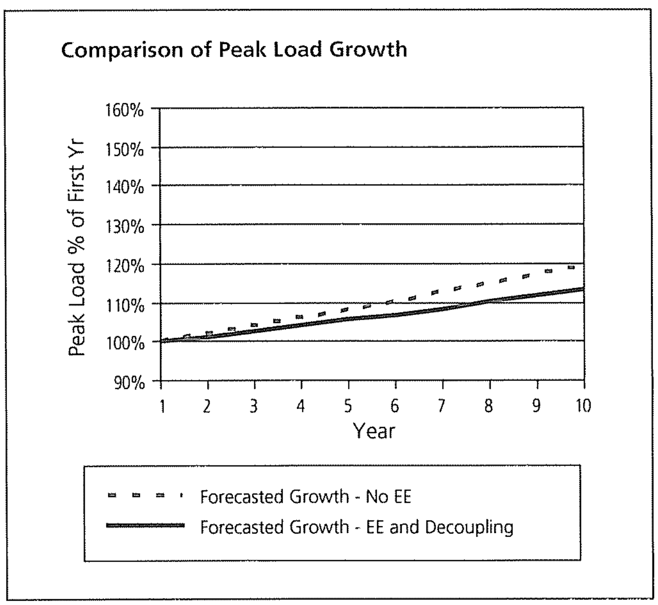
Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without EE, and illustrates the amount of EE relative to load growth. Load growth and energy savings are not impacted by decoupling. With load growth assumed at zero, no load or percent growth offset shown.



Peak Load Growth – Decrease

Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling.



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Regulatory Barriers to Energy Efficiency

Eliminating Disincentives, Creating the Right Incentives

Minnesota PUC
May 24, 2006
Cheryl Harrington
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The Regulatory Assistance Project

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The Regulatory Assistance Project

- RAP is a non-profit organization, formed in 1992, that provides workshops and education assistance to state government officials on electric utility regulation. RAP is funded by the Energy Foundation, US DOE and US EPA.
- RAP Mission:

  RAP is committed to fostering regulatory policies for the electric industry that encourage economic efficiency, protect environmental quality, assure system reliability, and allocate system benefits fairly to all customers.

Who We Are

- **Cheryl Harrington** is an attorney and cofounder of RAP. She was Commissioner of the Maine Public Utility Commission 1982-1991, Vice Chair of NARUC's Energy Conservation Committee. She has taught utility resource planning in just about every state except Nebraska.
- **Jim Lazar** is a regulatory economist based in Olympia, Washington consulting in electric and natural gas utility ratemaking and resource planning since 1982. His clients have included municipal and cooperative electric utilities, natural gas utilities, regulatory commissions, state consumer advocates, and public interest organizations in the United States, Canada, Ireland, New Zealand, and Australia.

Lost Profits Problems

- Consider whether regulation may unintentionally cause utilities to limit their demand side (baseload energy efficiency) and distributed resources and, if so, what regulatory fixes are available.

Regulatory Barriers

- Regulatory practice does not really support EE investment.
- Unless it is modified, utilities will carefully contain their EE investments.
- It usually takes broad stakeholder consensus to modify current regulatory practice.

The Effect of Energy Efficiency on Utility Profits

- With a fully-reconciled fuel clause, every lost sale means lost profits.
- Even without a fully-reconciled fuel clause, if retail rates are above short-run market prices, every lost sale means lost profits.
- The numbers can be very large – a 1% reduction in sales can mean a 5% reduction in profits.

Cost-Effectiveness of Efficiency is Not the Issue

- EE has the same energy and capacity values as generation facilities, transmission lines and distribution facilities.
- EE is considerably cheaper than most supply-side alternatives, lowering total revenue requirements.
- Furnace replacement and stopping building leaks especially important for gas customers right now.

Influencing Behavior: How Do Utilities Make $?

- Under traditional rate-of-return (ROR) regulation:
  - Price = Revenue Requirement/Sales
- But:
  - **Actual** Revenues = Price * Quantity
- And, therefore:
  - Profit = **Actual** Revenues – **Actual** Costs
- The utility makes money by:
  - Reducing costs and
  - Increasing sales

Traditional Regulation: The Throughput Problem

- Traditional ROR regulation sets *prices*, not *revenues*
  - The revenue requirement is simply an estimate of the total cost to provide service
- Without adjustment, consumption-based rates ($/kWh and $/kW) link profits to sales
  - The more kilowatt-hours a utility sells, the more money it makes
  - This is because, in most hours, the price of electricity is greater than the cost to produce it
    - *Utility makes money even when the additional usage is wasteful, and loses it even when the reduced sales are efficient*
- The profit incentive to increase sales is extremely powerful

Lowered Sales Reduces Revenues and Profits

- Vertically integrated utility with $284M ratebase
- ROE at 11%—$15.6 million
- Power costs $.04/kwh, retail rates average $.08; Sales at 1.776 TWh
  - At the margin, each saved kWh cuts $.04 from profits
  - If sales drop 5%: profits drop $3.5M
- EE equal to 5% of sales will cut profits by 23%
  - The effect is even worse for distribution-only utility: a reduction in sales of 5% lowers profits by 57%

Assumptions for A Sample Utility

Assumptions	
Operating Expenses	$160,000,000
Rate Base	$200,000,000
Tax Rate	35.00%

Cost of Capital	% of Total	Cost Rate	Wtd. Cost		Dollar Cost Amt.	
			Pre-tax	After-Tax	Pre-Tax	After-Tax
Debt	55.00%	8.00%	4.40%	2.86%	$8,800,000	$5,720,000
Equity	45.00%	11.00%	4.95%	7.62%	$9,900,000	**$15,230,769**
Total	100.00%			10.48%		

Revenue Requirement	
Operating Expenses	$160,000,000
Debt	$5,720,000
Equity	$15,230,769
Total	$180,950,769
Allowed Return on Equity	$9,900,000

Manager A: Purple Results
Manager B: Green Results
Which Manager Gets Promoted?

	Revenue Change		Impact on Earnings		
% Change in Sales	Pre-tax	After-tax	Net Earnings	% Change	Actual ROE
5.00%	$9,047,538	$5,880,900	$15,780,900	59.40%	17.53%
4.00%	$7,238,031	$4,704,720	$14,604,720	47.52%	16.23%
3.00%	$5,428,523	$3,528,540	$13,428,540	35.64%	14.92%
2.00%	$3,619,015	$2,352,360	$12,252,360	23.76%	13.61%
1.00%	$1,809,508	$1,176,180	$11,076,180	11.88%	12.31%
0.00%	$0	$0	$9,900,000	0.00%	11.00%
-1.00%	-$1,809,508	-$1,176,180	$8,723,820	-11.88%	9.69%
-2.00%	-$3,619,015	-$2,352,360	$7,547,640	-23.76%	8.39%
-3.00%	-$5,428,523	-$3,528,540	$6,371,460	-35.64%	7.08%
-4.00%	-$7,238,031	-$4,704,720	$5,195,280	-47.52%	5.77%
-5.00%	-$9,047,538	-$5,880,900	$4,019,100	-59.40%	4.47%

Alternatives to Addressing Utility Profit Loss

- Lost Margin Recovery Mechanisms
- Rate of Return Incentives
- Fixed / Variable Rate Design
- Real-Time Pricing
- Moving Efficiency Outside the Utility
- Revenue Adjustment Mechanism (Decoupling)

Lost Margin Recovery Mechanisms

- Does not remove sales incentive.
- Best financial outcome is when EE fails early.
- Measurement intense – lots of room for squabbles.
- Does not address rate design issues

Fixed / Variable Rate Design

- $30/month + variable energy cost
- Eliminates sales incentive
- Weakens consumer incentives for self-initiated efficiency.
- May attract uneconomic load – space heating and water heating.
- Without TOU prices, invites surging growth in on-peak loads like air-conditioning.

Rate of Return Incentives

- Washington (1980 – 1990): 2% bonus for return on equity for efficiency investment.
- Encouraged maximum spending on measures with minimum savings.
- Did not reduce sales incentive.
- Utility invested heavily in heat pump retrofits in mobile home parks – to prevent migration to natural gas.

Real-Time Pricing

- Often advocated by market theorists.
- Consumers do not like the volatility or, may not pay attention to price signals.
- Uneconomic metering for small consumers.
- Only addresses generation component of pricing – distribution capacity costs can be significant at the margin.

Moving Efficiency Outside the Utility

- Efficiency Vermont, Energy Trust of Oregon (org)
- Efficiency Maine (gov)
- Utility collects and remits revenue
- Efficiency company has no exposure to lost utility margins.
- Willingness of utilities to cooperate requires legislation.
- May not optimize geographic focus of investment without utility involvement.

Decoupling: How it Works

- Instead of rewarding the utility for increased sales, create a system that holds the company harmless (i.e., no effect on profits) for reductions in sales due to efficiency
- Replaces traditional ratemaking with a formula that determines how ***revenues*** will change over time
- The company, knowing what revenue levels to expect, is then free to take whatever actions it wants (within other legal and accounting constraints) to improve its profitability

Revenue Normalization Mechanisms (Decoupling)

- Establish an approved revenue requirement, and adjust rates as needed over time to sustain it.
- Breaks the sales incentive.
- Reduces volatility of utility earnings
- Allows management to focus on reducing costs – which will benefit consumers after next general rate proceeding.

Decoupling Examples

- CA - All gas & electric IOUs
  - http://www.sdge.com/tm2/pdf/EPBR.pd
- MD, OR – Washington Gas, Baltimore Gas (MDPSC, Calvin Timmerman), Northwest Natural (ORPUC, Lisa Schwartz)
- NC- Piedmont Gas
- NJ - gas filings pending for NJ Natural Gas (NJBPU, Mike Winka)
- OH - gas filings pending for Vectren (Ohio Consumers' Counsel, Janine Migden-Ostrander)
- WA – gas filings pending for PSE and Cascade

HOW TO...

Construct a Revenue Adjustment (Decoupling) Mechanism

Decoupling Basics

- Traditional regulation
- Step 1, revenue requirements.
  - Focus is on investment, expenses, return
  - Result is an accurate snapshot of revenue needs
- Step 2 , prices or revenue requirements / sales
  - Some parties focus on efficiency, some fairness, some revenue volatility, some revenue growth
- Step 3, prices are set and steps 1 and 2 are forgotten history

Decoupling Basics

- Traditional regulation and its theory embraced decoupling
- Price equaled cost so, increased sales resulted in increased revenue, increase expense <u>and</u> increased rate base.
- If all moved in lockstep:
  - No change in rate of profit
  - New plant paid for itself
  - No need for a rate adjustment

Decoupling Options

- There are many options
- Allow revenue growth to track cost changes
  - Example: Set forecasted base revenue on revenue requirement forecasts
- Allow revenue growth to be based on customer growth
  - Examples Revenue/customer model used in many states
- I'll focus on RPC method

RPC Steps

- Decoupling requires adding 2 steps
- Step 1, no change
- Step 2, no change
- Step 3, using data from 1 and 2 set RPC. RPC used to determine allowed revenue
- Step 4, periodically compare allowed revenue to actual revenue and true-up

Design Criteria

- Must do
  - Get the structure right to produce the right incentives
  - Get the numbers right to be fair to utility and consumers
- Other considerations
  - Weather risk
  - Economic risk
  - Trends in usage and revenue unrelated to weather or conservation.

Getting the Numbers Right

- Design decoupling formula to approximate revenue growth (and perhaps pattern) under traditional regulation
- Why?
  - To avoid windfall gains and losses
  - To minimize annual rate changes
- If risks shift consider effect on cost of capital

Existing System

- ***Rev* = *Price* * *Sales*** general formula for existing regulation.
- More precisely, the formula is ***Rev* = *K**(*Price* * *Sales*)**
- ***K*** is
  - The factor that reconciles required revenue growth to growth in the utility billing determinants (customers, kilowatts, kilowatt-hours).
  - Close to 1, could be higher or lower.
  - Different for each customer class
  - Changes with different rate designs
  - Different rate designs can dramatically affect revenue growth, revenue volatility, and weather related risk

Decoupling Formula

- Basic formula for RPC approach
  - Allowed rev = allowed revenue/customer * # of cust
  - More specifically, Allowed rev = K * allowed revenue/customer * # of cust
- K is designed to allow revenue growth to approximate revenue growth w/o decoupling

Mechanism Varies Depending on Type of Utility and Adjustment Mechanisms

- Gas Utility with PGA
  - Margin / Customer
- Electric Utility With Power Cost Adjustment
  - Non-Power Cost / Customer
- Electric Utility Without PCA
  - Total Revenue / Customer (and K factor is fairly critical)

Decoupling: Electric Utility With Power Cost Mechanism

- Basic principle: Average revenue minus average variable cost included in PCA
- Example:
  - $.08/kWh rates
  - $.04/kWh in PCA
  - $.06/kWh incremental cost of power (flows through PCA)
  - 1,000 kWh/ customer/month
  - 100,000 customers
  - 2,000 new customers per year using 1,000 kWh

- Revenue =
  - 100,000 x 1,000 x 12 x $.08

  = $96 million / year

  $48 million in PCA

  $48 million to decouple

  RPC = $48,000,000 / 100,000

  = $480/year/customer + PCA

  Add 2,000 customers

  New revenue requirement = $48,000,000 + 2,000 x $480

  = $48,960,000 + PCA Costs

  = $480 / customer + PCA costs

  If sales < 1,000 kWh/customer a true up surcharge of $.04 x reduced kWh flows into subsequent rates.

  If salex > 1,000 kWh/customer, a true up refund of $.04 x increased kWh flows into subsequent rates.

Without Decoupling: Electric Utility Without PCA

- Basic principle: Average revenue minus marginal variable cost
- Example:
  - $.08/kWh rates
  - $.04/kWh in average power costs
  - $.04/kWh in delivery costs
  - $.06/kWh is marginal market price for power
  - 1,000 kWh/ customer/month
  - 100,000 customers
  - 2,000 new customers per year using 1000 kWh.

- Revenue =
  - 100,000 x 1,000 x 12 x $.08

  = $96 million / year = $960 / customer

New customers require $.04/kWh x 1,000 kWh delivery costs + $.06/kWh for marginal power supply costs.

New revenue requirement =

$96 million + 2,000 x 1,000 x 12 x $.04 + 2,000 x 1,000 x 12 x $.06

= $98,400,000

= $964.70/customer

- General Rate Case Allows an increase of $479,400.

With Decoupling: Electric Utility Without PCA

- Basic principle: Average revenue minus marginal variable cost
- Example:
  - $.08/kWh rates
  - $.04/kWh in average power costs
  - $.04/kWh in delivery costs
  - $.06/kWh is marginal market price for power
  - 1,000 kWh/ customer/month
  - 100,000 customers
  - 2,000 new customers per year using 1000 kWh.
- Revenue =
  - 100,000 x 1,000 x 12 x $.08

  = $96 million / year = $960 / customer

New customers require $.04/kWh x 1,000 kWh delivery costs + $.06/kWh for marginal power supply costs.

New revenue requirement =

$96 million + 2,000 x 1,000 x 12 x $.04 + 2,000 x 1,000 x 12 x $.06

= $98,400,000

= **$964.70/customer**

Utility is allowed $960; in their interest to reduce consumption to previous kWh total.

If they succeed, they are allowed to recover DSM costs plus RPC of $960 per customer.

If they do NOT succeed, they absorb excess costs above $960.

OR: Commission sets "K" factor to reflect higher cost per customer over time. Allows **$965/customer**.

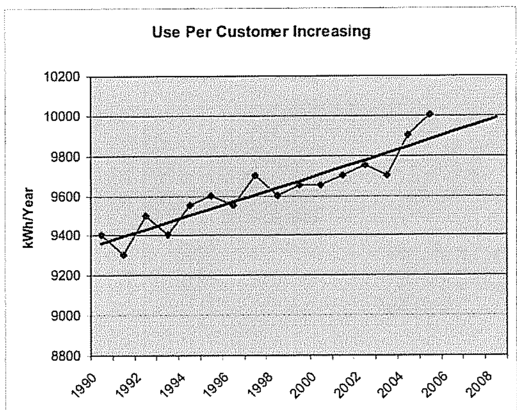
If usage exceeds 1,000 kwh, a refund is due to consumers based on ($.08 - $.06) x kWh (the gained margin).

If utility succeeds in keeping usage of customers below 1,000 kWh, a surcharge is allowed based on ($.08 - $.06) x kWh saved (the lost margin).

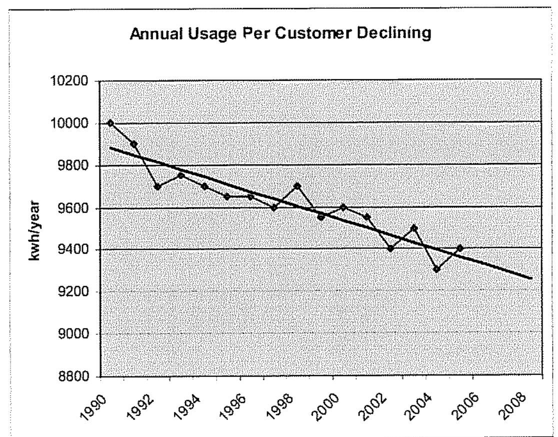
Incentive is to avoid those expensive marginal kilowatt-hours

Why Does the K Factor Vary from 1.00?

- Causes of Rising Revenue Per Customer (unrelated to utility marketing programs)
  - Inflation outstripping productivity
  - Bigger houses
  - More appliances
  - Growing A/C Penetration
  - Larger average size of new businesses
- K-factor > 1.00



- Causes of Declining Revenue Per Customer (unrelated to utility DSM programs)
  - Productivity outstripping inflation
  - Building Codes
  - Appliance Efficiency Standards
  - Higher % of multifamily housing
- K-factor < 1.00



The "K" Factor: Decoupling Is NOT An Attrition Adjustment

- If use per customer is rising, independent of utility DSM efforts, the utility should be "made whole" for the revenue that would be expected.
- If use per customer is declining, independent of utility DSM efforts, the utility should not get a windfall attrition adjustment.
- If average use is changing due to new customers using more or less than existing customers, a different RPC can be applied to customer growth.
- The line extension policy may need revision to ensure that new customers are contributing as much to revenue as to cost.

Dealing with Growth Trends: Xcel Energy Growth Rates

- Xcel historical growth, 1998-2004 - Residential
  - Cust growth 1.3%
  - Sales growth 2.3%
  - RPC growth ~ 1%
- 2004-2006 per rate case filing
  - Cust growth 1.4%
  - Sales growth 2.6%
  - RPC growth ~ 1.2%
- Allowed RPC increased each year.

Revenue Growth

- NSP existing revenue growth is about 2.8% per year. Customer growth about 1% per year.
- Use/customer is growing
- Setting revenue growth at customer growth would
  - Give NSP less $
  - Lead to annual reconciliations giving money back to consumers
  - May or may not be reasonable on a cost basis
- Unless productivity is offsetting factor, K-factor is > 1.0

Weather Risk

- Typical decoupling plans shift weather risk to customers
- Not unique to decoupling plans, rate design changes can have similar results
- When deciding risk allocation consider who can best bear risk, the cost implications of changing risk, the added administration of weather normalizing
- Rating agencies recognize weather risk reduction as a significant change, allowing a lower equity capitalization ratio and therefore lower cost of capital (and lower revenue requirement).

Elements for Fair and Effective Decoupling

- Significant commitment to energy efficiency investment.
- Progressive rate design that keeps fixed rate elements low (or zero.)
- A "collar" on rates – no more than X% change in a year. Additional amounts deferred
- Scheduled periodic rate cases: 3-5 years
- Capital Structure Adjustment if weather risk is shifted to consumers.

Resource Needs

- Commission attention needed
- At the time of rate cases
  - Getting the formula numbers right takes care but the data needs are already part of typical rate cases
  - Define key terms: how customers are counted
- Monthly or annual reconciliation
  - Much more routine than FAC – nothing to audit.

Five Point Plan for Achieving Consensus on Decoupling

- Significant Energy Efficiency Investment Commitment
- Good Rate Design
- Capital Structure Adjustment
- A Collar on Maximum Possible Adjustment
- Periodic Rate Cases

A Word About Performance Incentives

- Decoupling and, to a lesser extent, net lost revenue recovery remove the profit *disincentive* to EE investment
- To encourage superior performance, some states offered utilities positive financial incentives

Performance Incentives: For Both ROR and RPC

- Shared savings
  - Return to utility of some fraction (say, 10-20%) of the savings (avoided costs) from distributed resource deployment
    - Goes directly to utility's bottom line
  - Collars and dead bands
- Performance targets
  - Specified rewards (e.g., % of program budget) for achieving a mix of targets
    - Energy savings, capacity reductions, customer installations, reductions in program administration costs, etc.
- ROE adder
  - A premium on the ROE applied to unamortized portion of EE costs included in ratebase

Your Turn…

»Questions?

Writing A New Story for Kentucky's 21st Century Economy

Bill Prindle
Deputy Director
American Council for an Energy-Efficient Economy

NAPEE Workshop
November, 2007

Overview

How Kentuckians can use energy efficiency to write a new story for its 21st-Century economy

- The 19th-early 20th century story is ending….

  …. a new story awaits
- Efficiency can help write this new story because it is a state's best energy investment
- Efficiency is available now, in large quantities, and is ready to report for duty!
- But efficiency requires state policy leadership
- Kentucky can join the many states writing a new clean energy story, beginning with energy efficiency

The 19th/Early 20th Century Energy-Economy Story

- Rapidly industrializing economy
- Building out the modern power grid
- Proliferation/saturation of end uses necessary for economic development
- Fossils fuels cheap and abundant
- The environment was “free”—or at least the accounting was delayed

In the late 20th Century…

- …the story changed:
  - Economic development shifted from industrial growth to service growth
  - Energy systems reached economic maturity
  - The environmental cost of conventional fuels began to be reckoned
  - The energy demand/services infrastructure matured
  - Energy resource opportunities began shifting to the demand side

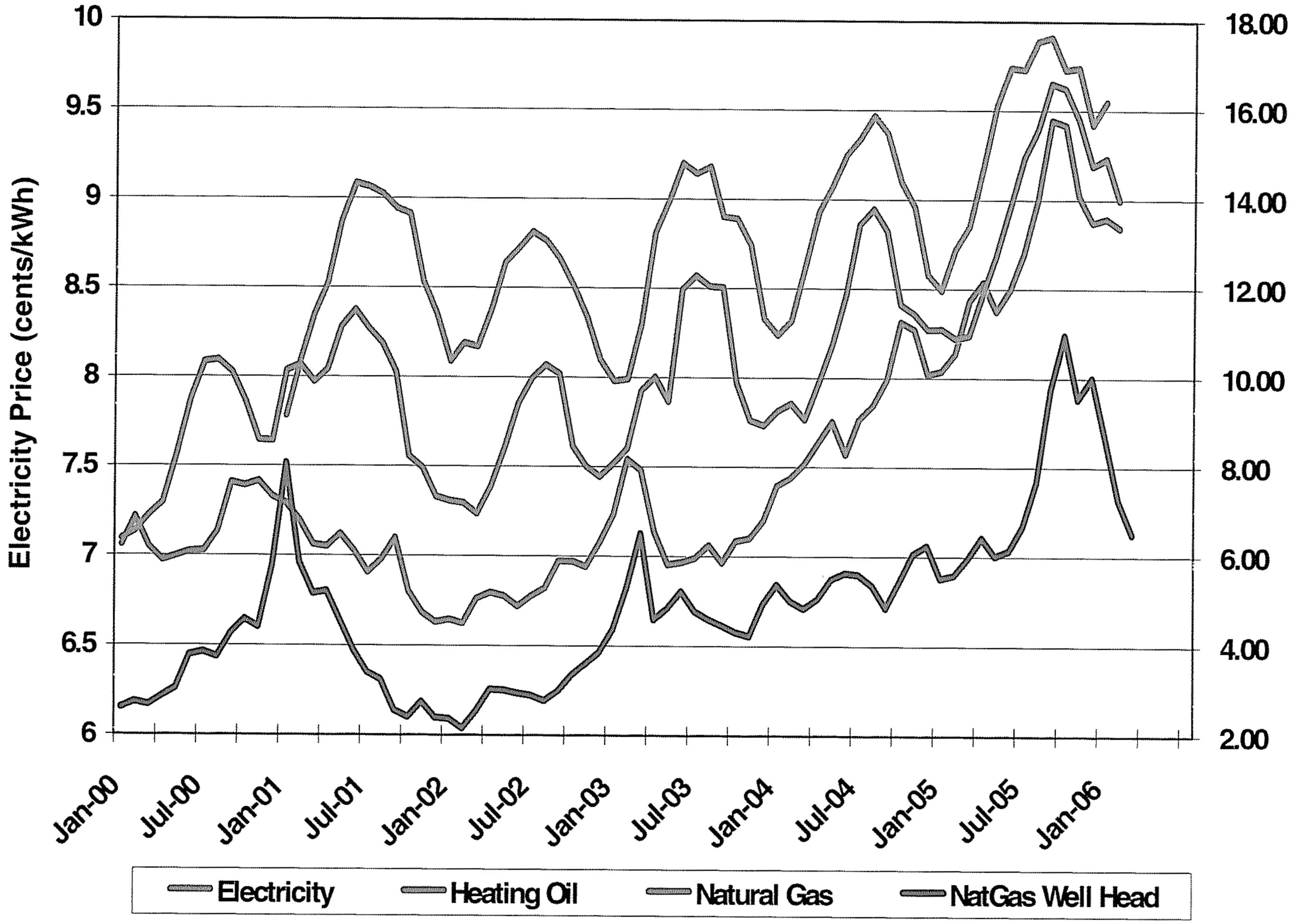
The 21st-Century Stage is Set

- The era of cheap energy has ended
- Conventional energy is harder to deliver
- Environmental cost of fossil fuels will further drive up prices
- Energy efficiency and other clean energy technologies have become serious economic contributors
- We are in a race for clean and affordable energy
- Energy efficiency is the 'first fuel' in this race

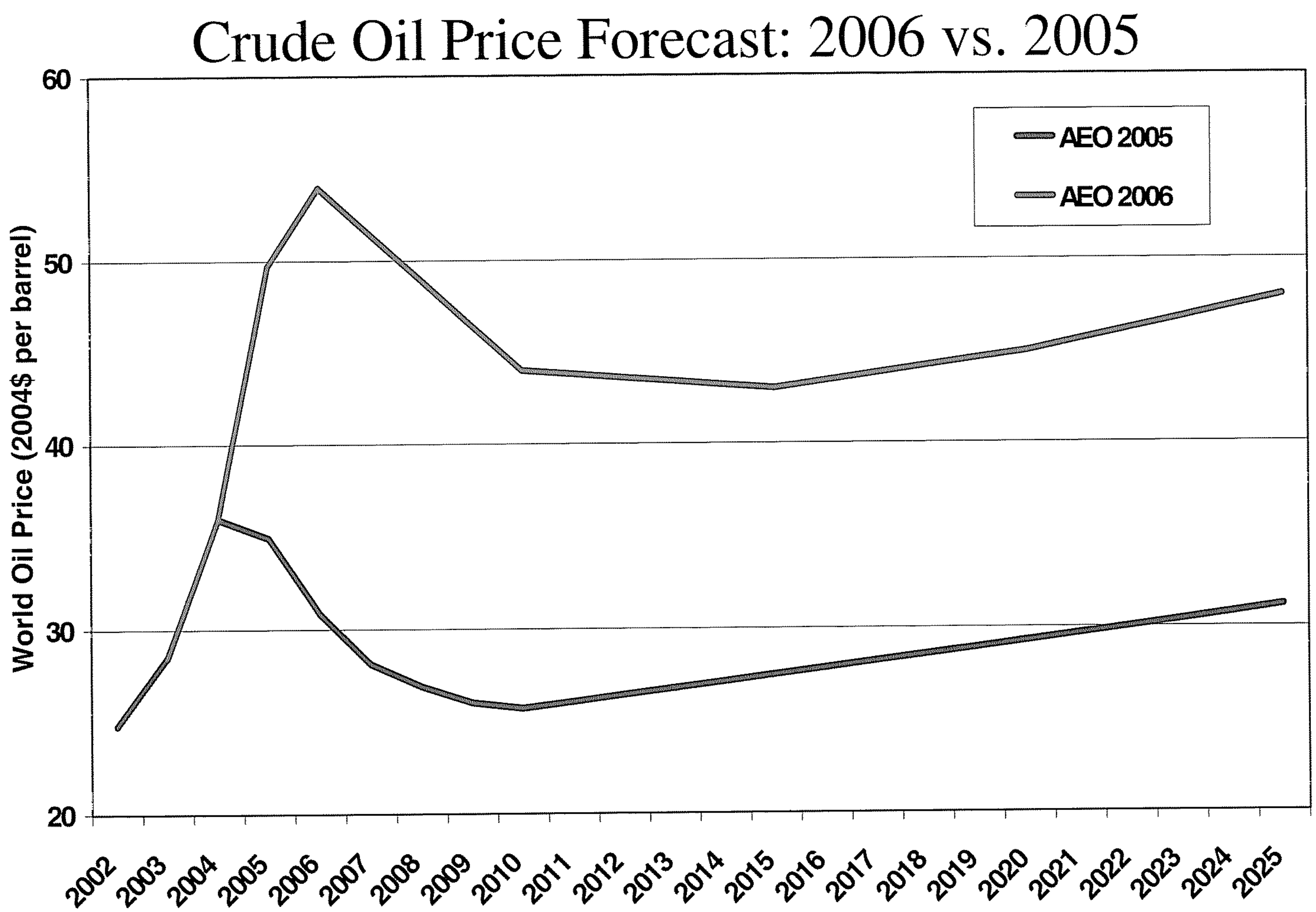
.....**Without efficiency, demand will grow too fast for *ANY* supply resource to keep up**

Energy: Cheap No Longer

Residential Energy Prices

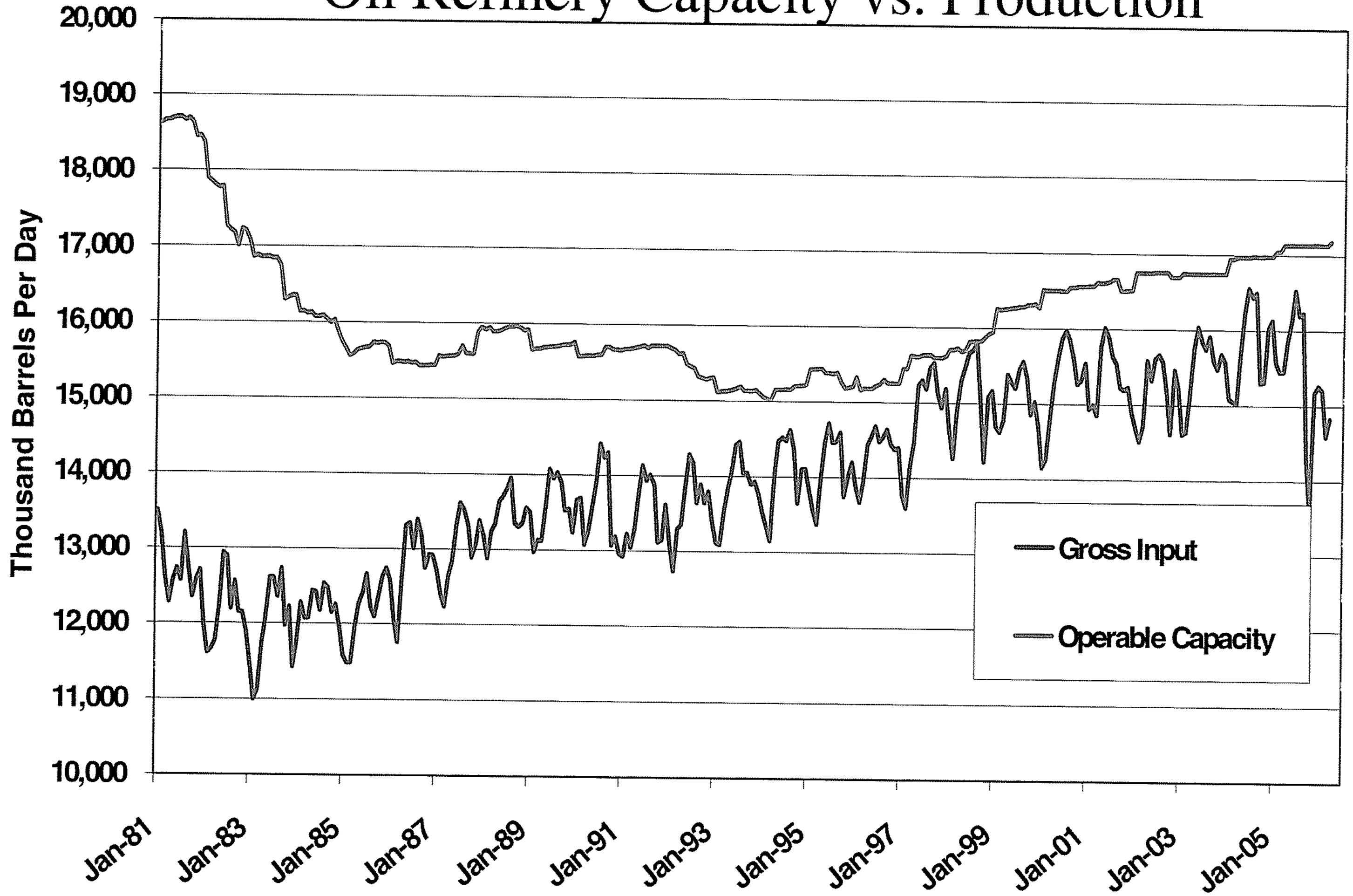


Energy: Cheap No Longer



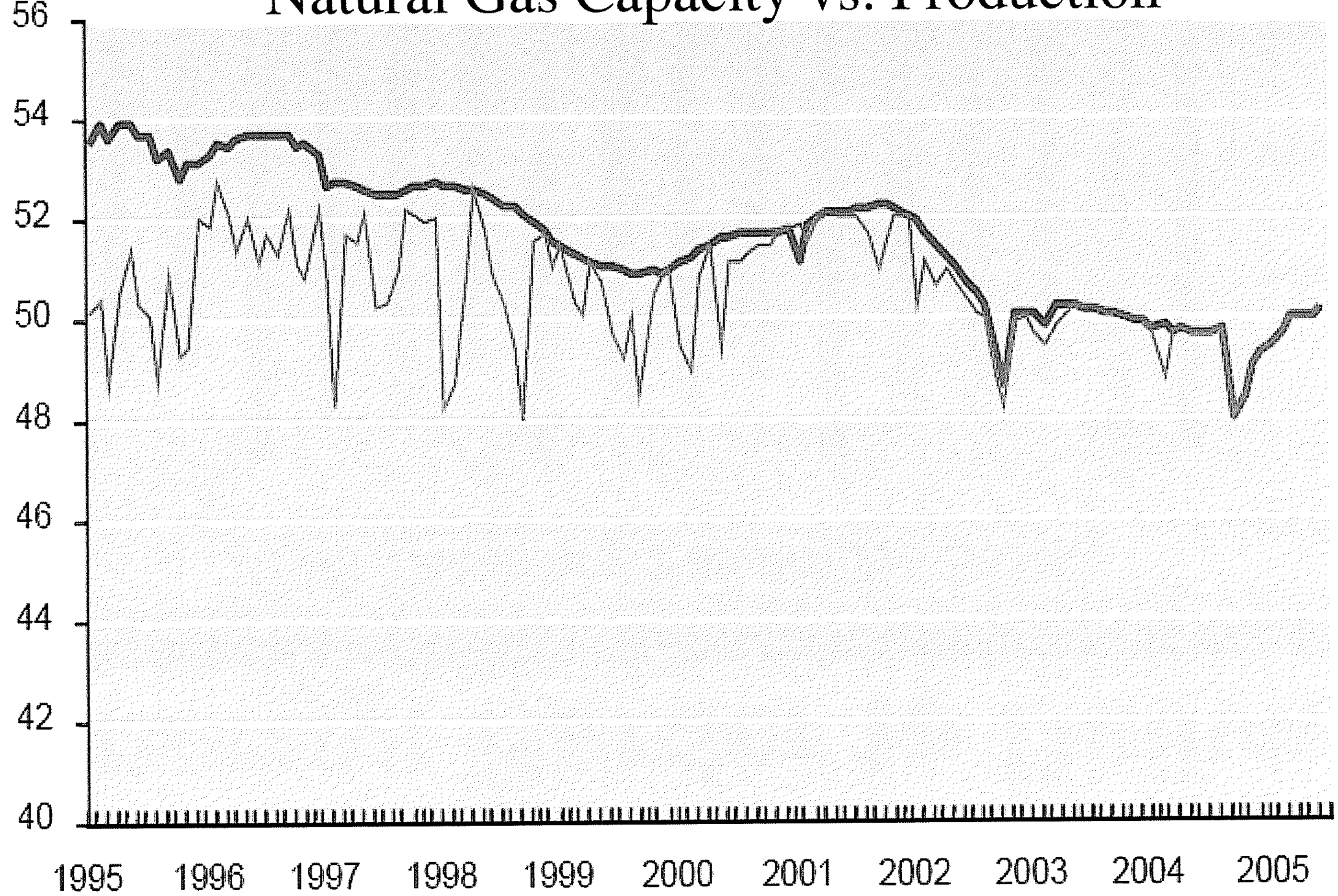
Energy: Harder to Deliver

Oil Refinery Capacity vs. Production



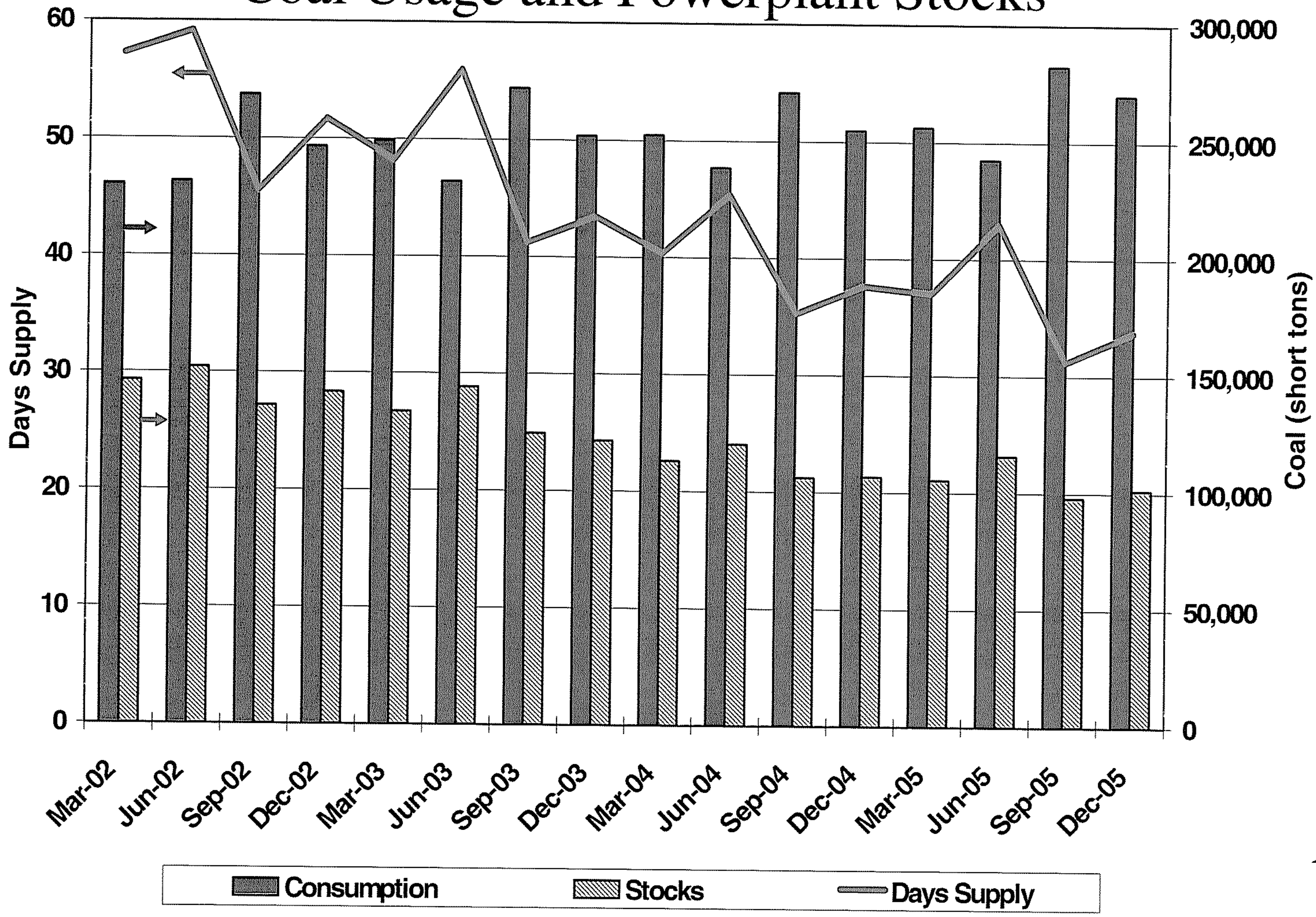
Energy: Harder to Deliver

Natural Gas Capacity vs. Production



Energy: Harder to Deliver

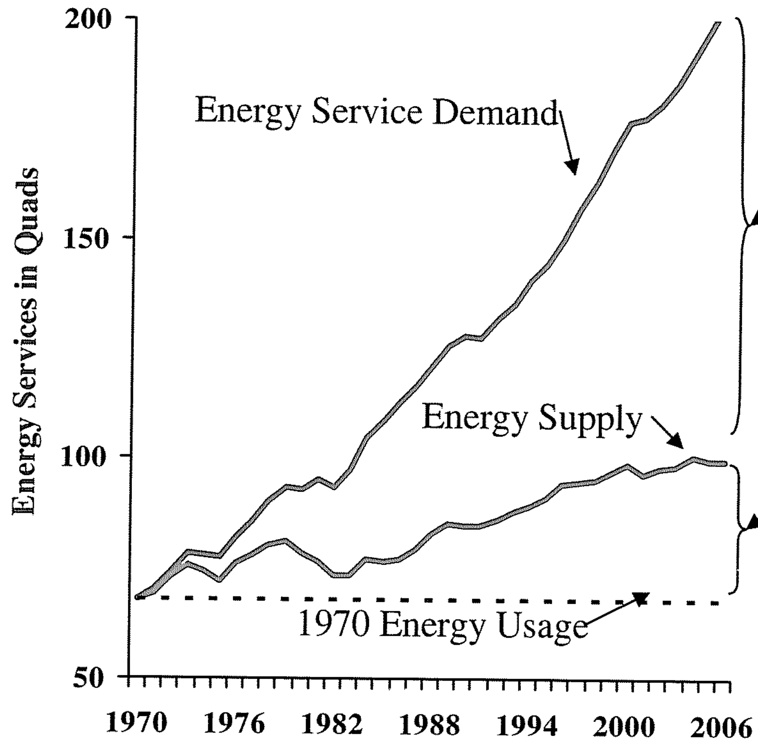
Coal Usage and Powerplant Stocks



Will We See Cheap and Abundant Energy Again?

- Prices not returning to 20^{th}-century lows
- Delivery problems mounting
  - Resources ‘in ground’ mean less than deliverability capacity
- Bringing any new resources to energy markets is harder than ever
- U.S. energy markets are in a “straitjacket” situation

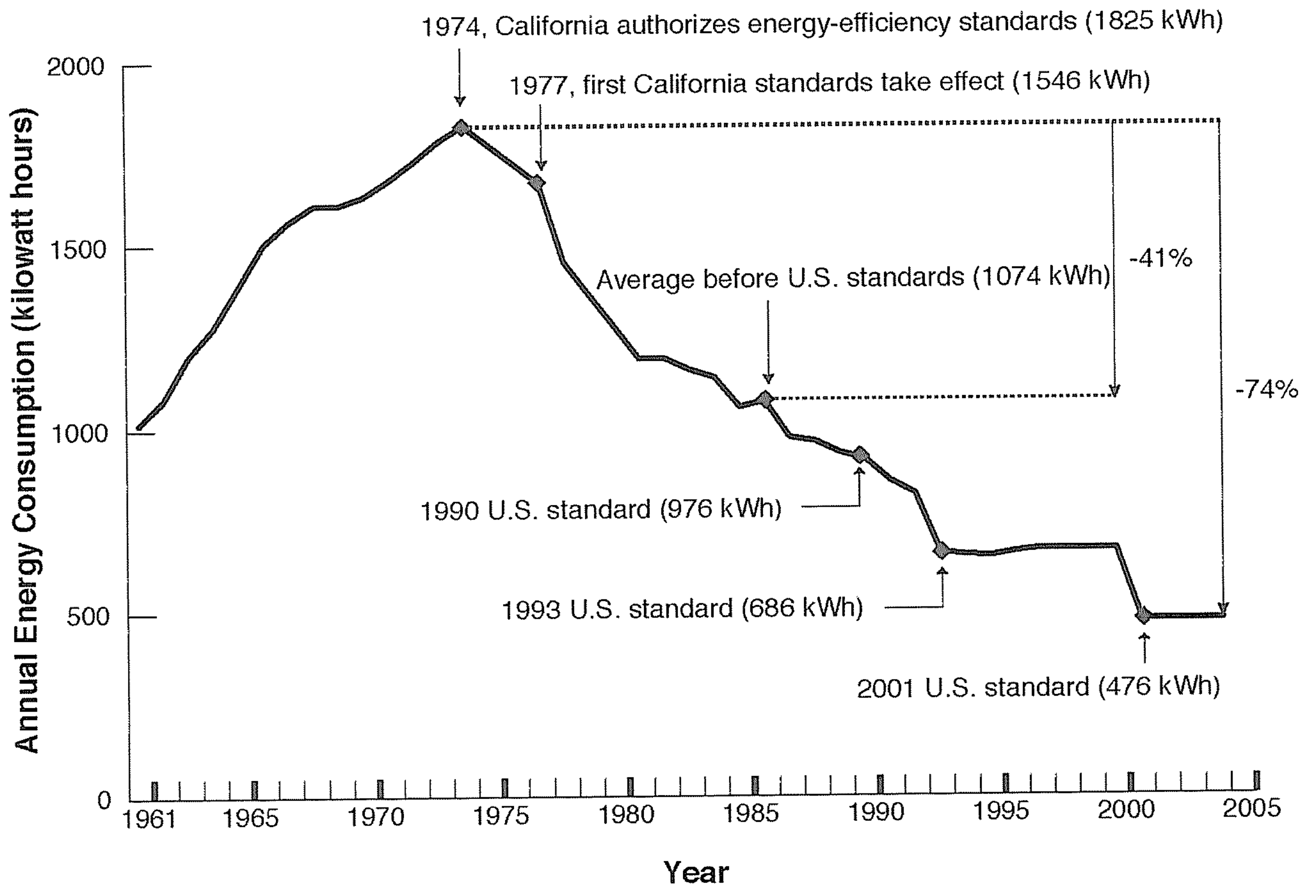
Now for Some Good News: Efficiency and the Economy



- Since 1970, ***energy efficiency*** has met 77% of new energy service demands in the U.S, while ***new energy supplies*** have contributed only 23% of new energy service demands.

How Efficiency Meets New Service Demand

The humble refrigerator...



U.S. Energy Infrastructure Investment in 2004

- Total annual investment in energy-efficient technologies and services = $300+ billion
  - Energy Star Product sales = $88 billion
  - Efficiency value added is not 100% of all investments
- Total 2004 U.S. investment in *energy supply* infrastructure = $100 billion
- **Inference**: U.S. energy services infrastructure investment exceeds energy supply infrastructure investment
- **Implication:** Investment opportunity is larger on the demand side than the supply side

Examples of EE Investment

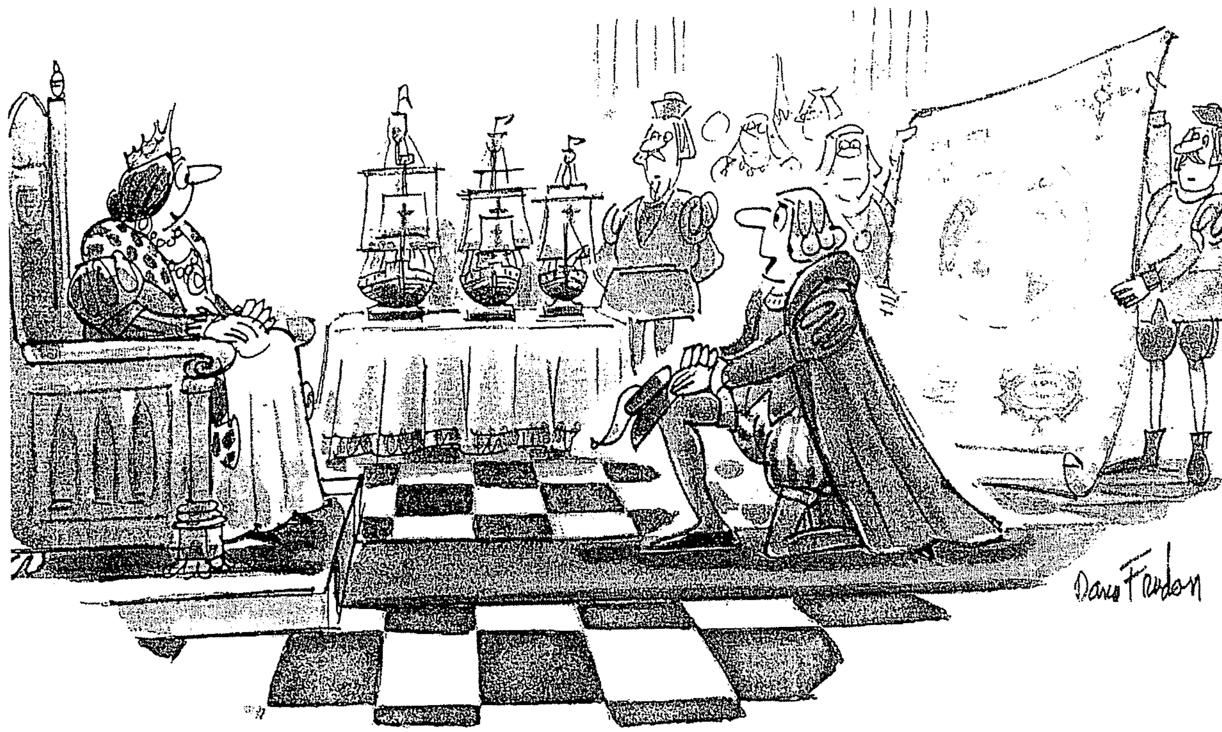
U.S. EE Spending, with Kentucky examples

- $88 billion on Energy Star Products
  - *Kentucky: 154 partners total, including GE*
- $29 billion on Energy Star Homes
  - *Kentucky: 58 homebuilders*
- $12 billion on Energy Star windows
  - *Kentucky: 7 companies*
- $5 billion on insulation
  - *Kentucky: 1 manufacturer*
- $32 billion on vehicles
  - *Kentucky: Toyota*

Efficiency Investment and Job Creation

- 2004 energy efficiency investment supports 1.6 million U.S. jobs
  - 230,000 directly attributable to efficiency value added
  - Distributed among manufacturing, services, construction
  - Jobs created in more labor-intensive sectors than those stimulated by energy supply investments
  - Direct jobs multiplier:
    - > 6 jobs per $ million invested, vs.
    - ~ 2 jobs/$ million for typical supply investments

The 'Eternal Caveat' on Job Creation

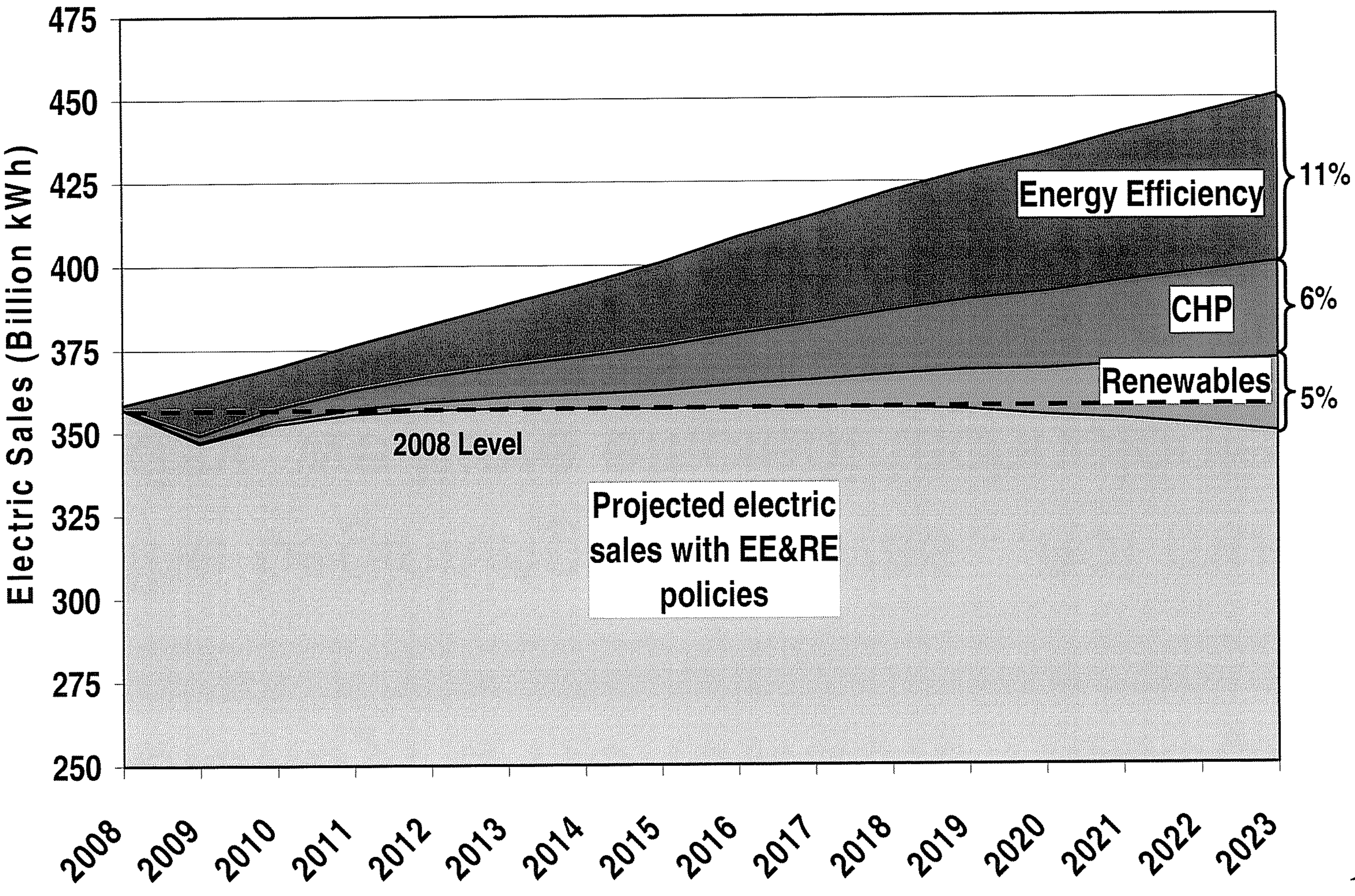


"Your Majesty, my voyage will not only forge a new route to the spices of the East, but it will also create over 3,000 jobs."

Efficiency and Future Energy Service Demands

- ACEEE efficiency potential studies show we can meet most energy service demand growth through efficiency
- Efficiency and renewables together can meet most future demand growth
- EE and RE provide price hedge and other value to resource portfolios

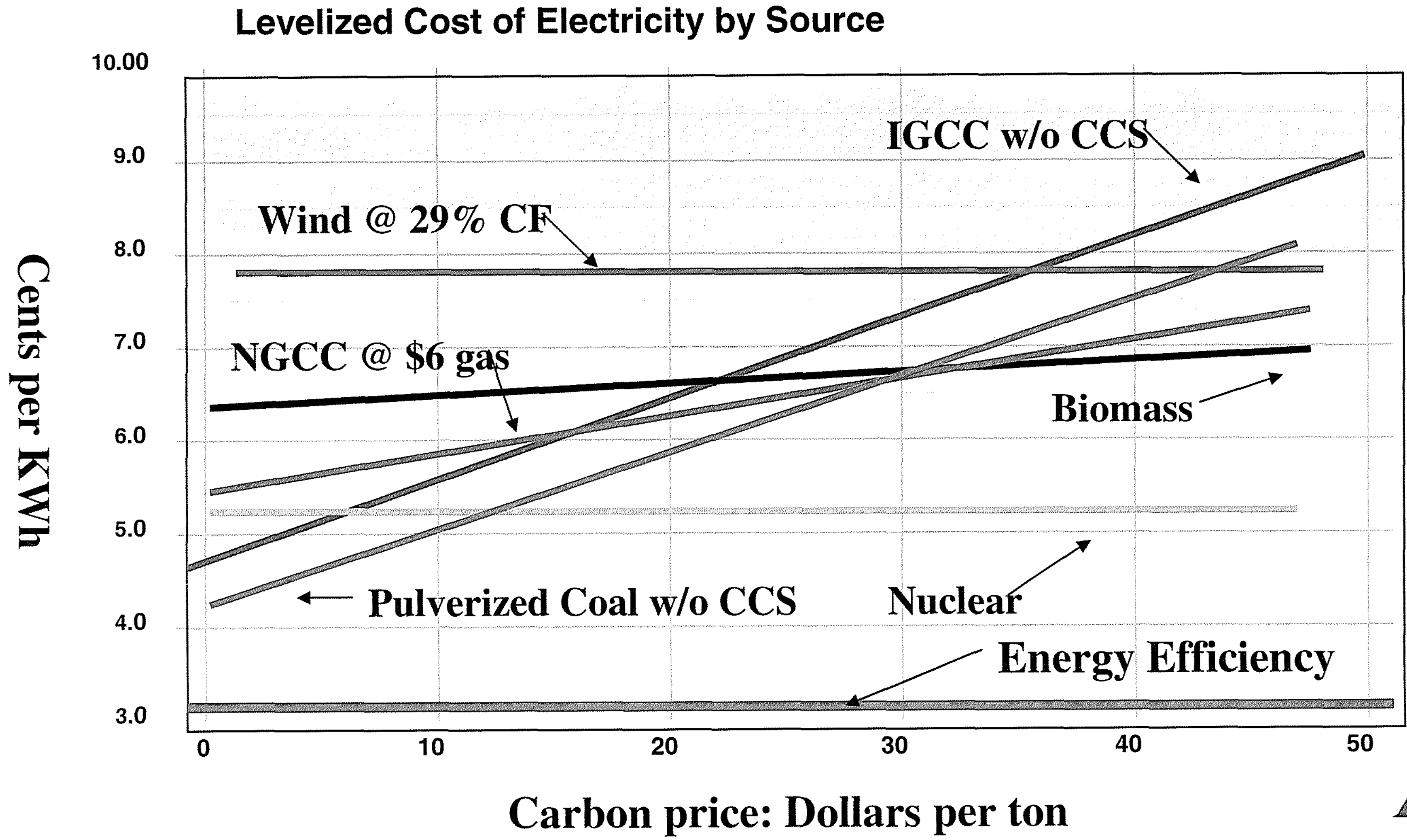
The Texas Example



Efficiency: a Renewable Resource

- In the beginning, there was…not much
- Today, we have efficient technologies in all end-use sectors
- Efficiency potential studies show we can cut demand growth by more than half
- Efficiency potentials stay high; new technologies and cost drops keep "refilling the well"

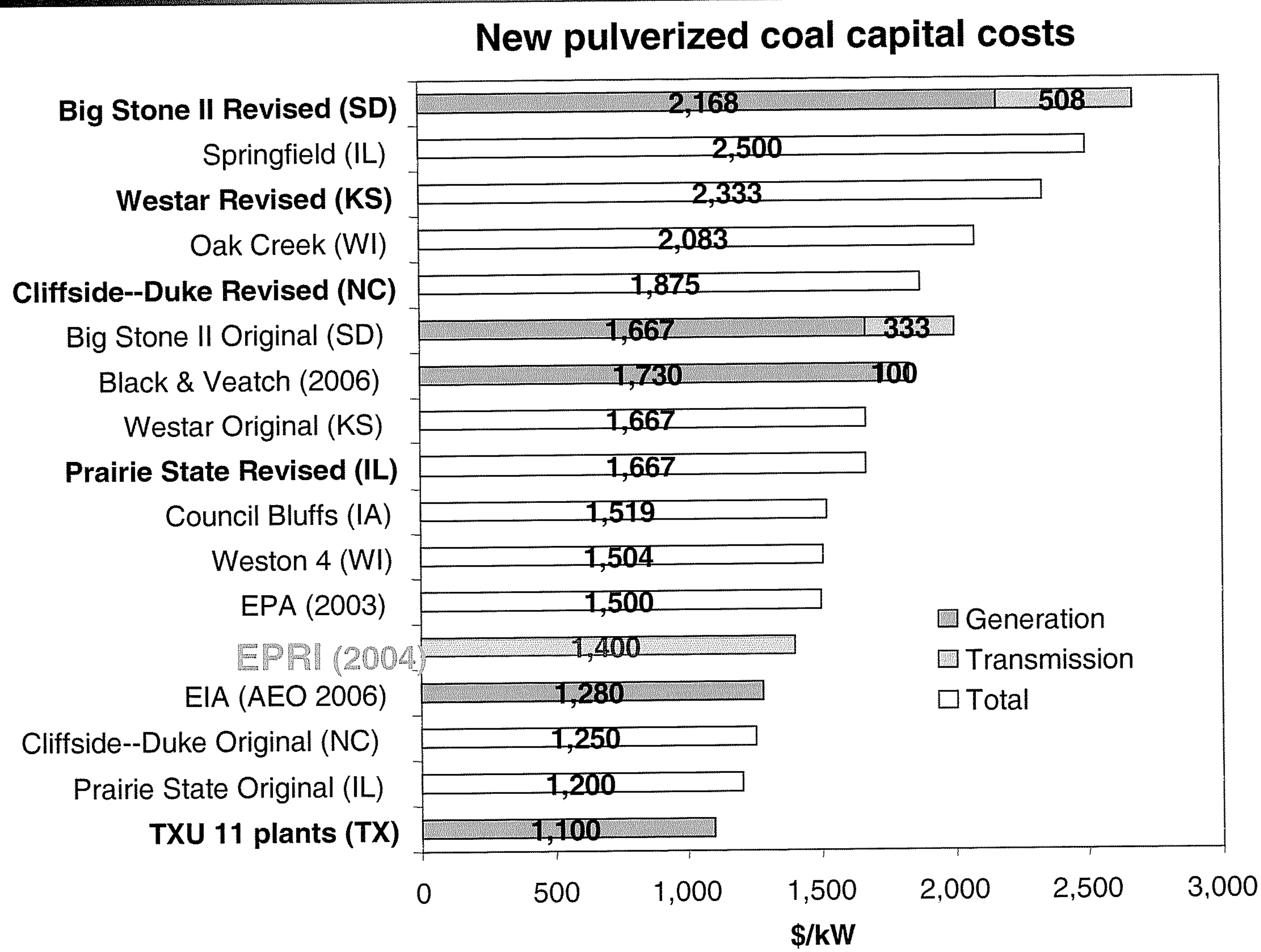
The Cheapest kWh



Leading State EE Economics

State	Benefit/Cost All programs	C/I programs B/C	Res. Programs B/C	Cost of saved kWh($)
California	2.0 – 2.4			0.03
Connecticut	NA	2.4 to 2.6	1.5 to 1.7	0.023
Maine	1.3 – 7.0			
Mass.	2.1	2.4 to 2.7	1.3 to 2.1	0.04
New Jersey				0.03
New York				0.044
Rhode Island	2.5	3.3	1.5	
Vermont	2.5	2.9	1.8	0.03
Wisconsin	3.0	2.0	4.3	
Median	**2.1 to 2.5**	**2.5 to 2.6**	**1.6 to 1.7**	**0.03**

Rising Powerplant Costs



But: Policy Leadership is Needed To Spur EE Markets

- Markets work, but won't reap enough EE fast enough
  - Income elasticity and cross-elasticity block price elasticity
  - Principal-agent barriers—builder-buyer, landlord-tenant
  - Information-cost barriers—consumers don't have time/$ to study each purchase
- IEA study: over half of building heating/cooling/hot water is affected by the principal-agent barrier
- Utility regulation must be reformed for the 21st century
- ***Bottom line:*** **policy action is need to make markets work for a clean energy future**

States Have Become the Leaders on Energy Policy

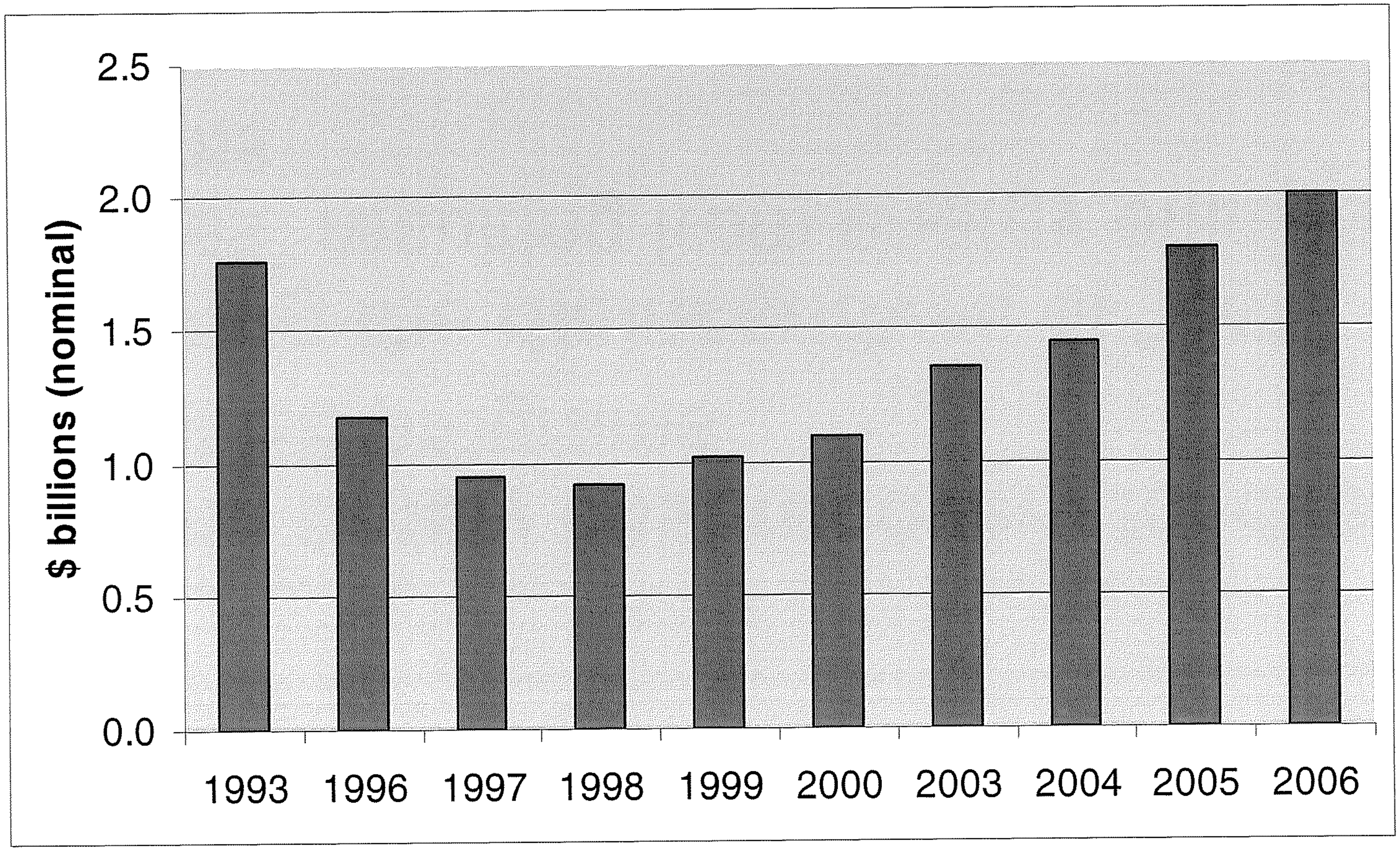
- Congress struggling to move transformational energy policies
- States more and more the laboratories of innovation and effectiveness
- States now outspending the federal government by 3:1
- State leadership more important than ever

Why are So Many States Leading with Efficiency?

- It's the only resource reliably available in *EVERY STATE*
- Most conventional energy dollars go out of state—more of the efficiency dollar STAYS HOME—so it's an economic winner
- It's something you can do *NOW (IMTOO)*
- It's a great hedge, against rising prices, supply problems, environmental problems

…*that's why we call it the 'first fuel*

Spending on Utility Sector Efficiency Programs



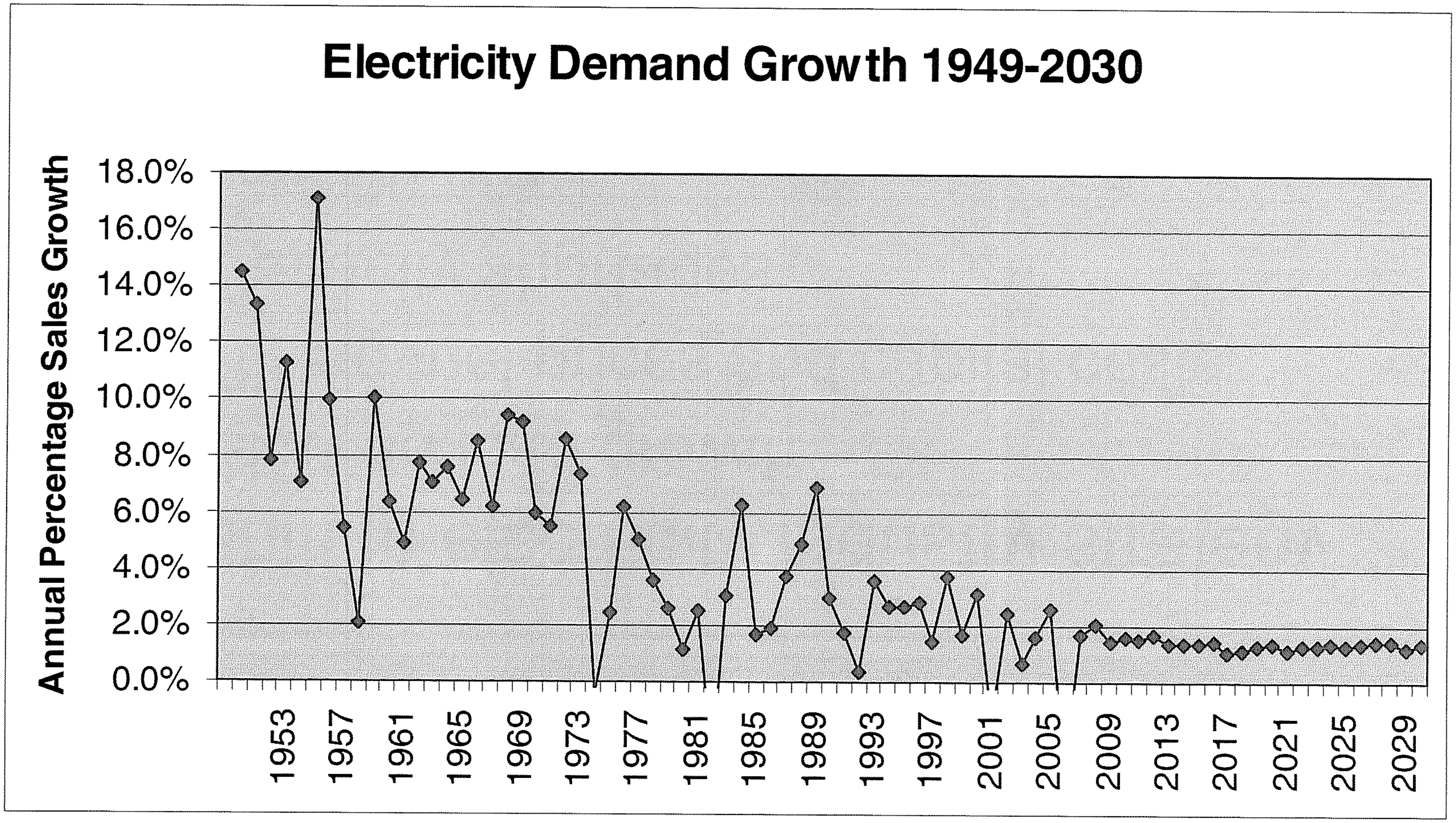
Three Utility Regulatory Issues

- **Allowing timely cost recovery** for direct costs of EE programs
- **Removing the disincentives** of "lost revenues" resulting from energy efficiency programs
- **Creating earnings potential** from energy efficiency program investments

Where's the Electricity Business Heading?

- A shift in electricity industry strategy
  - Slowing load growth
  - Rising fuel prices and capital costs
  - Capacity shortages
  - Carbon risk
  - Growing understanding of demand side investment potential
  - Consideration of new business models (eg. Duke Energy Save-a-Watt in NC, SC, IN)

Where's the Electricity Business Heading?



Where's the Electricity Business Heading?

- Proliferating state EERS encouraging federal action
- House-passed RPS bill in August requires 15% renewable electricity supply by 2020
  - allows EE to meet up to 27% of requirements
- Resembles MN and IL EE-RE policies
- States may see a federal requirement driving EE and well as RE resource acquisition

Where Does Kentucky's Energy Story Go From Here?

- There's no turning back the clock
  - Energy prices aren't falling
  - Fuels aren't getting easier to deliver
  - The climate challenge is growing
- The rest of the story starts with energy efficiency
  - Policies that spur investment in EE for job creation and balanced economic growth
- The happy ending comes from building a 21^{st}-century economy on clean technology

Contact Information

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RECEIVED
MAR 3 0 2007
PUBLIC SERVICE COMMISSION

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

PETITION OF KENTUCKY UTILITIES COMPANY FOR CONFIDENTIAL PROTECTION OF CERTAIN PLANNING-RELATED INFORMATION FILED IN CONNECTION WITH ITS 2006 ANNUAL RESOURCE ASSESSMENT FILING	)	Adm. **CASE NO.** ~~**2007-**~~ 387

PETITION OF
KENTUCKY UTILITIES COMPANY
FOR CONFIDENTIAL PROTECTION

Kentucky Utilities Company ("KU") petitions the Public Service Commission of Kentucky ("Commission") pursuant to 807 KAR 5:001, Section 7, to grant confidential protection to certain planning-related information it is required to submit in connection with its annual report. In support of this Petition, KU states as follows:

1. By Order of December 20, 2001, in *In the Matter of: A Review of the Adequacy of Kentucky's Generation Capacity and Transmission System,* Administrative Case No. 387, the Commission established findings regarding the adequacy of Kentucky's generation capacity and transmission system. In an effort to continue monitoring these issues, however, the Commission ordered Kentucky's six major jurisdictional electric utilities to file annually certain planning-related information, as defined in Appendix G to its Order, and as amended in its subsequent Order dated March 29, 2004. By Order of October 7, 2005, the Commission closed Administrative Case No. 387, but required jurisdictional utilities to continue to submit such information as a supplement to their annual report (such annual report being the FERC Form No. 1).

2. Simultaneous with the filing of this Petition, KU is filing its annual report including the planning-related information required by Appendix G to the Commission's December 20, 2001 Order. KU's response to Item No. 14 of Appendix G regarding the need for transmission capacity additions contains confidential information the disclosure of which has a reasonable likelihood of threatening public safety. Additionally, KU's response to Item No. 11 of Appendix G regarding scheduled outages or retirements of generating capacity contains confidential commercial information the disclosure of which would cause KU competitive injury. Therefore, KU's responses to Item Nos. 11 and 14 are being submitted with this request for confidential treatment.

Transmission Capacity Additions

3. Pursuant to Item No. 14 of Appendix G to the Commission's December 20, 2001 Order in Administrative Case No. 387, jurisdictional electric utilities must file annually all planned transmission capacity additions for the 10 years following such filing including such facility's expected in-service date, size and site, as well as, identify the transmission need each addition is intended to address.

4. On June 20, 2005, the Kentucky General Assembly amended the Kentucky Open Records Act to protect from disclosure certain information that has a reasonable likelihood of threatening public safety by exposing a vulnerability "in preventing, protecting against, mitigating, or responding to a terrorist act." KRS 61.878(1)(m). This includes infrastructure records exposing such a vulnerability in the location, configuration, or security of critical systems, including electrical systems. KRS 61.878(1)(m)(1)(f).

5. The information provided in response to Item No. 14 reveals information regarding KU's transmission capacity additions and the need that such additions are intended to address. If such information is made available in the public record, individuals seeking to induce public harm will have critical information concerning the present vulnerabilities of KU's transmission system. Knowledge of such vulnerabilities may allow such a person to cause public harm through the disruption of the electric transmission system.

6. The information contained in response to Item No. 14 for which KU is seeking confidential treatment is not known outside of KU, and it is not disseminated within KU except to those employees with a legitimate business need to know and act upon the information.

Scheduled Outages

7. Pursuant to Item No. 11 of Appendix G to the Commission's December 20, 2001 Order in Administrative Case No. 387, jurisdictional electric utilities also must file annually information concerning scheduled outages or retirements of generating capacity.

8. The Kentucky Open Records Act protects commercial information, generally recognized as confidential or proprietary, if its public disclosure would cause competitive injury to the disclosing entity. KRS 61.878(1)(c). Competitive injury occurs when disclosure of the information would give competitors an unfair business advantage. The information contained in the response to Item No. 11 contains such competitive and proprietary information, and is therefore being submitted with this request for confidential treatment.

9. KU's response to Item No. 11 regarding scheduled maintenance outages and retirements of generation capacity contains sensitive commercial information, the disclosure of which would unfairly advantage KU's competitors for wholesale power sales. This information would allow competitors of KU to know when KU's generating plants will be down for maintenance and thus know a crucial input into KU's generating costs and need for power and energy during those periods. The commercial risk of the disclosure of this information is that potential suppliers will be able to manipulate the price of power bid to KU in order to maximize their revenues, thereby causing higher prices for KU's customers and giving a commercial advantage to KU's competitors.

10. Further, disclosure of this information will damage KU's competitive position and business interests. The information provided in response to Item No. 11 regarding scheduled outages is highly sensitive information that, if made public, would enable prospective purchasers of KU's power supply to manipulate the bidding process to the detriment of KU. Thus, disclosure of this information may detrimentally impact KU's ability to contract for off-system sales during the same time period. Any impairment of KU's ability to obtain fair prices for its power supply will decrease the price KU is paid for its power supply. As a result, KU will not get the same quality of offers that would be produced by a system protected by the confidentiality employed by unregulated business and KU will not be able to compete effectively for off-system sales.

11. The information contained in response to Item No. 11 of the Commission's Order for which KU is seeking confidential treatment is not known outside of KU, and it is not disseminated within KU except to those employees with a legitimate business need to know and act upon the information. This information is not on file with the Federal Energy Regulatory

Commission, the Securities and Exchange Commission or other public agencies, and is not available from any commercial or other source outside of KU.

12. The information contained in response to Item No. 11 and for which KU is seeking confidential protection is identical in nature to that provided to the Commission in response to the Commission's requests for information in Case No. 2000-497 and previously in this proceeding. The Commission granted confidential protection to KU's planned maintenance schedule for each of KU's generating units.

13. The information provided in response to Item Nos. 11 and 14 of Appendix G to the Commission's December 20, 2001 Order demonstrates on its face that it merits confidential protection. If the Commission disagrees, however, it must hold an evidentiary hearing to protect the due process rights of KU and supply the Commission with a complete record to enable it to reach a decision with regard to this matter. *Utility Regulatory Commission v. Kentucky Water Service Company, Inc.*, Ky. App., 642 S.W.2d 591, 592-94 (1982).

14. KU does not object to disclosure of the confidential information, pursuant to a protective agreement, to intervenors with a legitimate interest in reviewing the confidential information for the purpose of assisting the Commission's review in this proceeding.

15. In accordance with the provisions of 807 KAR 5:001 Section 7, one copy of KU's response to the Commission's request with the confidential information highlighted and ten (10) copies of KU's response without the confidential information is herewith filed with the Commission.

WHEREFORE, Kentucky Utilities Company respectfully requests that the Commission grant confidential protection, or in the alternative, schedule an evidentiary hearing on all factual issues.

Respectfully submitted,

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COUNSEL FOR
KENTUCKY UTILITIES COMPANY

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Frankfort, Kentucky 40602-0615

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MAR 30 2007
PUBLIC SERVICE COMMISSION

March 30, 2007

Re: ***Annual Report Form No. 1 and Annual Resource Assessment for Kentucky Utilities Company Pursuant to Administrative Case No. 387***

Dear Mr. Feldman:

Enclosed is one completed signed copy of Annual Report Form No. 1 for Electric Utilities covering the operations of Kentucky Utilities Company ("KU").

Also enclosed, in accordance with Ordering Paragraph (2) of the Commission's Order in Administrative Case 387, dated October 7, 2005, are an original and five (5) copies of the 2006 Annual Resource Assessment Filing for KU, along with a Petition for Confidential Protection regarding certain information provided in response to Item Nos. *11* and *14*.

Sincerely,

Robert M. Conroy

Robert M. Conroy

Enclosures

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

In the Matter of:

A REVIEW OF THE ADEQUACY OF	)	
KENTUCKY'S GENERATION CAPACITY	)	ADMINISTRATIVE
AND TRANSMISSION SYSTEM	)	CASE NO. 387

2006 ANNUAL RESOURCE ASSESSMENT FILING OF KENTUCKY UTILITIES COMPANY PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER DATED DECEMBER 20, 2001 AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004

FILED: MARCH 2007

KENTUCKY UTILITIES COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387 AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004 FILED MARCH 2007

ITEM NO. 1

The information originally requested in Item 1 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

KENTUCKY UTILITIES COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387 AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004 FILED MARCH 2007

ITEM NO. 2

The information originally requested in Item 2 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

KENTUCKY UTILITIES COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007

ITEM NO. 3

RESPONDENT: Robert Thomson/Scott Cooke

3. Actual and weather-normalized monthly coincident peak demands for the just completed calendar year. Demands should be disaggregated into (a) native load demand (firm and non-firm) and (b) off-system demand (firm and non-firm).

Response:

Please refer to the attached Table KU-3, which shows the actual and weather-normalized native KU peak demands. The normalized native KU stand alone peak demands are available only on a seasonal (summer/winter) basis.

TABLE KU-3
NATIVE AND OFF-SYSTEM DEMANDS BY MONTH FOR 2006

Kentucky Utilities

	Actual			Normal Weather (Seasonal)	Off-System (1)		
Time of Monthly Native Peak	Native Peak	Non-Firm	Firm	Native Peak	Firm (2)	Non-Firm (2)	Total
2006-01-26 08:00	3,512	14	3,498		0	0	0
2006-02-06 08:00	3,631	14	3,617		0	0	0
2006-03-22 08:00	3,415	21	3,394		0	0	0
2006-04-10 07:00	2,867	61	2,806		0	0	0
2006-05-31 14:00	3,688	59	3,629		111	0	111
2006-06-22 14:00	3,919	69	3,850		0	0	0
2006-07-31 18:00	4,033	61	3,972		0	0	0
2006-08-02 14:00	4,207	7	4,200	4,257	84	2	86
2006-09-08 15:00	3,109	24	3,085		279	160	439
2006-10-25 07:00	3,208	46	3,162		55	76	131
2006-11-21 08:00	3,442	105	3,337		147	276	423
2006-12-08 08:00	4,172	31	4,141	4,194	0	0	0

Notes

(1) The allocation of off-system sales split between LG&E and KU is handled in the After-the-Fact Billing process in accordance with the Power Supply System Agreement between LG&E and KU. The individual company sales will include an allocation of the sales sourced with purchased power and allocated to the individual company based on each company's contribution to off-system sales.

(2) The allocation of off-system sales between firm and non-firm is not available from the hourly data in AFB. The breakout is based on the monthly totals for LG&E and KU sales for firm and non-firm sales.

KENTUCKY UTILITIES COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
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FILED MARCH 2007

ITEM NO. 4

RESPONDENT: Robert Thomson

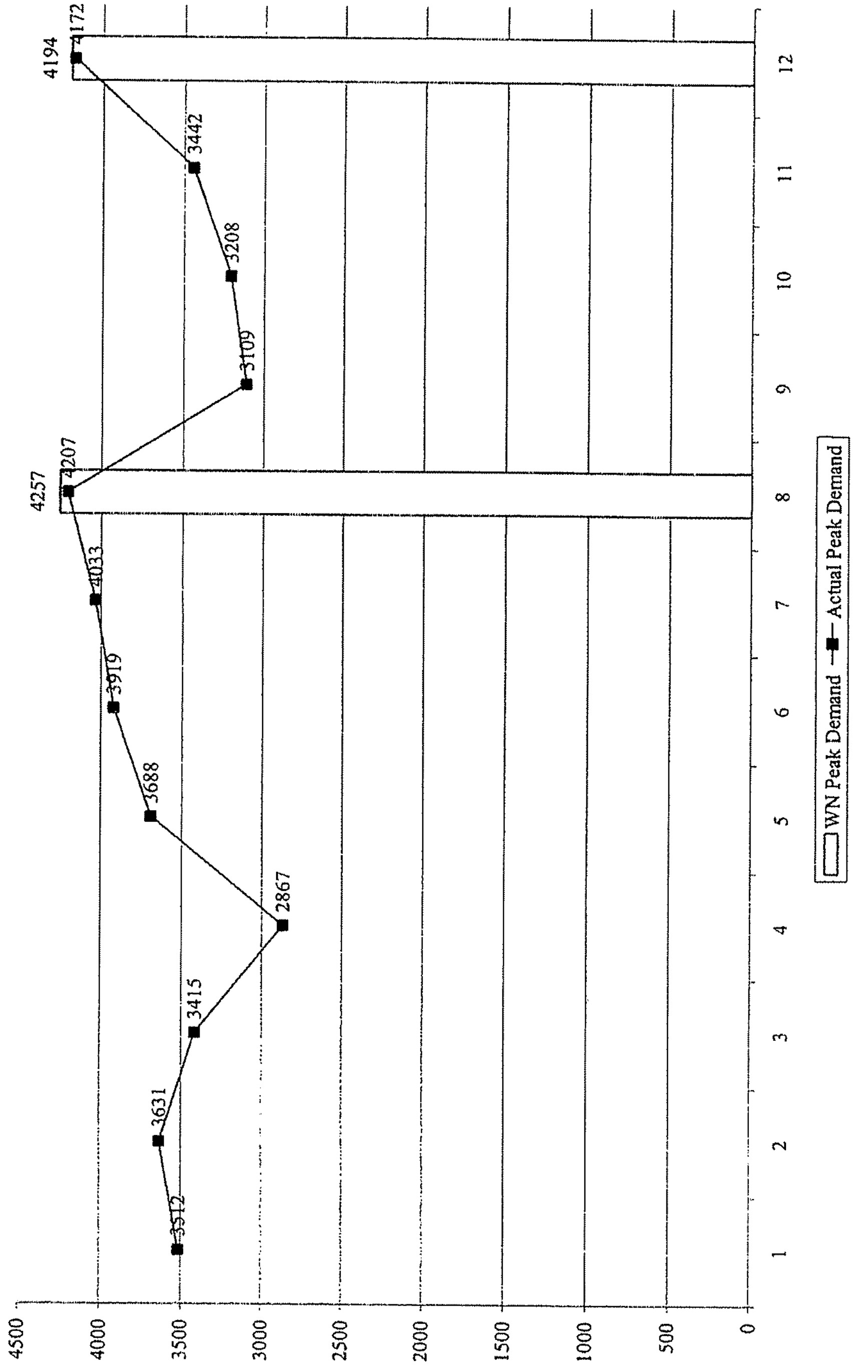
4. Load shape curves that show actual peak demands and weather-normalized peak demands (native load demand and total demand) on a monthly basis for the just completed calendar year.

Response:

Please refer to the attached Figure KU-4.

Figure KU-4

Actual and Weather-Normalized KU Peak Demand (MW) - 2006



KENTUCKY UTILITIES COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
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FILED MARCH 2007

ITEM NO. 5

The information originally requested in Item 5 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

KENTUCKY UTILITIES COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007

ITEM NO. 6

RESPONDENT: Robert Thomson/Scott Cooke

6. Based on the most recent demand forecast, the base case demand and energy forecasts and high case demand and energy forecasts for the current year and the following four years. The information should be disaggregated into (a) native load (firm and non-firm demand) and (b) off-system load (both firm and non-firm demand).

Response:

a) Please see the attached Table KU-6a.

b) Off-system sales ("OSS") projections for 2007-2011 contained in the attached Table KU-6b are based on the Companies' 2006 Plan. For OSS, only base case total sales energy projections exist for 2007-2011. The projections consist of "Existing OSS", which includes existing long-term sales agreements, and the expected market sales, dubbed "Wholesale OSS". Currently, there are no existing long-term sales agreements. In the long-range model, wholesale financially Firm and Non-firm sales are not distinguished but are combined into an overall expected sales energy.

   The projection is developed in-house using the Global Energy's PROSYM hourly production cost model, with market prices based on data provided to the E.On U.S. Energy Marketing group from several external parties including utilities, energy marketing entities, and/or brokers.

Table KU-6a

Kentucky Utilities	2007	2008	2009	2010	2011
Energy Sales (GWh)	21,613	22,054	22,519	22,910	23,284
Energy Requirements (GWh)	22,964	23,416	23,914	24,320	24,722
Native Peak Demand (MW)	4,235	4,318	4,410	4,485	4,559

* 2007 LT Forecast. No High Case was produced.

Table KU-6b
Total Base Case Off-System Sales Energy Projection

	2007	2008	2009	2010	2011
Existing OSS (GWH)	0	0	0	0	0
Wholesale OSS (GWH)	2,159	2,154	1,964	2,249	2,757
Total OSS (GWH)	2,159	2,154	1,964	2,249	2,757

KENTUCKY UTILITIES COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
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DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007

ITEM NO. 7

RESPONDENT: Scott Cooke

7. The target reserve margin currently used for planning purposes, stated as a percentage of demand. If changed from what was in use in 2001, include a detailed explanation for the change.

Response:

The Companies established an optimal reserve margin range of 12% to 14%, with 14% recommended for planning purposes. The range provides an optimum level of reliability through various system operating conditions. The reserve margin analysis was performed as part of the 2005 Integrated Resource Plan ("2005 IRP"), filed with the Commission in April 2005 (Case No. 2005-00162).

The Companies utilized a planning reserve margin target of 12% in 2001 and 14% in 2002 based on a reserve margin range of 11%-14% established in the Companies' 1999 IRP. A detailed explanation of the current target reserve margin is documented in the report titled "2005 Analysis of Reserve Margin Planning Criterion" contained in Volume III of the Companies' 2005 IRP. The Companies have utilized a 14% planning reserve margin target since 2002.

KENTUCKY UTILITIES COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387 AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004 FILED MARCH 2007

ITEM NO. 8

***RESPONDENT:* Scott Cooke**

8. Projected reserve margins stated in megawatts and as a percentage of demand for the current year and the following 4 years. Identify projected deficits and current plans for addressing these. For each year identify the level of firm capacity purchases projected to meet native load demand.

Response:

The requested data related to the reserve margin is specified in the attached table KU-8. The capacity required to meet the reserve margin targets of 12% and 14% are specified in the table. These values represent reserve margins prior to any future resource acquisition.

The Companies are projected to have a reserve margin shortfall in 2008 thru 2013 and are evaluating resources to meet the established 14% reserve margin target in a least cost manner. The shortfall is due in part to the loss of the EEI power purchase contract (200 MW) that expired at the end of 2005, and the notice of termination by OMU of the power purchase contract (approximately 169 MW) effective in 2010. The status of the pending litigation is detailed in KU's Response to Commission Staff's Interrogatories and Request for Production of Documents dated 2/8/07, Question No. 2 filed with the Commission on February 23, 2007 in Case No. 2006-00509.

Also, as approved by the Commission in Case No. 2004-507, the Companies are adding capacity by constructing Trimble County 2 that is scheduled for completion by early 2010.

Table KU-8
Combined Company
Reserve Margin Needs (MW)

Current Values	**2007**	**2008**	**2009**	**2010**	**2011**
Peak Load with CSR/Interrupt	6,933	7,080	7,239	7,345	7,489
Existing DSM	-114	-122	-122	-122	-122
New DSM (from '05 IRP)	-9	-13	-19	-24	-29
Net Load	6,810	6,945	7,098	7,199	7,338
Existing Capability	7,521	7,507	7,465	7,467	7,469
OMU	169	168	167	0	0
OVEC	179	179	179	179	179
Total Supply	7,869	7,854	7,811	7,646	7,648
MW Margin	1,059	909	713	447	310
Reserve Margin %	15.5%	13.1%	10.0%	6.2%	4.2%
Capacity Need for 12%	(241)	(76)	139	416	570
Capacity Need for 14%	(105)	63	281	560	717
New Capacity	0	0	0	549	0
Total Supply	7,869	7,854	7,811	8,195	8,197
Reserve Margin, MW	1,059	909	713	996	859
Reserve Margin %	15.5%	13.1%	10.0%	13.8%	11.7%

Based on **2007** Load forecast.

KENTUCKY UTILITIES COMPANY

**2006 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007**

ITEM NO. 9

The information originally requested in Item 9 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

KENTUCKY UTILITIES COMPANY

**2006 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007**

ITEM NO. 10

The information originally requested in Item 10 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

KENTUCKY UTILITIES COMPANY

**2006 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007**

ITEM NO. 11

RESPONDENT: Scott Cooke

11. A list that identifies scheduled outages or retirements of generating capacity during the current year and the following four years.

Response:

The planned maintenance outage schedule for 2007 through 2011 is being provided pursuant to a Petition for Confidential Protection. The schedule is regularly modified based on actual operating conditions, forced outages, changes in the schedule required to meet environmental compliance regulations, fluctuations in wholesale prices, and other unforeseen events.

Tyrone 1 and 2 were retired on midnight of February 26, 2007 as indicated in KU's Supplemental Response to Commission Staff's Interrogatories and Request for Production of Documents dated 2/8/07, Question No. 4 filed with the Commission on March 2, 2007 in Case No. 2006-00509.

KENTUCKY UTILITIES COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387 AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004 FILED MARCH 2007

ITEM NO. 12

RESPONDENT: Scott Cooke

12. Identify all planned base load or peaking capacity additions to meet native load requirements over the next 10 years. Show the expected in-service date, size and site for all planned additions. Include additions planned by the utility, as well as those by affiliates, if constructed in Kentucky or intended to meet load in Kentucky.

Response:

The Companies are currently evaluating additional capacity required to satisfy the increasing load growth identified in the Companies' 2005 IRP. The table below contains MW needs to maintain a 14% reserve margin through 2016 based on the most recent load forecast.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
MW Need	(105)	63	281	11	168	255	394	(250)	(103)	(134)

The expansion plan identified below is the same as the Companies' 2005 IRP thru the year 2012, which includes the construction of Trimble County Unit 2 as approved by the Commission in Case No. 2004-00507.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
New Capacity	0	0	0	549	0	0	0	739	0	148

Post 2012, a 739 MW base load unit in 2014 and a simple cycle combustion turbine in 2016 are planned. The site selection for these units has not been determined. The Companies are beginning the process of developing the 2008 Integrated Resource Plan to be filed April 2008, which will further identify the appropriate resource additions.

KENTUCKY UTILITIES COMPANY

**2006 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007**

ITEM NO. 13

RESPONDENT: Lonnie Bellar

13. *The following transmission energy data for the just completed calendar year and the forecast for the current year and the following four years:*

a. Total energy received from all interconnections and generation sources connected to the transmission system.

b. Total energy delivered to all interconnections on the transmission system.

c. Peak load capacity of the transmission system.

d. Peak demand for summer and winter seasons on the transmission system.

Response:

Data exists for 2006. The Company does not forecast this type of data; therefore no forecast exists for 2007-2010.

a. LG&E and KU operate as a single NERC Control area that contains several generators not owned by LG&E and KU; the non-Company owned facilities are also included as sources below:

Tie Lines Received (MWH)	14,269,190
Net Generation-LG&E (MWH)	17,032,640
Net Generation-KU (MWH)	17,087,538
Net Received from OMU (MWH)	1,284,796
Net Generation-IPPs (MWH)	1,088,459
Total Sources (MWH)	50,762,623

b. LG&E and KU operate as a single Control Area, the amount of energy delivered at the interconnections of the single Control area were 16,071,542 MWH(s).

c. There is no set number for peak load capacity for the transmission system. The system is built to support native load under first contingency conditions. Actual transmission capacity available for native load, import, export or thru-flow will vary depending on which facilities (generation, load or transmission) in the interconnected transmission system of the eastern interconnect are connected and operated.

d. The maximum summer peak transmission load for the combined LG&E/KU transmission system was 7437 MW for the peak hour of 8/2/2006 at 3PM.

The maximum winter peak transmission load for the combined LG&E/KU transmission system was 6508 for the peak hour of 12/8/2006 at 8 AM.

KENTUCKY UTILITIES COMPANY

**2006 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007**

ITEM NO. 14

RESPONDENT: Lonnie Bellar

14. Identify all planned transmission capacity additions for the next 10 years. Include the expected in-service date, size and site for all planned additions and identify the transmission need each addition is intended to address.

Response:

The response to this item is being provided pursuant to a Petition for Confidential Protection.

2006 Annual Resource Assessment Filing of
Louisville Gas and Electric Company
Pursuant to
Appendix G of PSC Order Dated 12/20/01
As Amended by Orders Dated
3/29/04 and 10/7/05 in
Administrative Case No. 387

Filed March 30, 2007

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PUBLIC SERVICE
COMMISSION

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION

In the Matter of:

PETITION OF LOUISVILLE GAS AND ELECTRIC COMPANY FOR CONFIDENTIAL PROTECTION OF CERTAIN PLANNING-RELATED INFORMATION FILED IN CONNECTION WITH ITS 2006 ANNUAL RESOURCE ASSESSMENT FILING	)	**CASE NO. ~~2007-~~** Adm. 387

PETITION OF
LOUISVILLE GAS AND ELECTRIC COMPANY
<u>FOR CONFIDENTIAL PROTECTION</u>

Louisville Gas and Electric Company ("LG&E") petitions the Public Service Commission of Kentucky ("Commission") pursuant to 807 KAR 5:001, Section 7, to grant confidential protection to certain planning-related information it is required to submit in connection with its annual report. In support of this Petition, LG&E states as follows:

1. By Order of December 20, 2001, in *In the Matter of: A Review of the Adequacy of Kentucky's Generation Capacity and Transmission System,* Administrative Case No. 387, the Commission established findings regarding the adequacy of Kentucky's generation capacity and transmission system. In an effort to continue monitoring these issues, however, the Commission ordered Kentucky's six major jurisdictional electric utilities to file annually certain planning-related information, as defined in Appendix G to its Order, and as amended in its subsequent Order dated March 29, 2004. By Order of October 7, 2005, the Commission closed Administrative Case No. 387, but required jurisdictional utilities to continue to submit such

information as a supplement to their annual report (such annual report being the FERC Form No. 1).

2. Simultaneous with the filing of this Petition, LG&E is filing its annual report including the planning-related information required by Appendix G to the Commission's December 20, 2001 Order. LG&E's response to Item No. 14 of Appendix G regarding the need for transmission capacity additions contains confidential information the disclosure of which has a reasonable likelihood of threatening public safety. Additionally, LG&E's response to Item No. 11 of Appendix G regarding scheduled outages or retirements of generating capacity contains confidential commercial information the disclosure of which would cause LG&E competitive injury. Therefore, LG&E's responses to Item Nos. 11 and 14 are being submitted with this request for confidential treatment.

Transmission Capacity Additions

3. Pursuant to Item No. 14 of Appendix G to the Commission's December 20, 2001 Order in Administrative Case No. 387, jurisdictional electric utilities must file annually all planned transmission capacity additions for the 10 years following such filing including such facility's expected in-service date, size and site, as well as, identify the transmission need each addition is intended to address.

4. On June 20, 2005, the Kentucky General Assembly amended the Kentucky Open Records Act to protect from disclosure certain information that has a reasonable likelihood of threatening public safety by exposing a vulnerability "in preventing, protecting against, mitigating, or responding to a terrorist act." KRS 61.878(1)(m). This includes infrastructure

records exposing such a vulnerability in the location, configuration, or security of critical systems, including electrical systems. KRS 61.878(1)(m)(1)(f).

5. The information provided in response to Item No. 14 reveals information regarding LG&E's transmission capacity additions and the need that such additions are intended to address. If such information is made available in the public record, individuals seeking to induce public harm will have critical information concerning the present vulnerabilities of LG&E's transmission system. Knowledge of such vulnerabilities may allow such a person to cause public harm through the disruption of the electric transmission system.

6. The information contained in response to Item No. 14 for which LG&E is seeking confidential treatment is not known outside of LG&E, and it is not disseminated within LG&E except to those employees with a legitimate business need to know and act upon the information.

Scheduled Outages

7. Pursuant to Item No. 11 of Appendix G to the Commission's December 20, 2001 Order in Administrative Case No. 387, jurisdictional electric utilities also must file annually information concerning scheduled outages or retirements of generating capacity.

8. The Kentucky Open Records Act protects commercial information, generally recognized as confidential or proprietary, if its public disclosure would cause competitive injury to the disclosing entity. KRS 61.878(1)(c). Competitive injury occurs when disclosure of the information would give competitors an unfair business advantage. The information contained in the response to Item No. 11 contains such competitive and proprietary information, and is therefore being submitted with this request for confidential treatment.

9. LG&E's response to Item No. 11 regarding scheduled maintenance outages and retirements of generation capacity contains sensitive commercial information, the disclosure of which would unfairly advantage LG&E's competitors for wholesale power sales. This information would allow competitors of LG&E to know when LG&E's generating plants will be down for maintenance and thus know a crucial input into LG&E's generating costs and need for power and energy during those periods. The commercial risk of the disclosure of this information is that potential suppliers will be able to manipulate the price of power bid to LG&E in order to maximize their revenues, thereby causing higher prices for LG&E's customers and giving a commercial advantage to LG&E's competitors.

10. Further, disclosure of this information will damage LG&E's competitive position and business interests. The information provided in response to Item No. 11 regarding scheduled outages is highly sensitive information that, if made public, would enable prospective purchasers of LG&E's power supply to manipulate the bidding process to the detriment of LG&E. Thus, disclosure of this information may detrimentally impact LG&E's ability to contract for off-system sales during the same time period. Any impairment of LG&E's ability to obtain fair prices for its power supply will decrease the price LG&E is paid for its power supply. As a result, LG&E will not get the same quality of offers that would be produced by a system protected by the confidentiality employed by unregulated business and LG&E will not be able to compete effectively for off-system sales.

11. The information contained in response to Item No. 11 of the Commission's Order for which LG&E is seeking confidential treatment is not known outside of LG&E, and it is not disseminated within LG&E except to those employees with a legitimate business need to know

and act upon the information. This information is not on file with the Federal Energy Regulatory Commission, the Securities and Exchange Commission or other public agencies, and is not available from any commercial or other source outside of LG&E.

12. The information contained in response to Item No. 11 and for which LG&E is seeking confidential protection is identical in nature to that provided to the Commission in response to the Commission's requests for information in Case No. 2000-498 and previously in this proceeding. The Commission granted confidential protection to LG&E's planned maintenance schedule for each of LG&E's generating units.

13. The information provided in response to Item Nos. 11 and 14 of Appendix G to the Commission's December 20, 2001 Order demonstrates on its face that it merits confidential protection. If the Commission disagrees, however, it must hold an evidentiary hearing to protect the due process rights of LG&E and supply the Commission with a complete record to enable it to reach a decision with regard to this matter. *Utility Regulatory Commission v. Kentucky Water Service Company, Inc.*, Ky. App., 642 S.W.2d 591, 592-94 (1982).

14. LG&E does not object to disclosure of the confidential information, pursuant to a protective agreement, to intervenors with a legitimate interest in reviewing the confidential information for the purpose of assisting the Commission's review in this proceeding.

15. In accordance with the provisions of 807 KAR 5:001 Section 7, one copy of LG&E's response to the Commission's request with the confidential information highlighted and ten (10) copies of LG&E's response without the confidential information is herewith filed with the Commission.

WHEREFORE, Louisville Gas and Electric Company respectfully requests that the Commission grant confidential protection, or in the alternative, schedule an evidentiary hearing on all factual issues.

Respectfully submitted,

Allyson K. Sturgeon

Allyson K. Sturgeon
Corporate Attorney
220 West Main Street
P.O. Box 32010
Louisville, Kentucky 40232
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COUNSEL FOR
LOUISVILLE GAS AND ELECTRIC COMPANY

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PUBLIC SERVICE COMMISSION

Bill Feldman, Assistant Director
Public Service Commission of Kentucky
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Robert M. Conroy
Manager - Rates
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robert.conroy@eon-us.com

March 30, 2007

Re: Annual Report Form No. 1, Annual Report Form No. 2, and Annual Resource Assessment for Louisville Gas and Electric Company Pursuant to Administrative Case No. 387

Dear Mr. Feldman:

Enclosed is one completed signed copy of Annual Report Form No. 1 for Electric Utilities and one completed signed copy of Annual Report Form No. 2 for Natural Gas Companies covering the operations of Louisville Gas and Electric Company ("LG&E").

Also enclosed, in accordance with Ordering Paragraph (2) of the Commission's Order in Administrative Case 387, dated October 7, 2005, are an original and five (5) copies of the 2006 Annual Resource Assessment Filing for LG&E, along with a Petition for Confidential Protection regarding certain information provided in response to Item Nos. 11 and 14.

Sincerely,

Robert M. Conroy

Enclosures

COMMONWEALTH OF KENTUCKY

BEFORE THE PUBLIC SERVICE COMMISSION OF KENTUCKY

In the Matter of:

A REVIEW OF THE ADEQUACY OF	)	
KENTUCKY'S GENERATION CAPACITY	)	ADMINISTRATIVE
AND TRANSMISSION SYSTEM	)	CASE NO. 387

2006 ANNUAL RESOURCE ASSESSMENT FILING
OF
LOUISVILLE GAS AND ELECTRIC COMPANY
PURSUANT TO APPENDIX G
OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001
AS AMENDED BY THE
COMMISSION'S ORDER
DATED MARCH 29, 2004

FILED: MARCH 2007

LOUISVILLE GAS AND ELECTRIC COMPANY

**2006 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007**

ITEM NO. 1

The information originally requested in Item 1 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

LOUISVILLE GAS AND ELECTRIC COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
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AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007

ITEM NO. 2

The information originally requested in Item 2 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

LOUISVILLE GAS AND ELECTRIC COMPANY

**2006 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
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FILED MARCH 2007**

ITEM NO. 3

RESPONDENT: Robert Thomson/Scott Cooke

3. Actual and weather-normalized monthly coincident peak demands for the just completed calendar year. Demands should be disaggregated into (a) native load demand (firm and non-firm) and (b) off-system demand (firm and non-firm).

Response:

Please refer to the attached Table LGE-3, which shows the actual and weather-normalized native LG&E peak demands. The normalized native LG&E stand alone peak demands are available only on a seasonal (summer/winter) basis.

TABLE LGE-3
NATIVE AND OFF-SYSTEM DEMANDS BY MONTH FOR 2006

Louisville Gas & Electric Co.

	Actual			Normal Weather (Seasonal)	Off-System **(1)**		
Time of Monthly Native Peak	Native Peak	Non-Firm	Firm	Native Peak	Firm **(2)**	Non-Firm **(2)**	Total
2006-01-18 19:00	1,656	44	1,612		379	0	379
2006-02-20 20:00	1,711	58	1,653		174	0	174
2006-03-21 20:00	1,689	56	1,633		0	0	0
2006-04-15 16:00	1,812	63	1,750		6	0	6
2006-05-30 15:00	2,460	60	2,400		0	0	0
2006-06-22 15:00	2,614	59	2,555		0	0	0
2006-07-19 16:00	2,699	55	2,644		0	0	0
2006-08-03 16:00	2,729	49	2,680	2,784	0	0	0
2006-09-08 16:00	1,998	59	1,940		311	178	489
2006-10-04 16:00	2,042	53	1,989		0	0	0
2006-11-21 08:00	1,587	18	1,569		147	276	423
2006-12-07 20:00	1,853	63	1,790	1,885	0	0	0

Notes

(1) The allocation of off-system sales split between LG&E and KU is handled in the After-the-Fact Billing process in accordance with the Power Supply System Agreement between LG&E and KU. The individual company sales will include an allocation of the sales sourced with purchased power and allocated to the individual company based on each company's contribution to off-system sales.

(2) The allocation of off-system sales between firm and non-firm is not available from the hourly data in AFB. The breakout is based on the monthly totals for LG&E and KU sales for firm and non-firm sales.

LOUISVILLE GAS AND ELECTRIC COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
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FILED MARCH 2007

ITEM NO. 4

RESPONDENT: Robert Thomson

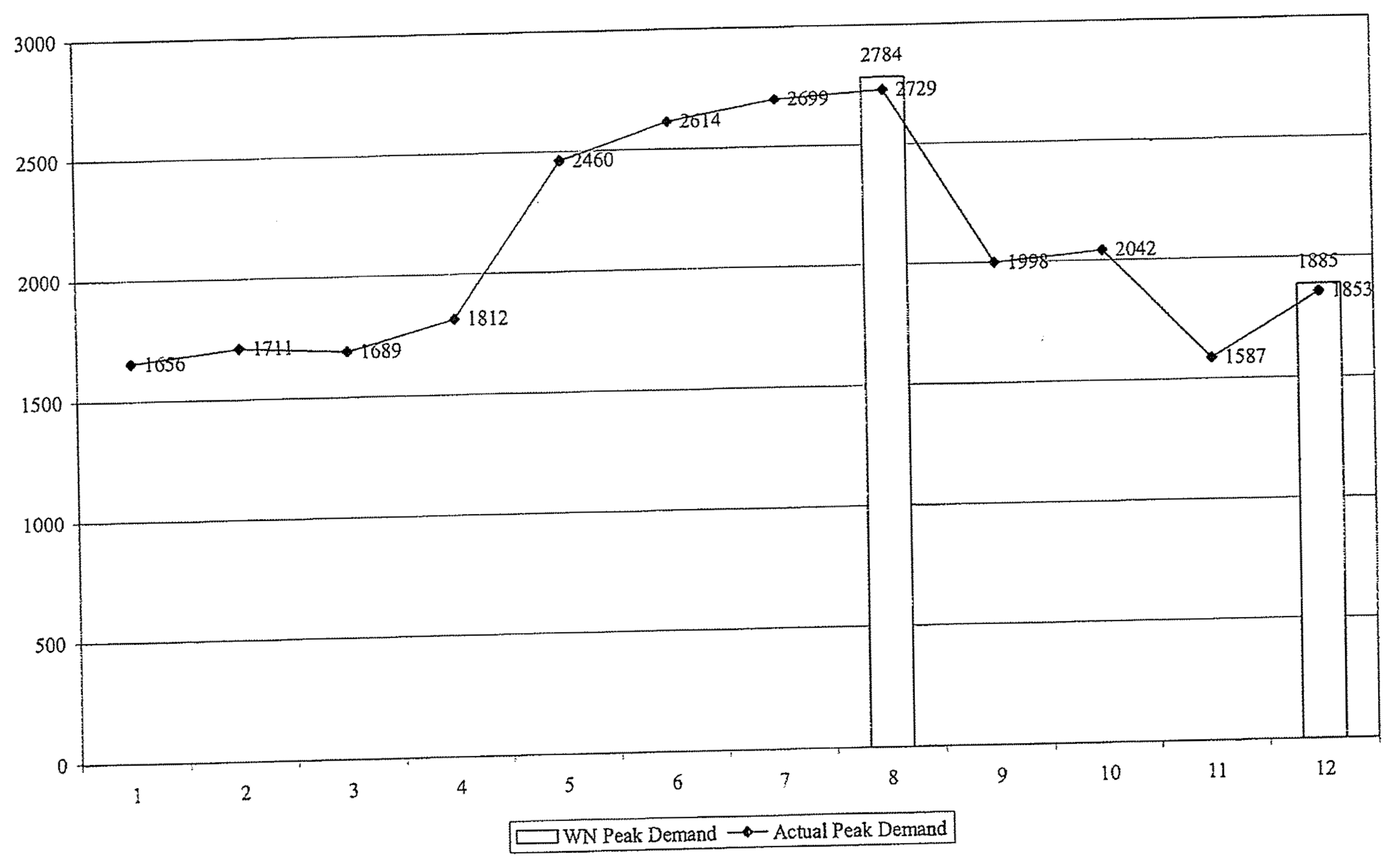
4. Load shape curves that show actual peak demands and weather-normalized peak demands (native load demand and total demand) on a monthly basis for the just completed calendar year.

Response:

Please refer to the attached Figure LGE-4.

Figure LGE-4

Actual and Weather-Normalized LG&E Peak Demand (MW) - 2006



LOUISVILLE GAS AND ELECTRIC COMPANY

**2006 ANNUAL RESOURCE ASSESSMENT FILING
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DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007**

ITEM NO. 5

The information originally requested in Item 5 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

LOUISVILLE GAS AND ELECTRIC COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER
DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007

ITEM NO. 6

RESPONDENT: Robert Thomson/Scott Cooke

6. Based on the most recent demand forecast, the base case demand and energy forecasts and high case demand and energy forecasts for the current year and the following four years. The information should be disaggregated into (a) native load (firm and non-firm demand) and (b) off-system load (both firm and non-firm demand).

Response:

a)

b) Off-system sales ("OSS") projections for 2007-2011 contained in Table LGE-6b are based on the Companies' 2006 Plan. For OSS, only base case total sales energy projections exist for 2007-2011. The projections consist of "Existing OSS", which includes existing long-term sales agreements, and the expected market sales, dubbed "Wholesale OSS". Currently, there are no existing long-term sales agreements. In the long-range model, wholesale financially Firm and Non-firm sales are not distinguished but are combined into an overall expected sales energy.

The projection is developed in-house using the Global Energy's PROSYM hourly production cost model, with market prices based on data provided to the E.On U.S. Energy Marketing group from several external parties including utilities, energy marketing entities, and/or brokers.

Table LGE-6a

Louisville Gas&Electric*	2007	2008	2009	2010	2011
Energy Sales (GWh)	12,370	12,613	12,856	13,058	13,319
Energy Requirements (GWh)	13,116	13,358	13,614	13,828	14,100
Native Peak Demand (MW)	2,725	2,775	2,829	2,873	2,930

* 2007 LT Forecast. No High Case was produced.

Table LGE-6b
Total Base Case Off-System Sales Energy Projection

	2007	2008	2009	2010	2011
Existing OSS (GWH)	0	0	0	0	0
Wholesale OSS (GWH)	2,159	2,154	1,964	2,249	2,757
Total OSS (GWH)	2,159	2,154	1,964	2,249	2,757

LOUISVILLE GAS AND ELECTRIC COMPANY

**2006 ANNUAL RESOURCE ASSESSMENT FILING
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DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007**

ITEM NO. 7

RESPONDENT: Scott Cooke

7. The target reserve margin currently used for planning purposes, stated as a percentage of demand. If changed from what was in use in 2001, include a detailed explanation for the change.

Response:

The Companies established an optimal reserve margin range of 12% to 14%, with 14% recommended for planning purposes. The range provides an optimum level of reliability through various system operating conditions. The reserve margin analysis was performed as part of the 2005 Integrated Resource Plan ("2005 IRP"), filed with the Commission in April 2005 (Case No. 2005-00162).

The Companies utilized a planning reserve margin target of 12% in 2001 and 14% in 2002 based on a reserve margin range of 11%-14% established in the Companies' 1999 IRP. A detailed explanation of the current target reserve margin is documented in the report titled "2005 Analysis of Reserve Margin Planning Criterion" contained in Volume III of the Companies' 2005 IRP. The Companies have utilized a 14% planning reserve margin target since 2002.

LOUISVILLE GAS AND ELECTRIC COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
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FILED MARCH 2007

ITEM NO. 8

RESPONDENT: Scott Cooke

8. Projected reserve margins stated in megawatts and as a percentage of demand for the current year and the following 4 years. Identify projected deficits and current plans for addressing these. For each year identify the level of firm capacity purchases projected to meet native load demand.

Response:

The requested data related to the reserve margin is specified in the attached table LGE-8. The capacity required to meet the reserve margin targets of 12% and 14% are specified in the table. These values represent reserve margins prior to any future resource acquisition.

The Companies are projected to have a reserve margin shortfall in 2008 thru 2013 and are evaluating resources to meet the established 14% reserve margin target in a least cost manner. The shortfall is due in part to the loss of the EEI power purchase contract (200 MW) that expired at the end of 2005, and the notice of termination by OMU of the power purchase contract (approximately 169 MW) effective in 2010. The status of the pending litigation is detailed in KU's Response to Commission Staff's Interrogatories and Request for Production of Documents dated 2/8/07, Question No. 2 filed with the Commission on February 23, 2007 in Case No. 2006-00509.

Also, as approved by the Commission in Case No. 2004-507, the Companies are adding capacity by constructing Trimble County 2 that is scheduled for completion by early 2010.

Table LGE-8
Combined Company
Reserve Margin Needs (MW)

Current Values	**2007**	**2008**	**2009**	**2010**	**2011**
Peak Load with CSR/Interrupt	6,933	7,080	7,239	7,345	7,489
Existing DSM	-114	-122	-122	-122	-122
New DSM (from '05 IRP)	-9	-13	-19	-24	-29
Net Load	6,810	6,945	7,098	7,199	7,338
Existing Capability	7,521	7,507	7,465	7,467	7,469
OMU	169	168	167	0	0
OVEC	179	179	179	179	179
Total Supply	7,869	7,854	7,811	7,646	7,648
MW Margin	1,059	909	713	447	310
Reserve Margin %	15.5%	13.1%	10.0%	6.2%	4.2%
Capacity Need for 12%	(241)	(76)	139	416	570
Capacity Need for 14%	(105)	63	281	560	717
New Capacity	0	0	0	549	0
Total Supply	7,869	7,854	7,811	8,195	8,197
Reserve Margin, MW	1,059	909	713	996	859
Reserve Margin %	15.5%	13.1%	10.0%	13.8%	11.7%

Based on 2007 Load forecast.

LOUISVILLE GAS AND ELECTRIC COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
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DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387
AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004
FILED MARCH 2007

ITEM NO. 9

The information originally requested in Item 9 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

LOUISVILLE GAS AND ELECTRIC COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387 AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004 FILED MARCH 2007

ITEM NO. 10

The information originally requested in Item 10 of Appendix G of the Commission's Order dated December 20, 2001, in Administrative Case No. 387, is no longer required pursuant to the Commission's Order of March 29, 2004, amending the previous Order.

LOUISVILLE GAS AND ELECTRIC COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387 AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004 FILED MARCH 2007

ITEM NO. 11

RESPONDENT: Scott Cooke

11. A list that identifies scheduled outages or retirements of generating capacity during the current year and the following four years.

Response:

The planned maintenance outage schedule for 2007 through 2011 is being provided pursuant to a Petition for Confidential Protection. The schedule is regularly modified based on actual operating conditions, forced outages, changes in the schedule required to meet environmental compliance regulations, fluctuations in wholesale prices, and other unforeseen events.

Waterside Units 7 and 8 were retired at midnight on 8/21/2006 in conjunction with the sale of that property to the Louisville Arena Authority as approved by the Kentucky Public Service Commission in Case No. 2006-00391.

The Companies have begun to perform life assessment studies for all the units in the fleet which have more than thirty years of service. Specifically, Paddy's Run Unit 12 (as discussed in LG&E's Response to Commission Staff's Interrogatories and Request for Production of Documents dated 2/8/07, Question No. 14 filed with the Commission on February 23, 2007 in Case 2006-00510) was placed in the Inactive State of Mothballed at midnight on 11/21/2006, while life assessment studies are being conducted. Mothballed is defined by IEEE 762 and GADS as "the State in which a unit is unavailable for service but can be brought back into service after some repairs with appropriate amount of notification, typically weeks or months."[1] Currently, Paddy's Run 12 is under evaluation for further capital investments. A decision as to how to proceed with this unit will be made in the near term. This decision will be provided as a supplement to LG&E's Response to Commission Staff's Interrogatories and Request for Production of Documents dated 2/8/07, Question No. 3 filed with the Commission on February 23, 2007 in Case 2006-00510 once the results of this evaluation and its decision have been made.

[1] See the NERC GADS DATA Reporting Instructions, Section III: Event Reporting, Pages III-5 and III-6.

LOUISVILLE GAS AND ELECTRIC COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING PURSUANT TO APPENDIX G OF THE COMMISSION'S ORDER DATED DECEMBER 20, 2001, IN ADMINISTRATIVE CASE NO. 387 AS AMENDED BY THE COMMISSION'S ORDER DATED MARCH 29, 2004 FILED MARCH 2007

ITEM NO. 12

RESPONDENT: Scott Cooke

12. Identify all planned base load or peaking capacity additions to meet native load requirements over the next 10 years. Show the expected in-service date, size and site for all planned additions. Include additions planned by the utility, as well as those by affiliates, if constructed in Kentucky or intended to meet load in Kentucky.

Response:

The Companies are currently evaluating additional capacity required to satisfy the increasing load growth identified in the Companies' 2005 IRP. The table below contains MW needs to maintain a 14% reserve margin through 2016 based on the most recent load forecast.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
MW Need	(105)	63	281	11	168	255	394	(250)	(103)	(134)

The expansion plan identified below is the same as the Companies' 2005 IRP thru the year 2012, which includes the construction of Trimble County Unit 2 as approved by the Commission in Case No. 2004-00507.

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
New Capacity	0	0	0	549	0	0	0	739	0	148

Post 2012, a 739 MW base load unit in 2014 and a simple cycle combustion turbine in 2016 are planned. The site selection for these units has not been determined. The Companies are beginning the process of developing the 2008 Integrated Resource Plan to be filed April 2008, which will further identify the appropriate resource additions.

LOUISVILLE GAS AND ELECTRIC COMPANY

**2006 ANNUAL RESOURCE ASSESSMENT FILING
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FILED MARCH 2007**

ITEM NO. 13

RESPONDENT: Lonnie Bellar

13. The following transmission energy data for the just completed calendar year and the forecast for the current year and the following four years:

a. Total energy received from all interconnections and generation sources connected to the transmission system.

b. Total energy delivered to all interconnections on the transmission system.

c. Peak load capacity of the transmission system.

d. Peak demand for summer and winter seasons on the transmission system.

Response:

Data exists for 2006. The Company does not forecast this type of data; therefore no forecast exists for 2007-2010.

a. LG&E and KU operate as a single NERC Control area that contains several generators not owned by LG&E and KU; the non-Company owned facilities are also included as sources below:

Tie Lines Received (MWH)	14,269,190
Net Generation-LG&E (MWH)	17,032,640
Net Generation-KU (MWH)	17,087,538
Net Received from OMU (MWH)	1,284,796
Net Generation-IPPs (MWH)	1,088,459
Total Sources (MWH)	50,762,623

b. LG&E and KU operate as a single Control Area, the amount of energy delivered at the interconnections of the single Control area were 16,071,542 MWH(s).

c. There is no set number for peak load capacity for the transmission system. The system is built to support native load under first contingency conditions. Actual transmission capacity available for native load, import, export or thru-flow will vary depending on which facilities (generation, load or transmission) in the interconnected transmission system of the eastern interconnect are connected and operated.

d. The maximum summer peak transmission load for the combined LG&E/KU transmission system was 7437 MW for the peak hour of 8/2/2006 at 3PM.

The maximum winter peak transmission load for the combined LG&E/KU transmission system was 6508 for the peak hour of 12/8/2006 at 8 AM.

LOUISVILLE GAS AND ELECTRIC COMPANY

2006 ANNUAL RESOURCE ASSESSMENT FILING
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ITEM NO. 14

RESPONDENT: Lonnie Bellar

14. Identify all planned transmission capacity additions for the next 10 years. Include the expected in-service date, size and site for all planned additions and identify the transmission need each addition is intended to address.

Response:

The response to this item is being provided pursuant to a Petition for Confidential Protection.