National Action Plan for Energy Efficiency

A PLAN DEVELOPED BY MORE THAN 50 LEADING ORGANIZATIONS IN PURSUIT OF ENERGY SAVINGS AND ENVIRONMENTAL BENEFITS THROUGH ELECTRIC AND NATURAL GAS ENERGY EFFICIENCY

JULY 2006

The goal is to create a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations.

Improving energy efficiency in our homes, businesses, schools, governments, and industries—which consume more than 70 percent of the natural gas and electricity used in the country—is one of the most constructive, cost-effective ways to address the challenges of high energy prices, energy security and independence, air pollution, and global climate change.

The U.S. Department of Energy and U.S. Environmental Protection Agency facilitate the work of the Leadership Group and the National Action Plan for Energy Efficiency.

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Executive Summary

This National Action Plan for Energy Efficiency (Action Plan) presents policy recommendations for creating a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations. Such a commitment could save Americans many billions of dollars on energy bills over the next 10 to 15 years, contribute to energy security, and improve our environment. The Action Plan was developed by more than 50 leading organizations representing key stakeholder perspectives. These organizations pledge to take specific actions to make the Action Plan a reality.

A National Action Plan for Energy Efficiency

We currently face a set of serious challenges with regard to the U.S. energy system. Energy demand continues to grow despite historically high energy prices and mounting concerns over energy security and independence as well as air pollution and global climate change. The decisions we make now regarding our energy supply and demand can either help us deal with these challenges more effectively or complicate our ability to secure a more stable, economical energy future.

Improving the energy efficiency[1] of our homes, businesses, schools, governments, and industries—which consume more than 70 percent of the natural gas and electricity used in the country—is one of the most constructive, cost-effective ways to address these challenges.[2] Increased investment in energy efficiency in our homes, buildings, and industries can lower energy bills, reduce demand for fossil fuels, help stabilize energy prices, enhance electric and natural gas system reliability, and help reduce air pollutants and greenhouse gases.

Despite these benefits and the success of energy efficiency programs in some regions of the country, energy efficiency remains critically underutilized in the nation's energy portfolio.[3] Now we simultaneously face the challenges of high prices, the need for large investments in new energy infrastructure, environmental concerns, and security issues. It is time to take advantage of more than two decades of experience with successful energy efficiency programs, broaden and expand these efforts, and capture the savings that energy efficiency offers. Much more can be achieved in concert with ongoing efforts to advance building codes and appliance standards, provide tax incentives for efficient products and buildings, and promote savings opportunities through programs such as ENERGY STAR®. Efficiency of new buildings and those already in place are both important. Many homeowners, businesses, and others in buildings and facilities already standing today—which will represent the vast majority of the nation's buildings and facilities for years to come—can realize significant savings from proven energy efficiency programs.

Bringing more energy efficiency into the nation's energy mix to slow demand growth in a wise, cost-effective manner—one that balances energy efficiency with new generation and supply options—will take concerted efforts by all energy market participants: customers, utilities, regulators, states, consumer advocates, energy service companies, and others. It will require education on the opportunities, review of existing policies, identification of barriers and their solutions, assessment of new technologies, and modification and adoption of policies, as appropriate. Utilities,[4] regulators, and partner organizations need to improve customer access to energy efficiency programs to help them control their own energy costs, provide the funding necessary to deliver these programs, and examine policies governing energy companies to ensure that these policies facilitate—not impede—cost-effective programs for energy efficiency. Historically, the regulatory structure has rewarded utilities for building infrastructure (e.g., power plants, transmission lines, pipelines) and selling energy, while discouraging energy efficiency, even when the energy-saving measures cost less than constructing new infrastructure.[5] And, it has been difficult to establish the funding necessary to capture the potential benefits that cost-effective energy efficiency offers.

This National Action Plan for Energy Efficiency is a call to action to bring diverse stakeholders together at the national, regional, state, or utility level, as appropriate, and 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.

The Action Plan was developed by a Leadership Group composed of more than 50 leading organizations representing diverse stakeholder perspectives. Based upon the policies, practices, and efforts of many organizations across the country, 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 1). These recommendations may be pursued through a number of different options, depending upon state and utility circumstances.

As part of the Action Plan, leading organizations are committing to aggressively pursue energy efficiency opportunities in their organizations and assist others who want to increase the use of energy efficiency in their regions. Because greater investment in energy efficiency cannot happen based on the work of one individual or organization alone, the Action Plan is a commitment to bring the appropriate stakeholders together—including utilities, state policy-makers, consumers, consumer advocates, businesses, energy services companies, and others—to be part of a collaborative effort to take energy efficiency to a new level. As energy experts, utilities may be in a unique position to play a leading role.

The reasons behind the National Action Plan for Energy Efficiency, the process for developing the Action Plan, and the final recommendations are summarized in greater detail as follows.

Figure 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.**

The United States Faces Large and Complex Energy Challenges

Our expanding economy, growing population, and rising standard of living all depend on energy services. Current projections anticipate U.S. energy demands to increase by more than one-third by 2030, with electricity demand alone rising by more than 40 percent (EIA, 2006). At work and at home, we continue to rely on more and more energy-consuming devices. At the same time, the country has entered a period of higher energy costs and limited supplies of natural gas, heating oil, and other fuels. These issues present many challenges:

Growing energy demand stresses current systems, drives up energy costs, and requires new investments. Events such as the Northeast electricity blackout of August 2003 and Hurricanes Katrina and Rita in 2005 increased focus on energy reliability and its economic and human impacts. Transmission and pipeline systems are becoming overburdened in places. Overburdened systems limit the availability of low-cost electricity and fossil fuels, raise energy prices in or near congested areas, and potentially compromise energy system reliability. High fuel prices also contribute to higher electricity prices. In addition, our demand for natural gas to heat our homes, for industrial and business use, and for power generation is straining the available gas supply in North America and putting upward pressure on natural gas prices. Addressing these issues will require billions of dollars in investments in energy efficiency, new power plants, gas rigs, transmission lines, pipelines, and other infrastructure, notwithstanding the difficulty of building new energy infrastructure in dense urban and suburban areas. In the absence of investments in new or expanded capacity, existing facilities are being stretched to the point where system reliability is steadily eroding, and the ability to import lower cost energy into high-growth load areas is inhibited, potentially limiting economic expansion.

High fuel prices increase financial burdens on households and businesses and slow our economy. Many household budgets are being strained by higher energy costs, leaving less money available for other household purchases and needs. This burden is particularly harmful for low-income households. Higher energy bills for industry can reduce the nation's economic competitiveness and place U.S. jobs at risk.

Growing energy demand challenges attainment of clean air and other public health and environmental goals. Energy demand continues to grow at the same time that national and state regulations are being implemented to limit the emission of air pollutants, such as sulfur dioxide, nitrogen oxides, and mercury, to protect public health and the environment. In addition, emissions of greenhouse gases continue to increase.

Uncertainties in future prices and regulations raise questions about new investments. New infrastructure is being planned in the face of uncertainties about future energy prices. For example, high natural gas prices and uncertainty about greenhouse gas and other environmental regulations, impede investment decisions on new energy supply options.

Our energy system is vulnerable to disruptions in energy supply and delivery. Natural disasters such as the hurricanes of 2005 exposed the vulnerability of the U.S. energy system to major disruptions, which have significant impacts on energy prices and service reliability. In response, national security concerns suggest that we should use fossil fuel energy more efficiently, increase supply diversity, and decrease the vulnerability of domestic infrastructure to natural disasters.

Energy Efficiency Can Be a Beneficial Resource in Our Energy Systems

Greater investment in energy efficiency can help us tackle these challenges. Energy efficiency is already a key component in the nation's energy resource mix in many parts of the country. Utilities, states, and others across the United States have decades of experience in delivering energy efficiency to their customers. These programs can provide valuable models, upon which more states,

Benefits of Energy Efficiency

Lower energy bills, greater customer control, and greater customer satisfaction. Well-designed energy efficiency programs can provide opportunities for customers of all types to adopt energy savings measures that can improve their comfort and level of service, while reducing their energy bills.[6] 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 are experiencing savings of 5, 10, 20, or 30 percent, depending upon the customer, program, and average bill. Offering these programs can also lead to greater customer satisfaction with the service provider.

Lower cost than supplying new generation only from new power plants. In some states, well-designed energy efficiency programs are saving energy at an average cost of about one-half of the typical cost of new power sources and about one-third of the cost of natural gas supply (EIA, 2006).[7] When integrated into a long-term energy resource plan, energy efficiency programs could help defer investments in new plants and lower the total cost of delivering electricity.

Modular and quick to deploy. Energy efficiency programs can be ramped up over a period of one to three years to deliver sizable savings. These programs can also be targeted to congested areas with high prices to bring relief where it might be difficult to deliver new supply in the near term.

Significant energy savings. Well-designed energy efficiency programs are delivering annual energy savings on the order of 1 percent of electricity and natural gas sales.[8] These programs are helping to offset 20 to 50 percent of expected growth in energy demand in some areas without compromising the end users' activities and economic well-being (Nadel et al., 2004; EIA, 2006).

Environmental benefits. While reducing customers' energy bills, cost-effective energy efficiency offers environmental benefits related to reduced demand such as lower air pollution, reduced greenhouse gas emissions, lower water use, and less environmental damage from fossil fuel extraction. Energy efficiency can be an attractive option for utilities in advance of requirements to reduce greenhouse gas emissions.

Economic development. Greater investment in energy efficiency helps build jobs and improve state economies. Energy efficiency users often redirect their bill savings toward other activities that increase local and national employment, with a higher employment impact than if the money had been spent to purchase energy (Kushler et al., 2005; NYSERDA, 2004). Many energy efficiency programs create construction and installation jobs, with multiplier impacts on employment and local economies. Local investments in energy efficiency can offset imports from out-of-state, improving the state balance of trade. Lastly, energy efficiency investments usually create long-lasting infrastructure changes to building, equipment and appliance stocks, creating long-term property improvements that deliver long-term economic value (Innovest, 2002).

Energy security. Energy efficiency reduces the level of U.S. per capita energy consumption, thus decreasing the vulnerability of the economy and individual consumers to energy price disruptions from natural disasters and attacks on domestic and international energy supplies and infrastructure. In addition, energy efficiency can be used to reduce the overall system peak demand or the peak demand in targeted load areas with limited generating or transport capability. Reducing peak demand improves system reliability and reduces the potential for unplanned brownouts or black-outs, which can have large adverse economic consequences.

utilities, and other organizations can build. Experience shows that energy efficiency programs can lower customer energy bills, cost less than and help defer new energy infrastructure, provide energy savings to consumers, improve the environment, and spur local economic development (see box on Benefits of Energy Efficiency). Significant opportunities for energy efficiency are likely to continue to be available at low costs in the future. State and regional studies have found that adoption of economically attractive, but as yet untapped, energy efficiency could yield more than 20 percent savings in total electricity demand nationwide by 2025. Depending on the underlying load growth, these savings could help cut load growth by half or more compared to current forecasts (Nadel et al., 2004; SWEEP, 2002; NEEP, 2005; NWPCC, 2005; WGA, 2006). Similarly, savings from direct use of natural gas could provide a 50 percent or greater reduction in natural gas demand growth (Nadel et al., 2004).

Capturing this energy efficiency resource would offer substantial economic and environmental benefits across the country. Widespread application of energy efficiency programs that already exist in some regions could deliver a large part of these potential savings.[9] Extrapolating the results from existing programs to the entire country would yield annual energy bill savings of nearly $20 billion, with net societal benefits of more than $250 billion over the next 10 to 15 years. This scenario could defer the need for 20,000 megawatts (MW), or 40 new 500-MW power plants, as well as reduce U.S. emissions from energy production and use by more than 200 million tons of carbon dioxide, 50,000 tons of sulfur dioxide, and 40,000 tons of nitrogen oxides annually.[10] These significant economic and environmental benefits can be achieved relatively quickly because energy efficiency programs can be developed and implemented within several years.

Additional policies and programs are required to help capture these potential benefits and address our substantial underinvestment in energy efficiency as a nation. An important indicator of this underinvestment is that the level of funding across the country for organized efficiency programs is currently less than $2 billion per year while it would require about 4 times today's funding levels to achieve the economic and environment benefits presented above.[11, 12]

The current underinvestment in energy efficiency is due to a number of well-recognized barriers, including some of the regulatory policies that govern electric and natural gas utilities. These barriers include:

- *Market barriers,* such as the well-known "split-incentive" barrier, which limits home builders' and commercial developers' motivation to invest in energy efficiency for new buildings because they do not pay the energy bill; and the transaction cost barrier, which chronically affects individual consumer and small business decision-making.

- *Customer barriers,* such as lack of information on energy saving opportunities, lack of awareness of how energy efficiency programs make investments easier, and lack of funding to invest in energy efficiency.

- *Public policy barriers,* which can present prohibitive disincentives for utility support and investment in energy efficiency in many cases.

- *Utility, state, and regional planning barriers,* which do not allow energy efficiency to compete with supply-side resources in energy planning.

- *Energy efficiency program barriers,* which limit investment due to lack of knowledge about the most effective and cost-effective energy efficiency program portfolios, programs for overcoming common marketplace barriers to energy efficiency, or available technologies.

While a number of energy efficiency policies and programs contribute to addressing these barriers, such as building codes, appliance standards, and state government leadership programs, organized energy efficiency programs provide an important opportunity to deliver greater energy efficiency in the homes, buildings, and facilities that already exist today and that will consume the majority of the energy used in these sectors for years to come.

The Leadership Group and National Action Plan for Energy Efficiency

Recognizing that energy efficiency remains a critically underutilized resource in the nation's energy portfolio, more than 50 leading electric and gas utilities, state utility commissioners, state air and energy agencies, energy service providers, energy consumers, and energy efficiency and consumer advocates have formed a Leadership Group, together with the U.S. Department of Energy and the U.S. Environmental Protection Agency, to address the issue. The goal of this group is to create a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations. The Leadership Group recognizes that utilities and regulators play critical roles in bringing energy efficiency programs to their communities and that success requires the joint efforts of customers, utilities, regulators, states, and other partner organizations.

Under co-chairs Diane Munns (Member of the Iowa Utilities Board and President of the National Association of Regulatory Utility Commissioners) and Jim Rogers (President and Chief Executive Officer of Duke Energy), the Leadership Group members (see Table 1) have developed this National Action Plan for Energy Efficiency, which:

- Identifies key barriers limiting greater investment in energy efficiency.
- Reviews sound business practices for removing these barriers and improving the acceptance and use of energy efficiency relative to energy supply options.
- Outlines recommendations and options for overcoming these barriers.

The members of the Leadership Group have agreed to pursue these recommendations and consider these options through their own actions, where appropriate, and to support energy efficiency initiatives by other industry members and stakeholders.

Recommendations

This National Action Plan for Energy Efficiency is a call to action to utilities, state utility regulators, consumer advocates, consumers, businesses, other state officials, and other stakeholders to create an aggressive, sustainable national commitment to energy efficiency.[1] The Action Plan offers the following recommendations as ways to overcome barriers that have limited greater investment in energy efficiency for customers of electric and gas utilities in many parts of the country. The following recommendations are based on the policies, practices, and efforts of leading organizations across the country. For each recommendation, a number of options are available to be pursued based on regional, state, and utility circumstances (see also Figure 2).

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.[13] 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, these existing planning processes might need to be adapted or even 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.

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 maintain customer awareness and support. Some steps may 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 measurement and verification procedures; and providing for routine updates to information on energy efficiency potential and key costs.

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 benefits are not fully documented nor recognized by customers, utilities, regulators, or 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 (e.g., return on equity, earnings per share, and 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.

Promote sufficient, timely, 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 long-term funding to recover program costs and implement the energy efficiency measures that have been demonstrated to be available and cost effective. A number of states are now linking program funding to the achievement of energy savings.

Modify policies to align utility incentives with the delivery of cost-effective energy efficiency and modify ratemaking practices to promote energy efficiency investments. Successful energy efficiency programs would be promoted by aligning utility incentives in a manner that encourages the delivery of energy efficiency as part of a balanced portfolio of supply, demand, and transmission investments. Historically, regulatory policies governing utilities have more commonly compensated utilities for building infrastructure (e.g., power plants, transmission lines, pipelines) and selling energy, while discouraging energy efficiency, even when the energy-saving measures may cost less. Within the existing regulatory processes, utilities, regulators, and stakeholders have a number of opportunities to create the incentives for energy efficiency investments by utilities and customers. A variety of mechanisms have already been used. For example, parties can decide to provide incentives for energy efficiency similar to utility incentives for new infrastructure investments, provide rewards for prudent management of energy efficiency programs, and incorporate energy efficiency as an important area of consideration within rate design. Rate design offers

Figure 2. National Action Plan for Energy Efficiency Recommendations & Options

Recognize energy efficiency as a high priority energy resource.

Options to consider:

- Establishing policies to establish energy efficiency as a priority resource.
- Integrating energy efficiency into utility, state, and regional resource planning activities.
- Quantifying and establishing the value of energy efficiency, considering energy savings, capacity savings, and environmental benefits, as appropriate.

Make a strong, long-term commitment to cost-effective energy efficiency as a resource.

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 measurement and verification 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.

Broadly communicate the benefits of and opportunities for energy efficiency.

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

Provide sufficient, timely, and stable program funding to deliver energy efficiency where cost-effective.

Options to consider:

- Deciding on and committing to a consistent way for program administrators to recover energy efficiency costs in a timely manner.
- 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.
- Establishing funding for multi-year periods.

Modify policies to align utility incentives with the delivery of cost-effective energy efficiency and modify ratemaking practices to promote energy efficiency investments.

Options to consider:

- Addressing the typical utility throughput incentive and removing other regulatory and management disincentives to energy efficiency.
- Providing utility incentives for the successful management of energy efficiency programs.
- 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 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.

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

National Action Plan for Energy Efficiency: Next Steps

In summer 2006, members of the Leadership Group of the National Action Plan on Energy Efficiency are announcing a number of specific activities and initiatives to formalize and reinforce their commitments to energy efficiency as a resource. To assist the Leadership Group and others in making and fulfilling their commitments, a number of tools and resources have been developed:

National Action Plan for Energy Efficiency Report. This report details the key barriers to energy efficiency in resource planning, utility incentive mechanisms, rate design, and the design and implementation of energy efficiency programs. It also reviews and presents a variety of policy and program solutions that have been used to overcome these barriers as well as the pros and cons for many of these approaches.

Energy Efficiency Benefits Calculator. This calculator can be used to help educate stakeholders on the broad benefits of energy efficiency. It provides a simplified framework to demonstrate the business case for energy efficiency from the perspective of the consumer, the utility, and society. It has been used to explore the benefits of energy efficiency program investments under a range of utility structures, policy mechanisms, and energy growth scenarios. The calculator can be adapted and applied to other scenerios.

Experts and Resource Materials on Energy Efficiency. A number of educational presentations on the potential for energy efficiency and various policies available for pursuing the recommendations of the Action Plan will be developed. In addition, lists of policy and program experts in energy efficiency and the various policies available for pursuing the recommendations of the Action Plan will be developed. These lists will be drawn from utilities, state utility regulators, state energy offices, third-party energy efficiency program administrators, consumer advocacy organizations, energy service companies, and others. These resources will be available in fall 2006.

The U.S. Department of Energy and U.S. Environmental Protection Agency are continuing to facilitate the work of the Leadership Group and the National Action Plan for Energy Efficiency. During winter 2006–2007, the Leadership Group plans to report on its progress and identify next steps for the Action Plan.

Table 1. Members of the National Action Plan for Energy Efficiency

Co-Chairs

Diane Munns	Member President	Iowa Utilities Board National Association of Regulatory Utility Commissioners
Jim Rogers	President and Chief Executive Officer	Duke Energy

Leadership Group

Barry Abramson	Senior Vice President	Servidyne Systems, LLC
Angela S. Beehler	Director of Energy Regulation	Wal-Mart Stores, Inc.
Bruce Braine	Vice President, Strategic Policy Analysis	American Electric Power
Jeff Burks	Director of Environmental Sustainability	PNM Resources
Kateri Callahan	President	Alliance to Save Energy
Glenn Cannon	General Manager	Waverly Light and Power
Jorge Carrasco	Superintendent	Seattle City Light
Lonnie Carter	President and Chief Executive Officer	Santee Cooper
Mark Case	Vice President for Business Performance	Baltimore Gas and Electric
Gary Connett	Manager of Resource Planning and Member Services	Great River Energy
Larry Downes	Chairman and Chief Executive Officer	New Jersey Natural Gas (New Jersey Resources Corporation)
Roger Duncan	Deputy General Manager, Distributed Energy Services	Austin Energy
Angelo Esposito	Senior Vice President, Energy Services and Technology	New York Power Authority
William Flynn	Chairman	New York State Public Service Commission
Jeanne Fox	President	New Jersey Board of Public Utilities
Anne George	Commissioner	Connecticut Department of Public Utility Control
Dian Grueneich	Commissioner	California Public Utilities Commission
Blair Hamilton	Policy Director	Vermont Energy Investment Corporation
Leonard Haynes	Executive Vice President, Supply Technologies, Renewables, and Demand Side Planning	Southern Company
Mary Healey	Consumer Counsel for the State of Connecticut	Connecticut Consumer Counsel
Helen Howes	Vice President, Environment, Health and Safety	Exelon
Chris James	Air Director	Connecticut Department of Environmental Protection
Ruth Kinzey	Director of Corporate Communications	Food Lion
Peter Lendrum	Vice President, Sales and Marketing	Entergy Corporation
Rick Leuthauser	Manager of Energy Efficiency	MidAmerican Energy Company
Mark McGahey	Manager	Tristate Generation and Transmission Association, Inc.
Janine Migden-Ostrander	Consumers' Counsel	Office of the Ohio Consumers' Counsel
Richard Morgan	Commissioner	District of Columbia Public Service Commission
Brock Nicholson	Deputy Director, Division of Air Quality	North Carolina Air Office
Pat Oshie	Commissioner	Washington Utilities and Transportation Commission
Douglas Petitt	Vice President, Government Affairs	Vectren Corporation

Bill Prindle	Deputy Director	American Council for an Energy-Efficient Economy
Phyllis Reha	Commissioner	Minnesota Public Utilities Commission
Roland Risser	Director, Customer Energy Efficiency	Pacific Gas and Electric
Gene Rodrigues	Director, Energy Efficiency	Southern California Edison
Art Rosenfeld	Commissioner	California Energy Commission
Jan Schori	General Manager	Sacramento Municipal Utility District
Larry Shirley	Division Director	North Carolina Energy Office
Michael Shore	Senior Air Policy Analyst	Environmental Defense
Gordon Slack	Energy Business Director	The Dow Chemical Company
Deb Sundin	Director, Business Product Marketing	Xcel Energy
Dub Taylor	Director	Texas State Energy Conservation Office
Paul von Paumgartten	Director, Energy and Environmental Affairs	Johnson Controls
Brenna Walraven	Executive Director, National Property Management	USAA Realty Company
Devra Wang	Director, California Energy Program	Natural Resources Defense Council
Steve Ward	Public Advocate	State of Maine
Mike Weedall	Vice President, Energy Efficiency	Bonneville Power Administration
Tom Welch	Vice President, External Affairs	PJM Interconnection
Jim West	Manager of *energy right* & Green Power Switch	Tennessee Valley Authority
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Dan Delurey	Executive Director	Demand Response Coordinating Committee
Roger Fragua	Deputy Director	Council of Energy Resource Tribes
Jeff Genzer	General Counsel	National Association of State Energy Officials
Donald Gilligan	President	National Association of Energy Service Companies
Chuck Gray	Executive Director	National Association of Regulatory Utility Commissioners
John Holt	Senior Manager of Generation and Fuel	National Rural Electric Cooperative Association
Joseph Mattingly	Vice President, Secretary and General Counsel	Gas Appliance Manufacturers Association
Kenneth Mentzer	President and Chief Executive Officer	North American Insulation Manufacturers Association
Christina Mudd	Executive Director	National Council on Electricity Policy
Ellen Petrill	Director, Public/Private Partnerships	Electric Power Research Institute
Alan Richardson	President and Chief Executive Officer	American Public Power Association
Steve Rosenstock	Manager, Energy Solutions	Edison Electric Institute
Diane Shea	Executive Director	National Association of State Energy Officials
Rick Tempchin	Director, Retail Distribution Policy	Edison Electric Institute
Mark Wolfe	Executive Director	Energy Programs Consortium

Notes

1 Energy efficiency refers to using less energy to provide the same or improved level of service to the energy consumer in an economically efficient way. The term energy efficiency as used here includes using less energy at any time, including at times of peak demand through demand response and peak shaving efforts.

2 Addressing transportation-related energy use is also an important challenge as energy demand in this sector continues to increase and oil prices hit historical highs. However, transportation issues are outside the scope of this effort, which is focused only on electricity and natural gas systems.

3 This effort is focused on energy efficiency for regulated energy forms. Energy efficiency for unregulated energy forms, such as fuel oil for example, is closely related in terms of actions in buildings, but is quite different in terms of how policy can promote investments.

4 A utility is broadly defined as an organization that delivers electric and gas utility services to end users, including, but not limited to, investor-owned, publicly owned, cooperatively owned, and third-party energy efficiency utilities.

5 Many energy efficiency programs have an average life cycle cost of $0.03/kilowatt-hour (kWh) saved, which is 50 to 75 percent of the typical cost of new power sources (ACEEE, 2004; EIA, 2006). The cost of energy efficiency programs varies by program and can include higher cost programs and options with lower costs to a utility such as modifying rate designs.

6 See Chapter 6: Program Best Practices for more information on leading programs.

7 Data refer to EIA 2006 new power costs and gas prices in 2015 compared to electric and gas program costs based on leading energy programs, many of which are discussed in Chapter 6: Program Best Practices.

8 Based on leading energy efficiency programs, many of which are discussed in Chapter 6: Energy Efficiency Program Best Practices.

9 These estimates are based on assumptions of average program spending levels by utilities or other program administrators, with conservatively high numbers for the cost of energy efficiency programs. See highlights of some of these programs in Chapter 6: Energy Efficiency Program Best Practices, Tables 1-1a and 1-1b.

10 These economic and environmental savings estimates are extrapolations of the results from regional program to a national scope. Actual savings at the regional level vary based on a number of factors. For these estimates, avoided capacity value is based on peak load reductions de-rated for reductions that do not result in savings of capital investments. Emissions savings are based on a marginal on-peak generation fuel of natural gas and marginal off-peak fuel of coal; with the on-peak period capacity requirement double that of the annual average. These assumptions vary by region based upon situation-specific variables. Reductions in capped emissions may reduce the cost of compliance.

11 This estimate of the funding required assumes 2 percent of revenues across electric utilities and 0.5 percent across gas utilities. The estimate also assumes that energy efficiency is delivered at a total cost (utility and participant) of $0.04 per kWh and $3 per million British thermal units (MMBtu), which are higher than the costs of many of today's programs.

12 This estimate is provided as an indicator of underinvestment and is not intended to establish a national funding target. Appropriate funding levels for programs should be established at the regional, state, or utility level. In addition, energy efficiency investments by customers, businesses, industry, and government also contribute to the larger economic and environment benefits of energy efficiency.

13 One example of energy efficiency's ability to meet load growth is the Northwest Power Planning Council's Fifth Power Plan which uses energy conservation and efficiency to meet a targeted 700 MW of forecasted capacity between 2005 and 2009 (NWPCC, 2005).

References

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1: Introduction and Background

Summary

We currently face a number of challenges in securing affordable, reliable, secure, and clean energy to meet our nation's growing energy demand. Demand is outpacing supply, costs are rising, and concerns for the environment are growing.

Improving the energy efficiency[1] of our homes, businesses, schools, governments, and industries – which consume more than 70 percent of the energy used in the country—is one of the most constructive, cost-effective ways to address these challenges. Greater investment in energy efficiency programs across the country could help meet our growing electricity and natural gas demand, save customers billions of dollars on their energy bills, reduce emissions of air pollutants and greenhouse gases, and contribute to a more secure, reliable, and low-cost energy system. Despite this opportunity, energy efficiency remains an under-utilized resource in the nation's energy portfolio.

There are many ways to increase investment in cost-effective energy efficiency including developing building codes and appliance standards, implementing government leadership efforts, and educating the public through programs such as ENERGY STAR®.[2] Another important area is greater investment in organized energy efficiency programs that are managed by electric and natural gas providers, states, or third-party administrators. Energy efficiency programs already contribute to the energy mix in many parts of the country and have delivered significant savings and other benefits. Despite the benefits, these programs face hurdles in many areas of the country. Identifying and removing these barriers is a focus of this effort.

October 2005
Excerpt from letter from co-chairs to the National Action Plan for Energy Efficiency Leadership Group

Energy efficiency is a critically under-utilized resource in the nation's energy portfolio. Those states and utilities that have made significant investments in energy efficiency have lowered the growth for energy demand and moderated their energy costs. However, many hurdles remain that block broader investments in cost-effective energy efficiency.

That is why we have agreed to chair the Energy Efficiency Action Plan. It is our hope that with the help of leading organizations like yours, we will identify and overcome these hurdles.

Through this Action Plan, we intend to identify the major barriers currently limiting greater investment by utilities in energy efficiency. We will develop a series of business cases that will demonstrate the value and contributions of energy efficiency and explain how to remove these barriers (including regulatory and market challenges). These business cases, along with descriptions of leading energy efficiency programs, will build upon practices already in place across the country.

Diane Munns
President,NARUC
Member, Iowa Utilities Board

Jim Rogers
President and CEO
Duke Energy

To drive a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations, more than 50 leading organizations joined together to develop this National Action Plan for Energy Efficiency. The Action Plan is co-chaired by Diane Munns, Member of the Iowa

[1] Energy efficiency refers to using less energy to provide the same or improved level of service to the energy consumer in an economically efficient way. The term energy efficiency as used here includes using less energy at any time, including at times of peak demand through demand response and peak shaving efforts.

[2] See EPA 2006 for a description of a broad set of policies being used at the state level to advance energy efficiency.

Utilities Board and President of the Natural Association Regulatory Utility Commissioners, and Jim Rogers, Chairman and Chief Executive Officer of Duke Energy. The Leadership Group includes representatives from a broad set of stakeholders, including electric and gas utilities, state utility commissioners, state air and energy agencies, energy service providers, energy consumers, and energy efficiency and consumer advocates. This effort is facilitated by the U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA). The National Action Plan for Energy Efficiency:

- Identifies key barriers limiting greater investment in energy efficiency,
- Reviews sound business practices for removing these barriers and improving the acceptance and use of energy efficiency relative to energy supply options, and
- Outlines recommendations and options for overcoming these barriers.

In addition, members of the Leadership Group are committing to act within their own organizations and spheres of influence to increase attention and investment in energy efficiency. Greater investment in energy efficiency cannot happen based on the work of one individual or organziation alone. The Leadership Group recognizes that the joint efforts of the customer, utility, regulator, and partner organizations are needed to reinvigorate and increase the use of energy efficiency in America. As energy experts, utilities may be in a unique position to play a leadership role.

The rest of this introduction chapter establishes why now is the time to increase our investment in energy efficiency, outlines the approach taken in the National Action Plan for Energy Efficiency, and explains the structure of this report.

Why Focus on Energy Efficiency?

Energy Challenges

We currently face multiple challenges in providing affordable, clean, and reliable energy in today's complex energy markets:

- *Electricity demand* continues to rise. Given current energy consumption and demographic trends, DOE projects that U.S. energy consumption will increase by more than one-third by the year 2025. Electric power consumption is expected to increase by almost 40 percent, and total fossil fuel use is projected to increase similarly (EIA, 2005). At work and at home, we continue to rely on more energy-consuming devices. This growth in demand stresses current systems and requires substantial new investments in system expansions.
- *High energy prices.* Our demand for natural gas to heat our homes, for industrial and business uses, and for power plants is straining the available gas supply in North America and putting upward pressure on natural gas prices. Many household budgets are being strained by higher energy costs, leaving less money available for other household purchases and needs; this situation is particularly harmful for low-income households. Consumers are looking for ways to manage their energy bills. Higher energy bills for industry are reducing the nation's economic competitiveness and placing U.S. jobs at risk. Higher energy prices also raise the financial risk associated with the development of new natural gas-fired power plants, which had been expected to make up more than 60 percent of capacity additions over the next 20 years (EIA, 2005). Coal prices are also increasing and contributing to higher electricity costs.
- *Energy system reliability.* Events such as the Northeast electricity blackout of August 2003 and Hurricanes Katrina and Rita in 2005 highlighted the vulnerability of our energy system to disruptions. This led to an

increased focus on energy reliability and its economic and human impacts, as well as national security concerns using fossil fuel more efficiently and increasing energy supply diversity.

- *Transmission systems* are overburdened in some places, limiting the flow of economical generation and, in some cases, shrinking reserve margins of the electricity grid to inappropriately small levels. This situation can cause reliability problems and high electricity prices in or near congested areas.

- *Environmental concerns.* Energy demand continues to grow as national and state regulations are being implemented to significantly limit the emissions of air pollutants such as sulfur dioxide, nitrogen oxides, and mercury to protect public health and the environment. Many existing base load generation plants are aging and significant retrofits are needed to ensure old generating units meet these emissions regulations. In addition, emissions of greenhouse gases continue to increase.

Addressing these issues will require billions of dollars in investments in new power plants, gas rigs, transmission lines, pipelines, and other infrastructure, notwithstanding the difficulty of building new energy infrastructure in dense urban and suburban locations even with current energy efficiency investment. The decisions we make now regarding our energy supply and demand can either help us deal with these challenges more effectively or complicate our ability to secure a more stable, economical energy future.

Benefits of Energy Efficiency

Greater investment in energy efficiency can help us tackle these challenges. Energy efficiency is already a key component in the nation's energy resource mix in many parts of the country, and experience shows that energy efficiency programs can lower customer energy bills, cost less than and help defer new energy production, provide environmental benefits, and spur local economic development. Some of the major benefits of energy efficiency include:

- *Lower energy bills, greater customer control, and greater customer satisfaction.* Well-designed programs can provide opportunities for all customer classes to adopt energy savings measures and reduce their energy bills.[3] These programs can help customers make sound energy use decisions, increase control over their energy bills with savings of 5 to 30 percent, and empower them to manage their energy usage. Customers often express greater satisfaction with electricity and natural gas providers where energy efficiency is offered.

- *Lower cost than supplying new generation only from new power plants.*[4] Well-designed energy efficiency programs are saving energy at an average cost of one-half to two-thirds of the typical cost of new power sources and about one-third of the cost of providing natural gas.[5] When integrated into a long-term energy resource plan and deferring investments in new plants, these resources lower the total energy system cost.

- *Modular and quick to deploy.* Energy efficiency programs can be ramped up over a period of one to three years to deliver sizable savings. These programs can also be targeted to congested areas with high prices to bring relief where it might be difficult to deliver new supply in the near term.

- *Significant energy savings.* Well-designed energy efficiency programs are delivering energy savings each year on the order of 1 percent of total electric and natural gas sales.[6] These programs are helping to offset 20 to 50 percent of expected growth in energy

[3] See Chapter 6: Energy Efficiency Program Best Practices for more information on leading programs.

[4] Many energy efficiency programs have an average lifecycle cost of $0.03/kilowatt-hours (kWh) saved, which is 50 to 75 percent of the typical cost of new power sources (ACEEE, 2004; EIA, 2005).

[5] Based on new power costs and gas prices in 2015 (EIA, 2006) compared to electric and gas program costs based on leading energy programs, many of which are discussed in Chapter 6: Energy Efficiency Program Best Practices.

[6] Based on leading energy efficiency programs, many of which are discussed in Chapter 6: Energy Efficiency Program Best Practices.

demand in some areas without compromising the end users' activities and economic wellbeing (Nadel, et al., 2004; EIA, 2006).

- *Environmental benefits.* Cost-effective energy efficiency offers environmental benefits related to reduced demand, such as reduced air pollution and greenhouse gas emissions, lower water use, and less environmental damage from fossil fuel extraction. Energy efficiency is an attractive option for generation owners facing requirements to reduce greenhouse gas emissions.

- *Economic development.* Greater investment in energy efficiency helps build jobs and improve state economies. Energy efficiency users often redirect their bill savings toward other activities that increase local and national employment, with a higher employment impact than if the money had been spent to purchase energy (York and Kushler, 2005; NYSERDA, 2004). Many energy efficiency programs create construction and installation jobs, with multiplier impacts on other employment and local economies (Sedano et al., 2005). Local investments in energy efficiency can offset energy imports from out-of-state, improving the state balance of trade. Lastly, energy efficiency investments usually create long-lasting infrastructure changes to building, equipment and appliance stocks, creating long-term property improvements that deliver long-term economic value (Innovest, 2002).

- *Energy security.* As energy efficiency reduces the level of U.S. per capita energy consumption, we decrease the vulnerability of our economy and individual consumers to energy price disruptions from natural disasters and attacks upon domestic and international energy supplies and infrastructure.

Decades of Experience with Energy Efficiency

Utilities and their regulators began recognizing the potential benefits of improving efficiency and reducing demand in the 1970s and 1980s. These "demand-side management" (DSM) approaches meet increased demands for electricity or natural gas by managing the demand on the customer's side of the meter rather than increasing or acquiring more supplies. Planning processes, such as "least-cost planning" or "integrated resource planning," have been used to evaluate DSM programs on par with supply options and allow investment in DSM programs when they cost less than new supply options.

DSM program spending exceeded $2 billion a year (in 2005 dollars) in 1993 and 1994 (York and Kushler, 2005). However, restructuring of the electric industry in the mid- to late 1990s changed the regulatory structure in about half of the states, increased political and regulatory pressures to hold down electricity prices, and reduced the funding for utility-sponsored energy effi-

Long Island Power Authority's Clean Energy Program Drives Economic Development, Customer Savings, and Environmental Quality Enhancements

Long Island Power Authority (LIPA) started its Clean Energy Initiative in 1999 and has invested $229 million over the past 6 years. LIPA's portfolio of energy efficiency programs from 1999 to 2005 produced significant energy savings, emissions reductions and stimulated economic growth on Long Island:

- 296 MW peak demand savings
- 1,348 GWh cumulative savings
- Emissions reductions of:
  - — Greater than 937,402 tons of CO_2
  - — Greater than 1,334 tons of NO_X
  - — Greater than 4,298 tons of SO_X
- $275 million in customer bill savings and rebates
- $234 million increase in net economic output on Long Island
- 4,500 secondary jobs created

Source: LIPA, 2006

ciency programs. This funding has partially recovered with new policies and funding mechanisms (see Figure 1-1) implemented to ensure that some level of cost-effective energy efficiency was pursued.

Notwithstanding the policy and regulatory changes that have affected energy efficiency program funding, wide scale, organized energy efficiency programs have now been operating for decades in certain parts of the country. These efforts have demonstrated the following:

- *Energy efficiency programs deliver significant savings.* In the mid-1990s, based on the high program funding levels of the early 1990s, electric utilities estimated program savings of 30 gigawatts (the output of about 100 medium-sized power plants) and more than 60 million megawatt-hours (MWh).

- *Energy efficiency programs can be used to meet a significant portion of expected load growth.* For example:

— The Pacific Northwest region has met 40 percent of its growth over the past two decades through energy efficiency programs (see Figure 1-2).

— California's energy efficiency goals, adopted in 2004 by the Public Utilities Commission, are to use energy

Puget Sound Energy's Resource Plan Includes Accelerated Conservation to Minimize Risks and Costs

Puget Sound Energy's (PSE's) 2002 and 2005 Integrated Resource Plans found that the accelerated development of energy efficiency minimizes both costs and risks. As a result, PSE significantly expanded its energy efficiency efforts. PSE is now on track to save 279 average MW (aMW) between 2006 and 2015, more than the company had saved between 1980 and 2004. The 279 aMW of energy efficiency represents nearly 10 percent of its forecasted 2015 sales.

Source: Puget Sound Energy, 2005

Connecticut's Energy Efficiency Programs Generate Savings of $550 Million in 2005

In 2005, the Connecticut Energy Efficiency Fund, managed by the Energy Conservation Management Board, invested $80 million in energy efficiency. This investment is expected to produce $550 million of bill savings to Connecticut electricity consumers. In addition, the 2005 programs, administered by Northeast Utilities and United Illuminating, resulted in:

- 126 MW peak demand reduction
- 4,398 GWh lifetime savings
- Emissions reductions of:

— Greater than 2.7 million tons of CO_2

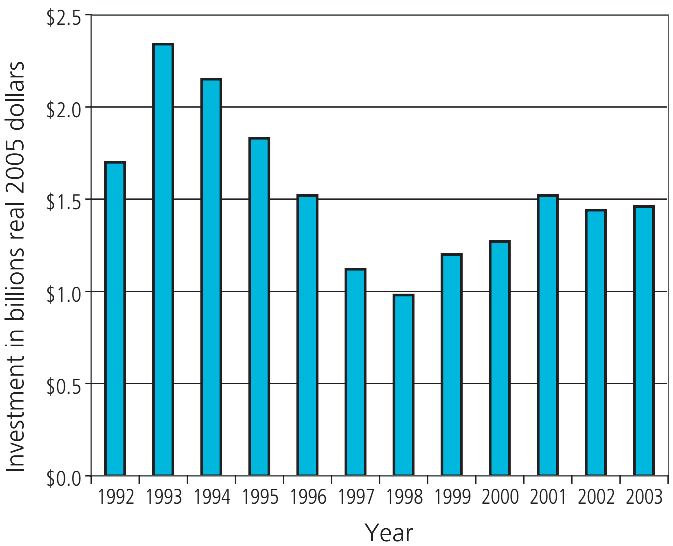
— Greater than 1,702 tons of NO_X

— Greater than 4,616 tons of SO_X

- 1,000 non-utility jobs in the energy efficiency industry

Source: CECMB, 2006

Figure 1-1: Energy Efficiency Spending Has Declined



Source: Data derived from ACEEE 2005 Scorecard (York and Kushler, 2005) adjusted for inflation using U.S. Department of Labor Bureau of Labor Statistics Inflation Calculator efficiency to displace more than half of future electricity load growth and avoid the need to build three large (500 MW) power plants.

- *Energy efficiency is being delivered cost-competitively with new supply.* Programs across the country are demonstrating that energy efficiency can be delivered at a cost of 2 to 4 cents per kilowatt-hour and a cost of $1.30 to $2.00 per lifetime million British thermal units (MMBtu) saved.

- *Energy efficiency can be targeted to reduce peak demand.* A variety of programs address the peak demand of different customer classes, lowering the strain on existing supply assets (e.g., pipeline capacity, transmission and distribution capacity, and power plant capability), allowing energy delivery companies to better utilize existing assets and deferring new capital investments.

- *Proven, cost-effective program models are available to build upon.* These program models are available for almost every customer class, both gas and electric.

Southern California Edison's Energy Efficiency Investments Provides Economic and Environmental Savings

Southern California Edison's (SCE's) comprehensive portfolio of energy efficiency programs for 2006 through 2008 will produce:

- 3 percent average bill reduction by 2010
- 3.5 billion kilowatt-hours (kWh) of energy savings
- 888 megawatts (MW) of demand savings
- 20.5 million tons of carbon dioxide (CO_2) emission reductions
- 5.5 million tons of nitrogen oxides (NO_X) emission reductions
- Energy saved at a cost of less than 4.1 cents/kWh

Source: *Southern California Edison,* 2006

New York State's Aggressive Energy Efficiency Programs Help Power the Economy As Well As Reduce Energy Costs

New York State Energy Research and Development Authority's (NYSERDA's) portfolio of energy efficiency programs for the period from 1999 to 2005 produced significant energy savings, as well as stimulated economic growth and jobs, and reduced energy prices in the state:

- 19 billion kWh/year of energy savings
- 4,166 added jobs/year (created/retained) from 1999 to 2017
- $244 million/year in added total economic growth from 1999 to 2017
- $94.5 million in energy price savings over three years

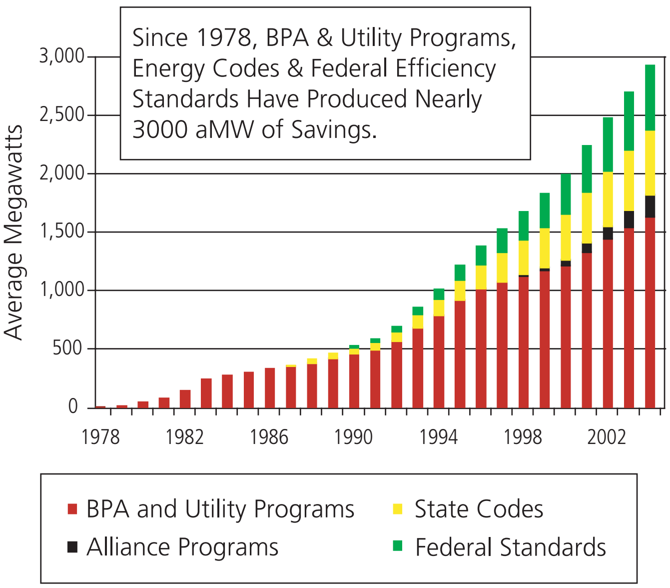
Source: NYSERDA, 2006

National Case for Energy Efficiency

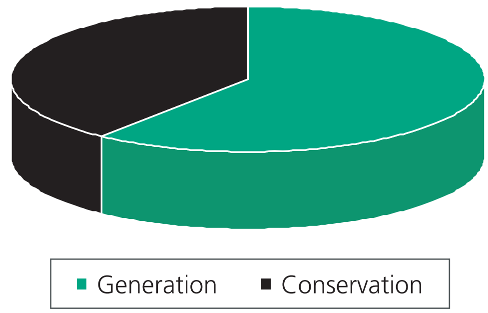
Improving the energy efficiency of homes, businesses, schools, governments, and industries—which consume more than 70 percent of the energy used in the country—is one of the most constructive, cost-effective ways to address the nation's energy challenges. Many of these buildings and facilities are decades old and will consume the majority of the energy to be used in these sectors for years to come. State and regional studies have found that adoption of economically attractive, but as yet untapped, energy efficiency could yield more than 20 percent savings in total electricity demand nationwide by 2025. Depending on the underlying load growth, these savings could help cut load growth, these savings could help cut load growth by half or more compared to current forecasts (Nadel et al., 2004; SWEEP, 2002; NEEP, 2005; NWPCC, 2005; Western Governors' Association, 2006). Similarly, energy efficiency targeted at direct natural gas use could lower natural gas demand growth by 50 percent (Nadel et al., 2004). Furthermore, studies also show that significant reductions in energy consumption

Figure 1-2: Energy Efficiency Has Been a Resource in the Pacific Northwest for the Past Two Decades

PNW Energy Efficiency Achievements 1978 - 2004



Energy Efficiency Met Nearly 40 Percent of Pacific Northwest Regional Firm Sales Growth Between 1980 to 2003



Source: Eckman, 2005

can be achieved quickly (Callahan, 2006) and at low costs for many years to come.

Capturing this energy efficiency resource would offer substantial economic and environmental benefits across the country. Widespread application of energy efficiency programs that already exist in some regions[7] could deliver a large part of these potential savings. Extrapolating the results from existing programs to the entire country would yield over the next 10 to 15 years[8]:

- Energy bill savings of nearly $20 billion annually.
- Net societal benefits of more than $250 billion.[9]
- Avoided need for 20,000 MW (40 new 500 MW-power plants).
- Avoided annual air emissions of more than 200 million tons of CO_2, 50,000 tons of sulfur dioxide (SO_2), and 40,000 tons of NO_X.

These benefits illustrate the magnitude of the benefits cost-effective energy efficiency offers. They are estimated based on (1) assumptions of average program spending levels by utilities or other program administrators

7 Based on assumptions of average program spending levels by utilities or other program administrators, with conservatively high numbers for the cost of energy efficiency programs. See highlights of some of these programs in Chapter 6: Energy Efficiency Program Best Practices, Tables 6-1 and 6-2.

8 These economic and environmental savings estimates extrapolate the results from regional programs to a national scope. Actual savings at the regional level vary based on a number of factors. For these estimates, avoided capacity value is based on peak load reductions de-rated for reductions that do not result in savings of capital investments. Emission savings are based on a marginal on-peak generation fuel of natural gas and marginal off-peak fuel of coal; with the on-peak period capacity requirement double that of the annual average. These assumptions vary by region based upon situation-specific variables. Reductions in capped emissions may reduce the cost of compliance.

9 Net present value assuming 5 percent discount rate.

that currently sponsor energy efficiency programs and (2) conservatively high estimates for the cost of the energy efficiency programs themselves (see Table 1-1).[10] They are not meant as a prescription; there are differences in opportunities and costs for energy efficiency that need to be addressed at the regional, state, and utility level to design and operate effective programs.

As a nation we are passing up these savings by substantially under-investing in energy efficiency. One indicator of this under-investment is the level of energy efficiency program funding across the country. Based on the effectiveness of current energy efficiency programs operated in certain parts of the country, the funding necessary to yield the economic and environmental benefits presented above is approximately four times the funding levels for organized efficiency programs today (less than $2 billion per year). Again, this is one indicator of under-investment and not meant to be a national funding target. Appropriate funding levels need to be established at the regional, state, or utility level based on the cost-effective potential for energy efficiency as well as other factors.

The current under-investment in energy efficiency is due to a number of well-recognized barriers. Some key barriers arise from choices concerning regulation of electric and natural gas utilities. These barriers include:

- *Market barriers*, such as the well-known "split-incentive" barrier, which limits home builders' and commercial developers' motivation to invest in new building energy efficiency because they do not pay the energy bill, and the transaction cost barrier, which chronically affects individual consumer and small business decision-making.
- *Customer barriers*, such as lack of information on energy saving opportunities, lack of awareness of how energy efficiency programs make investments easier through low-interest loans, rebates, etc., lack of time and attention to implementing efficiency measures, and lack of availability of necessary funding to invest in energy efficiency.
- *Public policy barriers*, which often discourage efficiency investments by electric and natural gas utilities, transmission and distribution companies, power producers and retail electric providers. Historically these organizations have been rewarded more for building infrastructure (e.g., power plants, transmission lines, pipelines) and increasing energy sales than for helping their customers use energy wisely even when the energy-saving measures may cost less.[11]
- *Utility, state, and regional planning barriers*, which do not allow energy efficiency to be considered equitably with supply-side resources in the energy planning process.
- *Energy efficiency program barriers*, which limit investment due to lack of knowledge about the most effective and cost-effective energy efficiency program portfolios, programs for overcoming common market barriers to energy efficiency, or available technologies.

While a number of energy efficiency policies and programs contribute to addressing these barriers such as building codes, appliance standards, and state government leadership programs, energy efficiency programs organized through electricity and gas providers also encourage greater energy efficiency in the homes, buildings, and facilities that exist today that will consume the majority of the energy used in these sectors for years to come.

10 This estimate of the funding required assumes 2 percent of revenues across electric utilities and 0.5 percent across gas utilities. The estimate also assumes that energy efficiency is delivered at a total cost (utility and participant) of $0.04 per kWh and $3 per MMBtu, which are higher than the costs of many of today's programs.

11 Many energy efficiency programs have an average lifecycle cost of $0.03/kWh saved, which is 50-75% of the typical cost of new power sources (ACEEE, 2004; EIA, 2006).

Table 1-1. Summary of Benefits for National Energy Efficiency Efforts

Program Cost	**Electric**	**Natural Gas**	**Total**
Utility Program Spending (% of utility revenue)	2.0%	0.5%	
Total Cost of Efficiency (customer & utility)	$35/MWh	$3/MMBtu	
Cost of Efficiency (customer)	$15/MWh	$2/MMBtu	
Average Annual Cost of Efficiency ($MM)	$6,800	$1,200	
Total Cost of Efficiency (NPV, $MM)	$140,000	$25,000	$165,000
Efficiency Spending - Customer (NPV, $MM)	$60,000	$13,000	$73,000
Efficiency Program Spending - Utility (NPV, $MM)	$80,000	$13,000	$93,000
Resulting Savings	**Electric**	**Natural Gas**	**Total**
Net Customer Savings (NPV, $MM)	$277,000	$76,500	$353,500
Annual Customer Savings $MM	*$18,000*	*$5,000*	*$23,000*
Net Societal Savings (NPV, $MM)	$270,000	$74,000	$344,000
Annual Net Societal Savings ($MM)	*$17,500*	*$5,000*	*$22,500*
Decrease in Revenue Requirement (NPV, $MM)	$336,000	$89,000	$425,000
Annual Decrease in Revenue Requirement ($MM)	*$22,000*	*$6,000*	*$28,000*
Energy Savings	**Electric**	**Natural Gas**	**Total**
Percent of Growth Saved, Year 15	61%	52%	
Percent of Consumption Saved, Year 15	12%	5%	
Peak Load Reduction, Year 15 (De-rated)[a]	34,000 MW		
Energy Saved, Year 15	588,000 GWh	1,200 BCF	
Energy Saved (cumulative)	9,400,000 GWh	19,000 BCF	
Emission Reductions	**Electric**	**Natural Gas**	**Total**
CO2 Emission Reduction (1,000 Tons), Year 15	338,000	72,000	410,000
NOx Emission Reduction (Tons), Year 15	67,000	61,000	128,000
Other Assumptions	**Electric**	**Natural Gas**	
Load Growth (%)	2%	1%	
Utility NPV Discount Rate	5%	5%	
Customer NPV Discount Rate	5%	5%	
EE Project Life Term (years)	15	15	

Source: Energy Efficiency Benefits Calculator developed for the National Action Plan for Energy Efficiency, 2006.

[a] De-rated peak load reduction based on the coincident peak load reduced multiplied by the percent of growth-related capital expenditures that are saved. Peak load reductions in unconstrained areas are not counted.

The National Action Plan for Energy Efficiency

To drive a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations, more than 50 leading organizations joined together to develop this National Action Plan for Energy Efficiency. The Leadership Group members (Table 1-2) have developed this National Action Plan for Energy Efficiency Report, which:

- Reviews the barriers limiting greater investment in energy efficiency by gas and electric utilities and partner organizations.
- Presents sound business strategies that are available to overcome these barriers.
- Documents a set of business cases showing the impacts on key stakeholders as utilities under different circumstances increase energy efficiency programs.
- Presents best practices for energy efficiency program design and operation.
- Presents policy recommendations and options for spurring greater investment in energy efficiency by utilities and energy consumers.

The report chapters address four main policy and program areas (see Figure 1-3):

- *Utility Ratemaking and Revenue Requirements.* Lost sales from the expanded use of energy efficiency have a negative effect on the financial performance of electric and natural gas utilities, particularly those that are investor-owned under conventional regulation. Cost-recovery strategies have been designed and implemented to successfully "decouple" utility financial health from electricity sales volumes to remove financial disincentives to energy efficiency, and incentives have been developed and implemented to make energy efficiency investments as financially rewarding as capital investments.

The goal of the National Action Plan for Energy Efficiency is to create a sustainable, aggressive national commitment to energy efficiency through gas and electric utilities, utility regulators, and partner organizations.

The Leadership Group:

- Recognizes that utilities and regulators have critical roles in creating and delivering energy efficiency programs to their communities.
- Recognizes that success requires the joint efforts of the customer, utility, regulator, and partner organizations.
- Will work across their spheres of influence to remove barriers to energy efficiency.
- Commits to take action within their own organization to increase attention and investment in energy efficiency.

Leadership Group Recommendations:

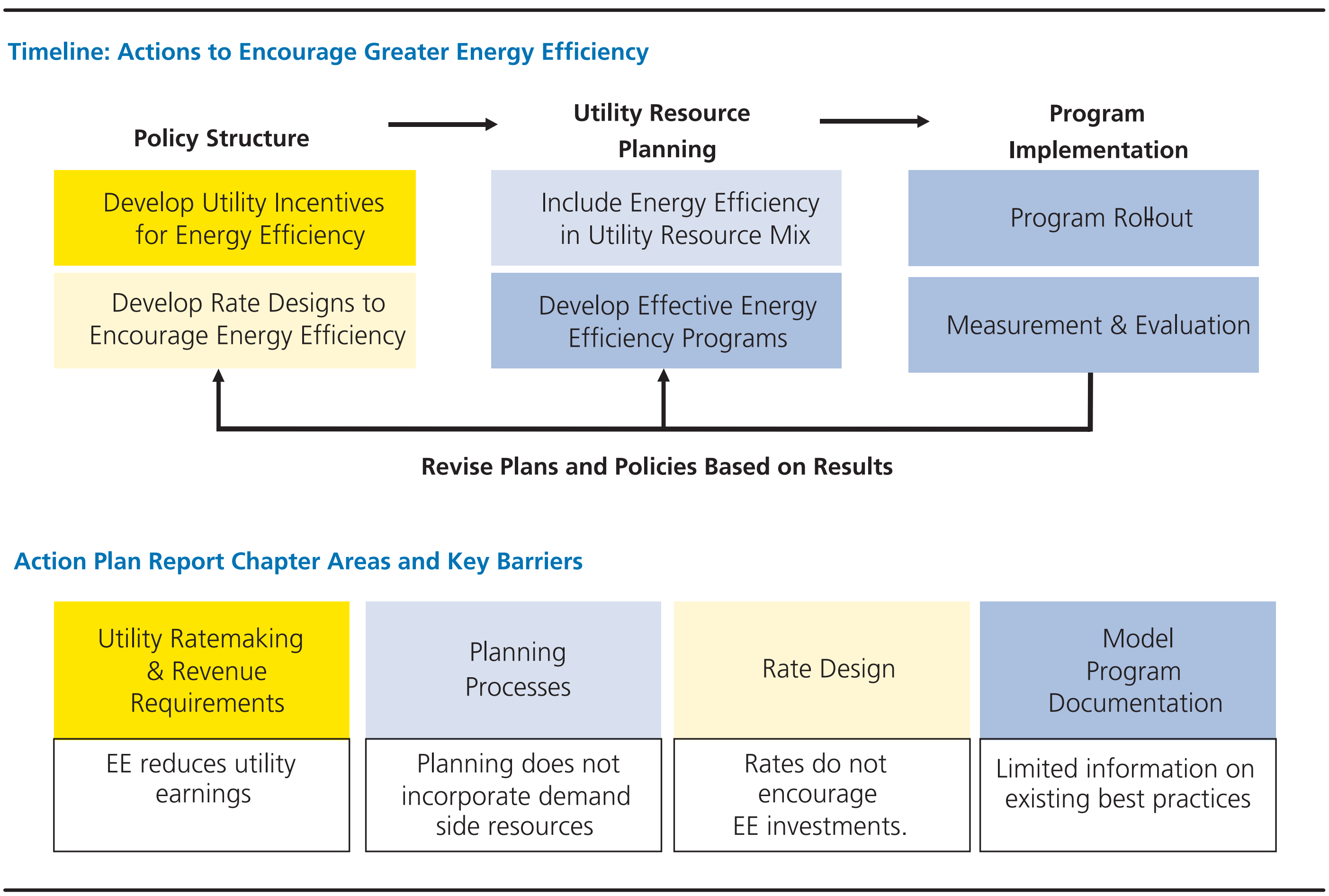
- Recognize energy efficiency as a high-priority energy resource.
- Make a strong, long-term commitment to implement cost-effective energy efficiency as a resource.
- Broadly communicate the benefits of and opportunities for energy efficiency.
- Promote sufficient, timely, and stable program funding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

- *Planning Processes.* Energy efficiency, along with other customer-side resources, are not fully integrated into state and utility planning processes that identify the need to acquire new electricity and natural gas resources.

- *Rate Design.* Some regions are successfully using rate designs such as time-of-use or seasonal rates to more accurately reflect the cost of providing electricity and to encourage customers to consume less energy.

- *Energy Efficiency Program Best Practices Documentation.* One reason given for slow adoption of energy efficiency is a lack of knowledge about the most effective and cost-effective energy efficiency program options. However, many states and electricity and gas providers are successfully operating energy efficiency programs across end-use sectors and customer classes, including residential, commercial, industrial, low-income, and small business. These programs employ a variety of approaches, including providing public information and training, offering financing and financial incentives, allowing energy savings bidding, and offering performance contracting.

Figure 1-3: National Action Plan for Energy Efficiency Report Addresses Actions to Encourage Greater Energy Efficiency

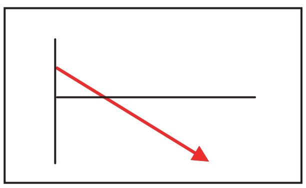


Business Cases for Energy Efficiency

A key element of the National Action Plan for Energy Efficiency is exploring the benefits of energy efficiency and the mechanisms and policies that may need to be modified so that each of the key stakeholders can benefit from energy efficiency investments. A key issue is that adoption of energy efficiency saves resources and utility costs, but also reduces utility sales. Therefore, the effect on utility financial health must be carefully evaluated. To that end, the Leadership Group has developed an Energy Efficiency Benefits Calculator (Calculator) that evaluates the financial impact of energy efficiency on its major stakeholders—utilities, customers, and society. The Calculator allows stakeholders to examine different efficiency and utility cases with transparent input assumptions.

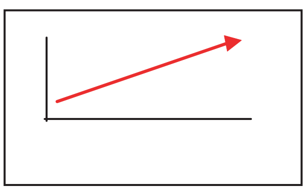
The business cases presented in Chapter 4 of this report show the impact of energy efficiency investments upon sample utility's financial health and earnings, upon customer energy bills, and upon social resources such as net efficiency costs and pollutant emissions. In general, the impacts of offering energy efficiency programs versus not offering efficiency follow the trends and findings illustrated below from the customer, utility and society perspectives.

Customer Perspective. Customers' overall bills will decrease with energy efficiency because lower energy usage offsets potential rate increases to cover the cost of offering the efficiency program.



Customer Bills – Decrease

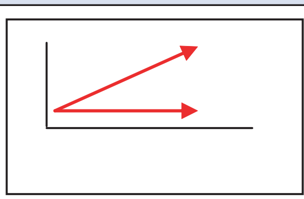
Total customer bills decline over time as a result of investment in cost-effective energy efficiency programs as customers save due to lower energy consumption. This decline follows an initial rise in customer bills reflecting the cost of energy efficiency programs, which will then reduce costs over many years.



Customer Bills – Mild Increase[12]

Rates might increase slightly to cover the cost of the energy efficiency program.

Utility Perspective. Energy efficiency affects utility revenues, shareholder earnings, and costs associated with capital investments. The utility can be financially neutral to investments in energy efficiency, at a minimum, or encourage greater investment through the implementation of a variety of decoupling, ratemaking, and incentives policies. These policies can ensure that shareholder returns and earnings could be the same or increased. Utility investment in infrastructure and contractual obligations for energy procurement could be reduced, providing a favorable balance sheet impact.

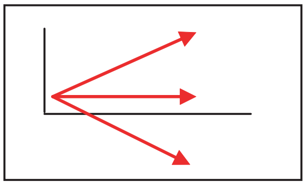


Utility Returns – No Change or Increase

Utility earnings remain stable or increase if decoupling or the use of shareholder incentives accompanies an energy efficiency program. Without incentives, earnings might be lower because effective energy efficiency will reduce the utility's sales volume and reduce the utility's rate base and thus the scope of its earnings.

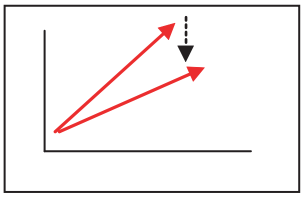
12 The changes shown in the business cases indicate a change from what would have otherwise occurred. This change does not include a one-time infrastructure investment in the assumptions, but it does include smooth capital expenditures. Energy efficiency will moderate prices of fossil fuels. The fuel price reductions from an aggressive energy efficiency program upon fuel prices have not been included and could result in an overall rate reduction.

Utility Perspective (continued)



Change in Utility Earnings – Results Vary

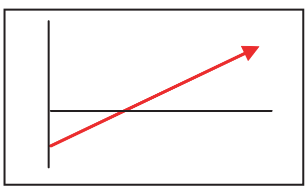
Depending on the inclusion of decoupling and/or shareholder incentives, utility earnings vary. Utility earnings increase if decoupling or shareholder incentives are included. If no incentives, earnings might be lower due to reduced utility investment



Peak Load Growth and Associated Capital Investment – Decreases

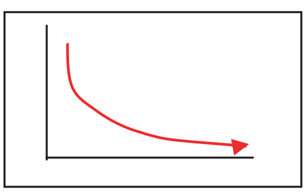
Capital investments in new resources and energy delivery infrastructure are reduced because peak capacity savings are captured due to energy efficiency measures.

Community or Society Perspective. From a broad community/society perspective, energy efficiency produces real savings over time. While initially, energy efficiency can raise energy costs slightly to finance the new energy efficiency investment, the reduced bills (as well as price moderation effects) provide a rapid payback on these investments, especially compared to the ongoing costs to cover the investments in new energy production and delivery infrastructure costs. Moreover, the environmental benefits of energy efficiency continue to grow. The Calculator evaluates the net societal savings, utility savings, emissions reductions, and the avoided growth in energy demand associated with energy efficiency.



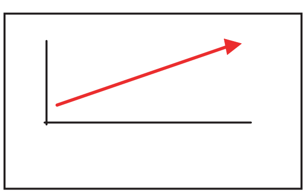
Net Resources Savings – Increases

Over time, as energy efficiency programs ramp up, cumulative energy efficiency savings lead to cost savings that exceed the energy efficiency program cost.



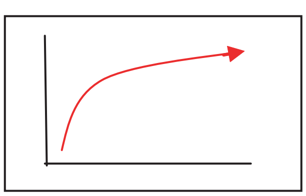
Total Resource Cost per Unit – Declines

Total cost of providing each unit of energy (MWh, MMBtu gas) declines over time because of the impacts of energy savings, decreased peak load requirements, and decreased costs during peak periods. Well-designed energy efficiency programs can deliver energy at an average cost less than that of new power sources.



Emissions and Cost Savings – Increases

Efficiency prevents or avoids producing many annual tons of emissions and emission control costs.



Growth Offset by EE – Increases

As energy efficiency programs ramp up, the percent of growth that is offset by energy efficiency climbs and then levels as cumulative savings as a percent of demand growth stabilizes.

About This Report

The National Action Plan for Energy Efficiency is structured as follows:

Chapter 2: *Utility Ratemaking & Revenue Requirements*

- Reviews mechanisms for removing disincentives for utilities to consider energy efficiency.
- Reviews the pros and cons for different strategies to reward utility energy efficiency performance, including the use of energy efficiency targets, shared savings approaches, and shareholder/company performance incentives.
- Reviews various funding options for energy efficiency programs.
- Presents recommendations and options for modifying policies to align utility incentives with the delivery of cost-effective energy efficiency and providing for sufficient and stable program funding to deliver energy efficiency where cost effective.

Chapter 3: *Energy Resource Planning Processes*

- Reviews state and regional planning approaches, including Portfolio Management and Integrated Resource Planning, which are being used to evaluate a broad array of supply and demand options on a level playing field in terms of their ability to meet projected energy demand.
- Reviews methods to quantify and simplify the value streams that arise from energy efficiency investments—including reliability enhancement/congestion relief, peak demand reductions, and greenhouse gas emissions reductions—for direct comparison to supply-side options.
- Presents recommendations and options for making a strong, long-term commitment to cost-effective energy efficiency as a resource.

Chapter 4: *Business Case for Energy Efficiency*

- Outlines the business case approach used to examine the financial implications of enhanced energy efficiency investment on utilities, consumers, and society.
- Presents case studies for eight different electric and natural gas utility situations, including different ownership structures, gas and electric utilities, and different demand growth rates.

Chapter 5: *Rate Design*

- Reviews a variety of rate design structures and their effect in promoting greater investment in energy efficiency by the end-user.
- Presents recommended strategies that encourage greater use of energy efficiency through rate design.

Chapter 6: *Energy Efficiency Program Best Practices*

- Reviews and presents best practices for operating successful energy efficiency programs at a portfolio level, addressing issues such as assessing energy efficiency potential, screening energy efficiency programs for cost-effectiveness, and developing a portfolio of approaches.
- Provides best practices for successful energy efficiency programs across end-use sectors, customer classes, and a broad set of approaches.
- Documents the political and administrative factors that lead to program success.

Chapter 7: *Summary*

- Summarizes the policy and program recommendations and options.

For More Information

Visit the National Action Plan for Energy Efficiency Web site: *www.epa.gov/cleanenergy/eeactionplan.htm* or contact:

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Table 1-2. Members of the National Action Plan for Energy Efficiency

Co-Chairs

Diane Munns	Member President	Iowa Utilities Board National Association of Regulatory Utility Commissioners
Jim Rogers	President and Chief Executive Officer	Duke Energy

Leadership Group

Barry Abramson	Senior Vice President	Servidyne Systems, LLC
Angela S. Beehler	Director of Energy Regulation	Wal-Mart Stores, Inc.
Bruce Braine	Vice President, Strategic Policy Analysis	American Electric Power
Jeff Burks	Director of Environmental Sustainability	PNM Resources
Kateri Callahan	President	Alliance to Save Energy
Glenn Cannon	General Manager	Waverly Light and Power
Jorge Carrasco	Superintendent	Seattle City Light
Lonnie Carter	President and Chief Executive Officer	Santee Cooper
Mark Case	Vice President for Business Performance	Baltimore Gas and Electric
Gary Connett	Manager of Resource Planning and Member Services	Great River Energy
Larry Downes	Chairman and Chief Executive Officer	New Jersey Natural Gas (New Jersey Resources Corporation)
Roger Duncan	Deputy General Manager, Distributed Energy Services	Austin Energy
Angelo Esposito	Senior Vice President, Energy Services and Technology	New York Power Authority
William Flynn	Chairman	New York State Public Service Commission
Jeanne Fox	President	New Jersey Board of Public Utilities
Anne George	Commissioner	Connecticut Department of Public Utility Control
Dian Grueneich	Commissioner	California Public Utilities Commission
Blair Hamilton	Policy Director	Vermont Energy Investment Corporation
Leonard Haynes	Executive Vice President, Supply Technologies, Renewables, and Demand Side Planning	Southern Company
Mary Healey	Consumer Counsel for the State of Connecticut	Connecticut Consumer Counsel
Helen Howes	Vice President, Environment, Health and Safety	Exelon
Chris James	Air Director	Connecticut Department of Environmental Protection
Ruth Kinzey	Director of Corporate Communications	Food Lion
Peter Lendrum	Vice President, Sales and Marketing	Entergy Corporation
Rick Leuthauser	Manager of Energy Efficiency	MidAmerican Energy Company
Mark McGahey	Manager	Tristate Generation and Transmission Association, Inc.
Janine Migden-Ostrander	Consumers' Counsel	Office of the Ohio Consumers' Counsel
Richard Morgan	Commissioner	District of Columbia Public Service Commission
Brock Nicholson	Deputy Director, Division of Air Quality	North Carolina Air Office
Pat Oshie	Commissioner	Washington Utilities and Transportation Commission
Douglas Petitt	Vice President, Government Affairs	Vectren Corporation

Bill Prindle	Deputy Director	American Council for an Energy-Efficient Economy
Phyllis Reha	Commissioner	Minnesota Public Utilities Commission
Roland Risser	Director, Customer Energy Efficiency	Pacific Gas and Electric
Gene Rodrigues	Director, Energy Efficiency	Southern California Edison
Art Rosenfeld	Commissioner	California Energy Commission
Jan Schori	General Manager	Sacramento Municipal Utility District
Larry Shirley	Division Director	North Carolina Energy Office
Michael Shore	Senior Air Policy Analyst	Environmental Defense
Gordon Slack	Energy Business Director	The Dow Chemical Company
Deb Sundin	Director, Business Product Marketing	Xcel Energy
Dub Taylor	Director	Texas State Energy Conservation Office
Paul von Paumgartten	Director, Energy and Environmental Affairs	Johnson Controls
Brenna Walraven	Executive Director, National Property Management	USAA Realty Company
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Steve Ward	Public Advocate	State of Maine
Mike Weedall	Vice President, Energy Efficiency	Bonneville Power Administration
Tom Welch	Vice President, External Affairs	PJM Interconnection
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Diane Shea	Executive Director	National Association of State Energy Officials
Rick Tempchin	Director, Retail Distribution Policy	Edison Electric Institute
Mark Wolfe	Executive Director	Energy Programs Consortium

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2: Utility Ratemaking & Revenue Requirements

While some utilities manage aggressive energy efficiency programs as a strategy to diversify their portfolio, lower costs, and meet customer demand, many still face important financial disincentives to implementing such programs. Regulators working with utilities and other stakeholders, as well as boards working with publicly-owned utilities, can establish or reinforce several policies to help address these disincentives, including overcoming the throughput incentive, ensuring program cost recovery, and defining shareholder performance incentives.

Overview

The practice of utility regulation is, in part, a choice about how utilities make money and manage risk. These regulatory choices can guide utilities toward or away from investing in energy efficiency, demand response, and distributed generation (DG). Traditional ratemaking approaches have strongly linked a utility's financial health to the volume of electricity or gas sold via the ratemaking structure, creating a disincentive to investment in cost-effective demand-side resources that reduce sales. The ratemaking structure and process establishes the rates that generate the revenues that gas and electric utilities, both public and private, can recover based on the just and reasonable costs they incur to operate the system and to procure and deliver energy resources to serve their customers.

Alternate financial incentive structures can be designed to encourage utilities to actively promote implementation of energy efficiency when it is cost effective to do so. Aligning utility and public interest aims by disconnecting profits and fixed cost recovery from sales volumes, ensuring program cost recovery, and rewarding shareholders can "level the playing field" to allow for a fair, economically based comparison between supply- and demand-side resource alternatives and can yield a lower cost, cleaner, and reliable energy system.

This chapter explores the utility regulatory approaches that limit greater deployment of energy efficiency as a resource in U.S. electricity and natural gas systems. Generally, it is within the power of utility commissions and utilities to remove these barriers.[1] Removing the thoughput incentive is one way to remove a disincentive to invest in efficiency. Offering shareholder incentives will further encourage utility investment. Other disincen-

Leadership Group Recommendations Applicable to Utility Ratemaking and Revenue Requirements

- Modify policies to align utility incentives with the delivery of cost-effective energy efficiency and modify ratemaking practices to promote energy efficiency investments.
- 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, timely, and stable program funding to deliver energy efficiency where cost-effective.

A more detailed list of options specific to the objective of promoting energy efficiency in ratemaking and revenue requirements is provided at the end of this chapter.

[1] In some cases, state law limits the latitude of a commission to grant ratemaking or earnings flexibility. Removing barriers to energy efficiency in these states faces the added challenge of amending statutes.

tives for energy efficiency include a short-term resource acquisition horizon and wholesale market rules that do not capture the system value of energy efficiency. After an introduction to these barriers and solutions, this chapter will report on successful efforts in states to implement these solutions. The chapter closes with a set of recommendations for pursuing the removal of these barriers.

This chapter refers to utilities as integrated energy companies selling electricity as well as delivering it. Many of these concepts, however, also apply to states that removed retail electricity sales responsibilities from utilities—turning the utility into an electric transmission and distribution company without a retail sales function.

Barriers and Solutions to Effective Energy Efficiency Deployment

Common disincentives for utilities to invest more in cost-effective energy efficiency programs include the "throughput incentive," the lack of a mechanism for utilities to recover the costs of and provide funding for energy efficiency programs, and a lack of shareholder and other performance incentives to compete with those for investments in new generation.

Traditional Regulation Motivates Utilities to Sell More: The Throughput Incentive

Rates change with each major "rate case," the traditional and dominant form of state-level utility ratemaking.[2] Between rate cases, utilities have a financial incentive to increase retail sales of electricity (relative to forecast or historic levels, which set "base" rates) and to maximize the "throughput" of electricity across their wires. This incentive exists because there is often a significant incremental profit margin on incremental sales. When rates are reset, the throughput incentive resumes with the new base. In jurisdictions where prices are capped for an extended time, the utility might be particularly anxious to grow sales to add revenue to cover cost increases that may occur during the freeze.

With traditional ratemaking, there are few mechanisms to prevent "over-recovery" of costs, which occurs if sales are higher than projected, and no way to prevent "under-recovery," which can happen if forecast sales are too optimistic (such as when weather or regional economic conditions deviate from forecasted or "normal" conditions).[3]

This dynamic creates an automatic disincentive for utilities to promote energy efficiency, because those actions will reduce the utility's net income—even if energy efficiency is clearly established and agreed-upon as a less expensive means to meet customer needs as a least-cost resource and is valuable to the utility for risk management, congestion reduction, and other reasons (EPA, 2006). The effect of this disincentive is exacerbated in the case of distribution-only utilities, because the revenue impact of electricity sales reduction is disproportionately larger for utilities without generation resources. While some states have ordered utilities to implement energy efficiency, others have questioned the practicality of asking a utility to implement cost-effective energy efficiency when their financial self-interest is to have greater sales.

Several options exist to help remove this financial barrier to greater investment in energy efficiency:

Decouple Sales from Profits and Fixed Cost Recovery

Utilities can be regulated or managed in a manner that allows them to receive their revenue requirement with less linkage to sales volume. The point is to regulate utilities such that reductions in sales from consumer-funded

[2] Public power utilities and cooperative utilities have their own processes to adjust rates that does not require state involvment.

[3] Over-recovery means that more money is collected from consumers in rates than is needed to pay for allowed costs, including return on investment. This happens because average rates tend to collect more for sales in excess of projected demand than the marginal cost to produce and deliver the electricity for those increased sales. Likewise, under-recovery happens if sales are less than the amount used to set rates (Moskovitz, 2000).

Utility and Industry Structure and Energy Efficiency

Public Power and Cooperatively-owned Utilities Compared with Investor-owned Utilities

The throughput incentive affects municipal and cooperative utilities in a distinctive way. Public power and co-ops and their lenders are concerned with ensuring that income covers debt costs, while they are not concerned about "profits." Available low-cost financing for co-ops sometimes comes with restrictions that limit its use to power lines and generation, further diminishing interest in energy efficiency investments.

Natural Gas vs. Electric utilities

Natural gas and electric utilities both experience the throughput incentive under traditional ratemaking. Natural gas utilities operate in a more competitive environment than do electric utilities because of the non-regulated alternative fuels, but this situation can cut either way for energy efficiency. For some gas utilities, energy efficiency is an important customer service tool, while in other cases, it is just seen as an imposed cost that competitors do not have. Natural gas companies in the United States also generally see a decline in sales due to state-of-the-art efficiencies in gas end uses, a phenomenon not seen by electric companies. Yet cost-effective efficiency opportunities for local gas distribution companies remain available.

Restructured vs. Traditional Markets

The transition to retail electric competition threw open for reconsideration all assumptions about utility structure. The effects on energy efficiency have been strongly positive and negative. The throughput incentive is stronger for distribution-only companies with no generation and transmission rate base. Price caps, which typically are imposed in a transition to retail competition, diminish utility incentive to reduce sales since added revenue helps cope with new costs. Price caps also discourage utilities from adding near-term costs that can produce a long-term benefit, such as energy efficiency. As a result, energy efficiency is often disconnected from utility planning. On the other hand, several states have provided stable funding for energy efficiency as part of the restructuring process.

High-Cost vs. Low-Cost States

Energy efficiency has been more popular in high-cost states. Low-cost states tend to see energy efficiency as more expensive than their supplies from hydroelectric and coal sources, though there are exceptions where efficiency is seen as a low-cost incremental resource and a way to meet environmental goals. Looking forward, all states face similar, higher cost options for new generation, suggesting that the current resource mix will be less important than future resource options in considering the value of new energy efficiency investments.

energy efficiency, building codes, appliance standards, and distributed generation are welcomed, and not discouraged.

For example, if utility revenues were connected to the number of customers, instead of sales, the utility would experience different incentives and might behave quite differently. Under this approach, at the conclusion of a conventional revenue requirement proceeding, a utility's revenues per customer could be fixed. An automatic adjustment to the revenue requirement would occur to account for new or departing customers (a more reliable driver of costs than sales). An alternative to the revenue per customer approach is to use a simple escalation formula to forecast the fixed cost revenue requirement over time.

Under this type of rate structure, a utility that is more efficient and reduces its costs over time through energy efficiency will be able to increase profits. Furthermore, if sales are reduced by any means (e.g., efficiency, weather, or economic swings) revenues and profits will not be affected.

This approach eliminates the throughput disincentive and does not require a commission resolution of the amount of lost revenues associated with energy efficiency (see Table 2-1). A critical element of revenue decoupling is a true-up of actual results to forecasted results. Rates would vary up or down reflecting a balancing account for total authorized revenue requirements and actual revenues from electricity or gas consumed by customers. The true-up is fundamental to accomplish decoupling profits and fixed cost revenues from sales volumes. Annual adjustments have been typical and can be modeled in the Energy Efficiency Benefits Calculator (see Chapter 4: Business Case for Energy Efficiency), but a quarterly or monthly adjustment might be preferred. The plan may also include a deadband, meaning that modest deviations from the forecast would produce no change in rates, while larger deviations will result in a rate change. The plan might also share some of the deviations between customers and the utility. The magnitude of rate changes at any one time can be capped if the utility and regulators agree to defer the balance of exceptional changes to be resolved later. Prudence reviews should be unaffected by a decoupling plan. A decoupling plan would typically last a few years and could be changed to reflect new circumstances and lessons learned. Decoupling has the potential to lower the risk of the utility, and this feature should lead to consumer benefits through an overall lower cost of capital to the utility.[4]

Decoupling through a revenue per customer cap is presently more prevalent in natural gas companies, but can be a sound tool for electric companies also. Rate design need not be affected by decoupling (see Chapter 5: Rate Design for rate design initiatives that promote energy efficiency), and a shift of revenues from the variable portion of rates to the fixed portion does not address the throughput incentive. The initial revenue requirement would be determined in a routine rate case, the revenue per customer calculation would flow from the same billing determinants used to set rates. Service performance measures can be added to assure that cost reductions result from efficiency rather than service reductions. Some state laws limit the use of balancing accounts and true-ups, so legislative action would be necessary to enable decoupling in those states.

A decoupling system can be simple or complex, depending on the needs of regulators, the utility, or other parties and the value of a broad stakeholder process leading up to a decoupling system (Kantor, 2006). As the text box addressing lessons learned suggests, it is important to establish the priorities that the system is being created to address so it can be as simple as possible while avoiding unintended consequences. Additionally, it is important to evaluate any decoupling system to ensure it is performing as expected.[5]

Shifting More Utility Fixed Costs Into Fixed Customer Charges

Traditionally, rates recover a portion of the utility's fixed costs through volumetric rates, which helps service remain affordable. To better assure recovery of capital asset costs with reduced dependence on sales, state utility commissions could reduce variable rates and increase the fixed rate component, often referred to as the fixed charge or customer charge. This option may be particularly relevant in retail competition states because wires-only electric utilities have relatively high proportions of fixed costs. This shift is attractive to some natural gas systems experiencing sales volume attrition due to improved furnace efficiency and other trends. This shift reduces the throughput incentive for distribution companies and is an alternative to decoupling. There are some limiting concerns, including the effect a reduction in the variable charge may have on consumption and consumers' motivation to practice energy efficiency, and the potential for high using consumers to benefit from the change while low-using customers pay more.

4 The lowering of a gas utility's cost of capital because of the reduced risk introduced by a revenue decoupling mechanism was recently affirmed by Barone (2006).

5 Two recent papers discuss decoupling in some detail: Costello, 2006 and NERA, 2006.

The First Wave of Decoupling and Lessons Learned

In the early 1990s, several state commissions and utilities responded to the throughput incentive by creating decoupling systems. In all cases, decoupling was discontinued by the end of the decade. The reasons for discontinuation provide guidance to those considering decoupling today and indicate that the initial idea was good, but that the execution of left important issues unaddressed.

In the case of California, decoupling was functioning well, using forecasted revenues and true-ups to actuals, but the move to retail competition precipitated its end in 1996 (CPUC, 1996). Following the energy crisis of 2000-2001, California recognized the importance of long-term energy efficiency investments and reinstated mechanisms to eliminate the throughput incentive.

Puget Sound Energy in Washington adopted a decoupling plan in 1990. There were several problems. The split between variable power costs (recovered via a true-up based on actual experience) and fixed costs (recovered based on a revenue-per-customer calculation) was wrong. While customer numbers (and revenue) were increasing, new investments in transmission were not needed so the fixed cost part of the plan over-recovered. Meanwhile, new generation from independent generators was too expensive, and this added power cost (minus a prudence disallowance, which further complicated the scene) was passed to ratepayers. Unlike the current California decoupling method, there was no reasonable forecast over time for power costs. And risk of power cost increases was insufficiently shared. The results were a big rate increase and anger among customers. In retrospect, risk allocation and the split of fixed and variable costs were incompatible to the events that followed and offer a useful lesson to future attempts. The true-up process and the weather normalization process worked well. The power costs that ignited the controversy over the decoupling plan would have been recoverable in rates under the traditional system. A recent effort to restore decoupling with Puget foundered over a dispute about whether the allowed return on equity during a prior rate case should be changed if decoupling was reinstated (Jim Lazar, personal communication, October 21, 2005).

Central Maine Power also adopted a decoupling plan at the beginning of the 1990s. The plan was ill-equipped, however, to account for an ensuing steep economic downturn that reduced sales by several percentage points. Unfortunately, this effect far outweighed any benefits from energy efficiency. The true-ups called for in the plan were onerous due to the dip in sales, and authorities decided to delay them in hopes that the economy would turn around. When that did not happen, the rate change was quite large and was attributed to the decoupling plan, even though most of the rate increase was due to reduced sales and would have occurred anyway. A lesson from this experience is to not let the period between true-ups go on too long and to consider more carefully what happens if market prices, the economy, the weather, or other significant drivers are well outside expected ranges.

In both the Puget and Central Maine cases, responsibility for large rate increases was misassigned to the decoupling plan, when high power costs from independent power producers (Puget) or general economic conditions (Central Maine) were primarily responsible. That said, serious but correctable flaws in the decoupling plans left consumers exposed to more risk than was necessary.

Provide Utilities the Profit Lost through Efficiency

Another way to address the throughput incentive is to calculate the profits forgone to successful energy efficiency. Lost Revenue Adjustment Mechanisms (LRAM) allow a utility to directly recoup the "lost" profits and contributions to fixed costs associated with not selling additional units of energy because of the success of energy efficiency programs in reducing electricity consumption. The amount of lost profit can be estimated by multiplying the fixed portion of the utility's prices by the energy savings from energy efficiency programs or the energy generated from DG, based on projected savings or ex post impact evaluation studies. The amount of lost estimated profits is then directly returned to the utility's shareholders. Some states have adopted these mechanisms either through rate cases or add-ons to the fuel adjustment clause calculations.

Experience has shown that LRAM can allow utilities to recover more profits than the energy efficiency program

Table 2-1. Options to Mitigate the Throughput Incentive: Pros and Cons

Policy	Pros	Cons
Traditional cost of service plus return regulation	• Familiar system for regulators and utilities. • Rate changes follow rate cases (except for fuel/purchased gas adjustment clause states).	• Reduced sales reduce net income and contributions to fixed costs. • Sales forecasts can be contentious. • Harder to connect good utility performance to a financial consequence. Risks outside control of utility might be assigned to the utility.
Decoupling (use of a forecast of revenue or revenue per customer, with true-ups to actual results during a defined timeframe)	• Removes sales incentive and distributed resource disincentives. • Authorized fixed costs covered by revenue. • All beneficial actions and policies that reduce sales (distributed generation, energy efficiency programs, codes and standards, voluntary actions by customers, demand response) can be promoted by the utility without adversely affecting net income or coverage of fixed costs. Opportunity to easily reward or penalize utilities based on performance. • True-ups from balancing accounts or revenue per customer are simple. • Easy to add productivity factors, inflation adjustments, and performance indicators with rewards and penalties that can be folded into the true-up process. • Reduces volatility of utility revenue resulting from many causes. Risks from abnormal weather, economic performance, or energy markets can be allocated explicitly between customers and the utility.	• Lack of experience. Viewed by some as a more complex process. • Quality of forecasts is very important. • Some consumer advocates are uncomfortable with rate adjustments outside rate case or familiar fuel adjustment clause. • Frequent rate adjustments from true-ups are objectionable to those favoring rate stability and who worry about accountability for rate increases. • Process of risk allocation can cause decoupling plan to break down. Connection between reconstituted risks and cost of capital can cause impasse. • Many issues to factor into the decoupling agreement. Past experience with decoupling indicates that it can be hard to "get it right," though these experiences suggest solutions.
Lost Revenue Adjustment	• Restores revenue to utility that would have gone to earnings and coverage of fixed costs but is lost by energy efficiency. • Diminishes the throughput disincentive for specific qualifying programs.	• Any sales reductions from efficiency initiatives outside qualifying programs are not addressed, leaving the throughput incentive in place. • Historically contentious, complex process to decide on lost revenue adjustment. Potentially rewards under-performing energy efficiency programs.
Independent energy efficiency administration	• Administration of energy efficiency is assigned to an entity without the conflict of the throughput incentive.	• Utility can still promote load building. Programs that would reduce sales outside the activities of the independent administrator might still be discouraged due to the throughput incentive.

actually saved because the lost profit is based on projected, rather than actual, energy savings. Resolving LRAM in rate cases has been contentious in some states. Furthermore, because utilities still earn increased profits on additional sales, this approach still discourages utilities from implementing additional energy efficiency or supporting independent energy efficiency activities. A comparison of decoupling and the LRAM approach is provided in Table 2-1.

A variation is to roughly estimate the amount of lost profits and make a specified portion (50 to 100 percent) available to the utility to collect based on its performance at achieving certain program goals. This approach is simpler and more constructive than a commission docket to calculate lost revenue. It provides a visible way for the utility to earn back lost profits with program performance and achievements consistent with the public interest. This system translates well into employee merit pay systems, and the goals can fit nicely into management objectives reported to shareholders, a utility's board of directors, or Governors. Public interest groups appreciate the connection to performance.

Non-Utility Administration

Several states, such as Oregon, Vermont and New York, have elected to relieve utilities from the task of managing energy efficiency programs. In some cases, state government has taken on this responsibility, and in others, a third party was created or hired for this purpose. The utility still has the throughput incentive, so while efficiency administration may be without conflict, the utility may still engage in load-building efforts contrary to the messages from the efficiency programs. Addressing the throughput incentive remains desirable even where non-utility administration is in place. Non-utility energy efficiency administration can apply to either electricity or natural gas. Where non-utility energy efficiency administration is in place, cooperation with the utility remains important to ensure that the customer receives good service (Harrington, 2003).

Wholesale Power Markets and the Throughput Incentive

In recent years, wholesale electric power prices have increased, driven by increases in commodity fuel costs. In many parts of the country, these increases have created a situation in which utilities with generation or firm power contracts that cost less than clearing prices might make a profit if they can sell excess energy into the wholesale market. Some have questioned whether or not the situation of utilities seeing wholesale profits from reduced retail sales diminishes or removes the throughput incentive.

Empirically, these conditions do not appear to have moved utilities to accelerate energy efficiency program deployment. In states in which generation is divested from the local utility, the companies serving retail customers see no change to the throughput incentive. There is little to suggest how these market conditions will persist or change. In the absence of a more definitive course change, evidence suggests that the recent trend should not dissuade policymakers and market participants from addressing the throughput incentive.

Recovering Costs / Providing Funding for Energy Efficiency Programs

Removing the throughput incentive is a necessary step in addressing the barriers many utilities face to investing more in energy efficiency. It is unlikely to be sufficient by itself in promoting greater investment, however, because under traditional ratemaking, utilities might be unable to cover the costs of running energy efficiency programs.[6] To ensure funds are available for energy efficiency, policy-makers can utilize and establish the following mechanisms with cooperation from stakeholders:

Revenue Requirement or Procurement Funding

Policy-makers and regulators can set clear expectations that utilities should consider energy efficiency as a resource in its resource planning process, and it should spend money to procure that resource as it would for

[6] See Chapter 3: Energy Resource Planning Processes for discussion of utility resource planning budgets being used to fund energy efficiency.

other resources. This spending would be part of the utility revenue requirement and would likely appear as part of the resource procurement spending for all resources needed to meet consumer demand in all hours. In retail competition states, the default service provider, the distribution company, or a third party can handle the responsibility of acquiring efficiency resources.

Spending Budgets

To reduce regulatory disputes and create an atmosphere of stability among utility managers, trade allies, and customers, the legislature or regulator can determine a budget level for energy efficiency spending—generally a percentage of utility revenue. This budget level would be set to achieve some amount of the potentially available, cost-effective, program opportunities. The spending budget allows administrator staff, trade allies, and consumers to count on a baseline level of effort and reduces the likelihood of spending disruptions that erode customer expectations and destroy hard-to-replace market infrastructure needed to deliver energy efficiency. Unfortunately, spending budgets are sometimes treated as a maximum spending level even if more cost-effective efficiency can be gained. Alternatively, a spending budget can be treated as a minimum if policymakers also declare efficiency to be a resource. In that event, additional cost-effective investments would be recovered as part of the utility revenue requirement.

Savings Target

An alternative to minimum spending levels is a minimum energy savings target. This alternative could be policy-driven (designed for consistency to obtain a certain percentage of existing sales or forecasted growth, or as an Energy Efficiency Portfolio Standard) or resource-driven (changing as system needs dictate). Efficiency budgets can be devised annually to achieve the targets. The use of savings targets does not address how money is collected from customers, or how program administration is organized. For more information on how investments are selected, see Chapter 3: Energy Resource Planning Processes.

Clear, Reliable, and Timely Energy Efficiency Cost Recovery System

Utilities value a clear and timely path to cost recovery, and a well-functioning regulatory process should provide that. Such a process contributes to a stable regulatory atmosphere that supports energy efficiency programs. Cost recovery can be linked to program performance (as discussed in the next section) so that utilities would be responsible for prudent spending of efficiency funds.

The energy efficiency program cost recovery issue is eliminated from the utility perspective if a non-utility administrative structure is used; however, this approach does not eliminate the throughput incentive. Furthermore, funding still needs to be established for the non-utility administrator.

Tariff Rider for Energy Efficiency

A tariff rider for energy efficiency allows for a periodic rate adjustment to account for the difference between planned costs (included in rates) and actual costs.

System Benefits Charge

In implementing retail competition, several states added a separate charge to customer bills to collect funds for energy efficiency programs; several other states have adopted this idea as well. A system benefits charge is designed to provide a stable stream of funds for public purposes, like energy efficiency. System benefits charges do have disadvantages. If the funds enter the purview of state government, they may be vulnerable to decisions to use the funds for general government purposes. Also, the charge appears to be an add-on to bills, which can irritate some consumers. This distinct funding stream can lead to a disconnection in resource planning between energy efficiency and other resources. Regulators and utilities may need to take steps to ensure a comprehensive planning process when dealing with this type of funding.[7]

[7] This device might also pool funds for other public benefit purposes, such as renewable energy system deployment and bill assistance for low-income consumers.

Providing Incentives for Energy Efficiency Investment

Some suggest that if energy efficiency is a cost-effective resource, utilities should invest in it for that reason, with no reason for added incentives. Others say that for effective results, incentives should be considered since utilities are not rewarded financially for energy efficiency resources as they are for supply-side resources. This section reviews options for utility incentives to promote energy efficiency.

When utilities invest in hard assets, they depreciate these costs over the useful lives of the assets. Consumers pay a return on investment for the un-depreciated balance of costs not yet recovered, which spreads the rate effect of the asset over time. Utilities often do not have any opportunity to earn a return on energy efficiency spending, as they do with hard assets. This lack of opportunity for profit can introduce a bias against efficiency investment. Incentives for energy efficiency should be linked to achieving performance objectives to avoid unnecessary expenditures, and be evaluated by regulators based on their ability to produce cost-effective program performance. Performance objectives can also form the basis of penalties for inferior program performance. Financial incentives for utilities should represent revenues above those that would normally be recovered in a revenue requirement from a rate case.

Energy Efficiency Costs: Capitalize or Expense?

In most jurisdictions, energy efficiency costs are expensed, which means all costs incurred for energy efficiency are placed into rates during the year of the expense. When a utility introduces an energy efficiency program, or makes a significant increase or decrease in energy efficiency spending, rates must change to collect all annual costs. Higher rates are usually opposed by consumer advocates, even if the increase is for cost-effective energy efficiency or other investments.

To moderate the rate effect of efficiency, regulators could capitalize efficiency costs, at least in part.[8] Capitalizing helps the utility by allowing for cost recovery over time but can cost consumers more than expensing in the long run. Some efficiency programs can meet short term rate-oriented cost-effectiveness tests if costs are capitalized. However, if the choice is made to capitalize, the regulator still has to decide the appropriate amortization period for program costs, balancing concern for immediate rate impacts and long term costs.[9] Capitalizing energy efficiency investments may be limited by the magnitude of "regulatory assets" that is appropriate for a utility. Bond ratings may decline if the utility asset account has too many assets that are not backed by physical capital. The limit on capitalized efficiency investment varies depending on the rest of the utility balance sheet.

Some argue that capitalizing energy efficiency is too costly and that rate effects from expensing are modest. Others note that in some places, capitalizing energy efficiency is the only way to deal with transitional rate effects and can provide a match over time between the costs and benefits of the efficiency investments (Arthur Rosenfeld, personal communication, February 20, 2006).

In some cases, it may be appropriate to consider encouraging unregulated utility affiliates to invest in and benefit from energy efficiency and other distributed resources.

Bonus Return, Shared Savings

To encourage energy efficiency investments over supply investments, regulators can authorize a return on investment that is slightly higher (e.g., 5 percent) for energy efficiency investments or offer a bonus return on equity investment for superior performance. Another approach is to share a percentage of the energy savings value, perhaps 5 to 20 percent, with the utility. A shared savings system has the virtue of linking the magnitude of the

[8] Capitalizing energy efficiency also reinforces the idea of efficiency as a substitute to supply and transmission.

[9] Iowa and Vermont initially capitalized energy efficiency spending, but transitioned to expense in the late 1990s.

reward with the level of program performance. A variation is to hold back some of the funds allocated to energy efficiency for award to shareholders for achieving energy efficiency targets. Where this incentive is used, the holdback can run between 3 and 8 percent of the program budget. Some of these funds can be channeled to employees to reward their efforts (Arthur Rosenfeld, personal communication, February 20, 2006; Plunkett, 2005).

Bonus returns, shared savings, and other incentives can raise the total cost of energy efficiency. However, if the incentives are well-designed and effective, they will encourage the utility to become proficient at achieving energy efficiency savings. The utility may be motivated to provide greater savings for consumers through more cost-effective energy efficiency.

Energy Efficiency Lowers Risk

Energy efficiency can help the financial ratings of utilities if it reduces the risks associated with regulatory uncertainty, long-term investments in gas supply and transport and electric power and transmission, and the risks associated with fossil fuel market prices that are subject to volatility and unpredicted price increases. By controlling usage and demand, utilities can also control the need for new infrastructure and exposure to commodity markets, providing risk management benefits. To the extent that a return on efficiency investments is likely and the chance of a disallowance of associated costs is minimized, investors will be satisfied. Decoupling tends to stabilize actual utility revenues, providing a better match to actual cost, which should further benefit utility bond ratings.

Reversing a Short-Term Resource Acquisition Focus: Focus on Bills, Not Just Rates

Policy-makers tend to focus on electric rates since they can be easily compared across states. They become a measure for business-friendliness, and companies consider rate levels in manufacturing siting and expansion decisions. But rates are not the only measure of service. A short-term focus on low rates can lead to costly missed investment opportunities and higher overall costs of electricity service over the long run.

Over the long term, energy efficiency benefits can extend to all consumers. Eventually, reduced capital commitments and lower energy costs resulting from cost-effective energy efficiency programs benefit all consumers and lower overall costs to the economy, freeing customer income for more productive purposes, like private investment, savings, and consumption. Improved rate stability and risk management from limited sales growth tends to improve the reputation of the utility. Incentives and removing the throughput incentive make it easier for utilities to embrace stable or declining sales.

A commitment to energy efficiency means accepting a new cost in rates over the short-term to gain greater system benefits and lower long-term costs, as is the case with other utility investments. State and local political support with a measure of public education might be needed to maintain stable programs in the face of persistent immediate pressure to lower rates.

Related Issues with Wholesale Markets and Long-Term Planning

Regulatory factors can hinder greater investment in cost-effective energy efficiency programs. These factors include the demand-side of the wholesale market not reacting to supply events like shortages or wholesale price spikes, and, for the electric sector, a short-term generation planning horizon, especially in retail competition states. In addition, transmission system planning by regional transmission organizations (RTOs) and utilities tends to focus on wires and supply solutions, not demand resources like efficiency. The value of sustained usage reductions through energy efficiency, demand response and distributed generation is not generally considered, nor compensated for in wholesale tariffs. These are regulatory choices and are discussed further in Chapter 3: Energy Resource Planning Processes.[10]

[10] Planning and rate design implications are more thoroughly discussed in Chapters 3: Energy Resource Planning Processes and Chapter 5: Rate Design.

Energy Efficiency Makes Wholesale Energy Markets Work Better

In the wholesale market venue, the value of energy efficiency would be revealed by a planning process that treats customer load as a manageable resource like supply and transmission, with investment in demand-side solutions in a way that is equivalent to (not necessarily the same as) supply and transmission solutions. Demand response and efficiency can be called forth that specifically reduces demand at peak times or in other strategic ways, or that reduces demand year-round.

Declare Energy Efficiency a Resource

To underscore the importance of energy efficiency, states can declare in statute or regulatory policy that energy efficiency is a resource and that utilities should factor energy efficiency into resource planning and acquisition. States concerned with risks on the supply side can also go one step further and designate that energy efficiency is the preferred resource.

Link Energy and Environmental Regulation

Environmental policy-makers have observed that energy efficiency is an effective and comparatively inexpensive way to meet tightening environmental limits to electric power generation, yet this attribute rarely factors into decisions by utility regulators about deployment of energy efficiency. This issue is discussed further in Chapter 3: Energy Resource Planning Processes.

State and Regional Examples of Successful Solutions to Energy Efficiency Deployment

Numerous states have previously addressed or are currently exploring energy efficiency electric and gas incentive mechanisms. Experiments in incentive regulation occurred through the mid-1990s but generally were overtaken by events leading to various forms of restructuring. States are expressing renewed interest in incentive regulation due to escalating energy costs and a recognition that barriers to energy efficiency still exist. Many state experiences are highlighted in the following text and Table 2-2.

Addressing the Throughput Disincentive

Direction Through Legislation

New Mexico offers a bold statutory statement directing regulation to remove barriers to energy efficiency: "It serves the public interest to support public utility investments in cost-effective energy efficiency and load management by removing any regulatory disincentives that may exist and allowing recovery of costs for reasonable and prudently incurred expenses of energy efficiency and load management programs" (New Mexico Efficient Use of Energy Act of 2005).

Decoupling Net Income from Sales

California adopted decoupling for its investor-owned companies as it restored utility responsibility for acquiring all cost-effective resources. The state has also required these companies to pursue all cost-effective energy efficiency at or near the highest levels in the United States. A balancing account collects forecasted revenues and rates are reset periodically to adjust for the difference between actual revenues and forecasts. Because some utility cost changes are factored into most decoupling systems, rate cases can become less frequent, since revenues and costs track more closely over time.[11]

[11] See, for example, orders in California PUC docket A02-12-027. http://www.cpuc.ca.gov/proceedings/A0212027.htm. Oregon had used this method successfully for PacifiCorp, but when the utility was acquired by Scottish Power, the utility elected to return to the more familiar regulatory form.

Maryland and **Oregon** have decoupling mechanisms in place for natural gas. In **Maryland**, Baltimore Gas and Electric has operated with decoupling for more than seven years, and Washington Gas recently adopted decoupling, indicating that regulators view decoupling as a success.[12] In **Oregon**, Northwest Natural Gas has a similar decoupling mechanism in place.[13]

The inherently cooperative nature of decoupling is demonstrated by utilities and public interest advocates agreeing on a system that addresses public and private interests. In all these instances, no rate design shift was needed to implement decoupling – the change is invisible to customers. A new proposal for **New Jersey** Natural Gas would adopt a system similar to those in use in Oregon and Maryland.

See Table 2-2 for additional examples of decoupling.

Reducing Cost Recovery through Volumetric Charges

After **New York** moved to retail competition and separated energy commodity sales from the electricity delivery utility, the distribution utilities' rates were modified to increase fixed cost recovery through per-customer charges and to decrease the magnitude of variable, volumetric rates. Removing fixed generation costs, as these

Table 2-2. Examples of Decoupling

State	Type of Utility	Key Features	Related Rate Design Shifts?	Political/Administrative Factors
California	Investor-owned electric and gas	Balancing account to collect forecasted revenue; annual true-up.	No	Driven by commission, outcome of energy crisis; consensus oriented.
	http://www.epa.gov/cleanrgy/pdf/keystone/PrusnekPresentation.pdf http://www.cpuc.ca.gov/Published/Final_decision/15019.htm			
Maryland	Investor-owned gas only	Revenue per customer cap; monthly true-up.	No	Revenue stability primary motive of utility; frequent true-ups.
	http://www.energetics.com/madri/pdfs/timmerman_101105.pdf http://www.bge.com/vcmfiles/BGE/Files/Rates%20and%20Tariffs/Gas%20Service%20Tariff/Brdr_3.doc			
Oregon	Investor-owned gas only at present; investor-owned electric in the past	Revenue per customers cap; annual true-up.	No	Revenue stability primary motive of utility; renewed in 2005.
	http://www.raponline.org/Pubs/General/OregonPaper.pdf http://www.advisorinsight.com/pub/indexes/600_mi/nwn_ir.htm http://www.nwnatural.com/CMS300/uploadedFiles/24190ai.pdf http://apps.puc.state.or.us/orders/2002ords/02-633.pdf			
New Jersey	Investor-owned gas (proposed)	Revenue per customer.	No	Explicit intent of utility to promote energy efficiency and stabilize fixed cost recovery.
	http://www2.njresources.com/news/trans/newsrpt.asp?Year=2005 (see 12/05/05)			
Vermont	Investor-owned electric (proposed)	Forecast revenue cap and costs; balancing account and true-ups.	No	Legislative change promoted utility proposal; small utility looking for stability.
	http://www.greenmountainpower.biz/atyourservice/2006ratefiling.shtml			

12 BG&E's "Monthly Rate Adjustment" tariff rider is downloadable at http://www.bge.com/portal/site/bge/menuitem.6b0b25553d65180159c031e0da6176a0/.

13 The full agreement can be found in Appendix A of Order 02-634, available at http://apps.puc.state.or.us/orders/2002ords/02-634.pdf. See also Hansen and Braithwait (2005) for an independent assessment of the Northwest Natural Gas decoupling plan prepared for the commission.

assets were divested, dampened the effects on consumers. In combination with tracking and deferral mechanisms to protect the utility from unanticipated costs and savings, the utilities have little incentive to increase electric sales.

Using a Lost Revenue Adjustment

Minnesota provided Xcel Energy with lost revenue adjustments for energy efficiency through 1999, and then moved to a performance-based incentive. **Iowa** currently provides utilities with lost revenue adjustments for energy efficiency. **Connecticut** allows lost revenue recovery for all electric energy efficiency. **Massachusetts** allows lost revenue recovery for all gas energy efficiency, requiring the accumulated lost revenues to be recovered within three years to prevent large accumulated balances. **Oregon** allows lost revenue recovery for utility efficiency programs. Lost revenue adjustments have been removed in many states because of its cost to consumers. **New Jersey** is in the midst of a transition to a state-run administrator and provides lost revenue for utility-run programs in the meantime.

Non-Utility Administration

Several states have taken over the administration of energy efficiency, including **Wisconsin** (Focus on Energy), **Maine** (Efficiency Maine), **New Jersey**, and **Ohio**. In other states, a third party has been set up to administer programs, including **Vermont** (Efficiency Vermont) and **Oregon** (Energy Trust of Oregon). The **New York** State Energy Research and Development Authority (NYSERDA), a public authority, fits into both categories. There is no retail competition in Vermont or Wisconsin; this change was based entirely on an expectation of effectiveness. **Oregon** combines natural gas and electric efficiency programs, but only for the larger companies in each sector. Statewide branding of energy efficiency programs is a dividend of non-utility administration. **Connecticut** introduced an aspect of non-utility administration by vesting its Energy Conservation Management Board, a state board including state officials, utility managers, and others, with responsibility to approve energy efficiency plans and budgets.

Recovering Costs / Providing Funding for Energy Efficiency Programs

Revenue Requirement

When energy efficiency programs first began, they were funded as part of a utility revenue requirement. In many states, like Iowa, this practice has continued uninterrupted. In California, retail competition interrupted this method of acquiring energy efficiency, but since 2003, California is again funding energy efficiency along with other resources through the revenue requirement, a practice known there as "procurement funding." California also funds energy efficiency through system benefits charge funding.

Capitalizing Energy Efficiency Costs

Oregon allows capitalization of costs, and the small electrics do so. Washington, Vermont, and Iowa capitalized energy efficiency costs when programs began in the 1980s to moderate rate effects. **Vermont**, for example, amortized program costs over five years. In the late 1990s, however, as program spending declined, these states ended the practice of capitalizing energy efficiency costs, electing to expense all costs. Currently, **Vermont** stakeholders are discussing how to further increase efficiency spending beyond the amount collected by the system benefits charge, and they are reconsidering moderating new rate effects through capitalizing costs.

Spending Budgets, Tariff Riders, and System Benefits Charges

Several states have specified percentages of net utility revenue or a specific charge per energy unit to be spent for energy efficiency resources. **Massachusetts**, for example specifies 2.5 mills per kWh (while spending for natural gas energy efficiency is determined case by case). In **Minnesota**, there is a separate percentage designated for electric (1.5 percent of gross operating revenues) and for natural gas (0.5 percent) utilities. **Vermont** adopted a statewide system benefit charge for its vertically integrated electric sector, while its gas energy efficiency costs remain embedded in the utility revenue requirement. Strong statutory protections guard funds from government appropriation. Wisconsin requires a charge, but leaves the commission to determine the appropriate level for each utility. There is a history of system benefits charge funds being used for general government within the state; 2005 legislation apparently intended to make funding more secure (Wisconsin Act 141 of 2005).

The **New York** commission chose to establish an annual spending budget for its statewide effort (exclusive of the public authorities and utilities), increasing it to $150 million in 2001 and to $175 million in 2006. **Washington** tariffs include a rider that allows adjustment of rates to recover energy efficiency costs that diverge from amounts included in rates, with annual true-ups.

Providing Incentives for Energy Efficiency Investment

Performance Incentives

In **Connecticut**, the two electric utilities managing energy efficiency programs are eligible for "performance management fees" tied to performance goals approved by the regulators, including lifetime energy savings, demand savings, and other measures. Incentives are available for a range of outcomes from 70 to 130 percent of pre-determined goals. In 2004, the two utilities collectively reached 130 percent of their energy savings goals and 124 percent of their demand savings goals. They received performance management fees totaling $5.27 million. The 2006 joint budget anticipates $2.9 million in performance incentives.

In 1999, the **Minnesota** Commission adopted performance incentives for the electric and natural gas investor-owned utilities that began at 90 percent of performance targets and are awarded for up to 150 percent of target levels. Performance targets for Minnesota utilities spending more than the minimum spending requirement are adjusted to the minimum spending level for purposes of calculating the performance incentive.

Rhode Island and **Massachusetts** offer similarly structured incentives. **Rhode Island** sets aside roughly 5 percent of the efficiency budget for performance incentives. This amount is less than the amount that would probably be justified if a lost revenue adjustment were used. A collaborative group of stakeholders recommends performance indicators and levels to qualify for incentives. In **Massachusetts**, utilities achieving performance targets earn 5 percent on money spent for efficiency (in addition to being able to expense efficiency costs).

Efficiency Vermont operates under a contract with the Vermont Public Service Board. The original contract called for roughly 3 percent of the budget for efficiency programs to be held back and paid if Efficiency Vermont meets a variety of performance objectives.

Shared Savings

Before retail competition, **California** used a shared savings approach, in which the utilities received revenue equal to a portion of the savings value produced by the energy efficiency programs. A similar mechanism may be reinstated in 2006 (Arthur Rosenfeld, personal communication, February 20, 2006).

Bonus Rate of Return

Nevada allows a bonus rate of return for demand-side management that is 5 percent higher than authorized rates of return for supply investments. Regulations specify programs that qualify and the process to account for qualifying investments (Nevada Regulation of Public Utilities Generally, 2004).

Lower Risk of Disallowance Through Multi-Stakeholder Collaborative.

California, **Rhode Island**, and other states employ stakeholder collaboratives to resolve important program and administrative issues and to provide settlements to the regulator.

See Table 2-3 for additional examples of incentives for energy efficiency investments.

Table 2-3. Examples of Incentives for Energy Efficiency Investments

State	Type of Utility	Key Features	Political/Administrative Factors
California	Investor-owned electric	Shared savings	Encouraged by energy commission and utilities. Incentive proportionate to value of savings; no cap.
	http://www.raponline.org/Conferences/Minnesota/Presentations/PrusnekCAEEMinnesota.pdf		
Connecticut	Investor-owned electric	Performance incentives	Part of retail competition bargain; incentive limited to a percentage of program budget; simple to compare results to performance goals.
	www.state.ct.us/dpuc/ecmb/index.html		
Massachusetts, Rhode Island	Investor-owned electric	Performance incentives	Part of retail competition bargain; incentive limited to a percentage of program budget; simple to compare results to performance goals.
	http://www.mass.gov/dte/electric/04-11/819order.pdf (Docket 04-11) http://www.ripuc.org/eventsactions/docket/3463_NEC-2004DSMSettle(9.12.03).pdf		
Minnesota	Investor-owned electric and natural gas	Performance incentives	Utility-specific plan arising to resolve other regulatory issues; incentive awarded on a sliding scale of performance compared with goals; decoupling not authorized by statute.
	http://www.raponline.org/Pubs/RatePayerFundedEE/RatePayerFundedMN.pdf		
Nevada	Investor-owned electric	Bonus rate of return on equity	Process to establish bonus is statutory.
	See http://www.leg.state.nv.us/NAC/NAC-704.html#NAC704Sec9523		
Vermont	Efficiency utility	Performance incentives	Incentive structure set by contract; result of bargain between commission and third-party efficiency provider.
	http://www.state.vt.us/psb/eeucontract.html		

Regulatory Drivers for Efficiency in Resource Planning and Energy Markets

Declare Energy Efficiency a Resource

In **New Mexico**, the legislature has declared that "decreasing electricity demand by increasing energy efficiency and demand response, and meeting new generation needs first with renewable and distributed generation resources, and second with clean fossil-fueled generation." (New Mexico Efficient Use of Energy Act of 2005)

In **California**, the state has made it very clear that energy efficiency is the most important resource (California SB 1037, 2005). After the crisis of 2000 and 2001, state leaders used energy efficiency to dampen demand growth and market volatility. An Energy Action Plan, adopted in 2003 by the California Public Utilities Commission (CPUC), the California Energy Commission (CEC), and the power authority, developed a "loading order" for new electric resources; the Energy Action Plan has been revised but the energy efficiency preference remains firm. The intent of the loading order is to "decreas(e) electricity demand by increasing energy efficiency and demand response, and meeting new generation needs first with renewable and distributed generation resources, and second with clean fossil-fueled generation" (CEC, 2005). As a result, utilities are acquiring energy efficiency in amounts well in excess of those that would be procured with the system benefits charge alone. Further, the utilities are integrating efficiency into their resource plans and using efficiency to solve resource problems.

Clarifying the primary regulatory status of efficiency makes it clear that sympathetic regulation and cost recovery policies are important. **California** has adopted decoupling of net income and sales for its investor-owned utilities to remove regulatory barriers to a full financial commitment to energy efficiency.

One device for implementing this policy is an energy efficiency supply curve. The California Energy Commission created such a curve based on an assessment of energy efficiency potential to provide guidance as it reintroduced energy efficiency procurement expectations for the utilities in 2003. Furthermore, the CPUC cooperated with the CEC to set energy savings targets for each of the California investor-owned utilities based on an assessment of cost-effectiveness potential.

A different approach to declaring energy efficiency a resource is to establish a portfolio or performance standard for energy efficiency. In 2005, **Pennsylvania** and **Connecticut** included energy efficiency in their resource portfolio standards. Requiring all retail sellers to acquire sufficient certificates of energy savings will allocate revenue to efficiency providers in an economically efficient way (Pennsylvania Alternative Energy Portfolio Standards Act of 2004; Connecticut Act Concerning Energy Independence of 2005).

As an outcome of its electric restructuring law, **Texas** is using energy efficiency as a resource to reduce demand. Texas' spending for energy efficiency is intended to produce savings to meet 10% of forecasted electric demand growth. Performance is exceeding this level.

Consider Energy Efficiency As a System Reliability Solution

In **New England**, Independent System Operator New England (ISO-NE) faced a reliability problem in southwest Connecticut. A transmission line to solve the problem was under development, but would not be ready in time. New central station generation could not be sited in this congested area. Because the marketplace was not providing a solution, ISO-NE issued a Request for Proposal (RFP) for any resources that would address the reliability problem and be committed for four years. One energy efficiency bid was selected—a commercial office building lighting project worth roughly 5 megawatts (MW). Conditions of the award were very strict about availability of the capacity savings. This project will help to demonstrate how energy efficiency does deliver capacity. While ISO-NE deemed the RFP an emergency step that it would not undertake routinely, this process demonstrates that energy efficiency can be important to meeting reliability goals and can be paid for through federal jurisdictional tariffs.

Other states, including **Indiana**, **Vermont**, and **Minnesota** direct that energy efficiency be considered as an alternative when utilities are proposing a power line project (Indiana Resource Assessment, 1995; Vermont Section 248; Minnesota Certificate of need for large energy facility, 2005.)

Key Findings

This chapter reviews opportunities to make energy efficiency an attractive business prospect by modifying electric and gas utility regulation and the way that utilities collect revenue and make a profit. Key findings of this chapter include:

- There are real financial disincentives that hinder all utilities in their pursuit of energy efficiency as a resource, even when it is cost-effective and would lead to a lower cost energy system. Regulation, which is a key source of these disincentives, can be modified to remove these barriers.

- Many states have experience in addressing 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 and other risks.

    — Recognizing the full value of energy efficiency to the utility system.

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 utility ratemaking and revenue requirements, and provides a number of options for consideration for consideration by utilities, regulators, and stakeholders *(as presented in the Executive Summary):*

Recommendation: Modify policies to align utility incentives with the delivery of cost-effective energy efficiency and modify ratemaking practices to promote energy efficiency investments. Successful energy efficiency programs would be promoted by aligning utility incentives in a manner that encourages the delivery of energy efficiency as part of a balanced portfolio of supply, demand, and transmission investments. Historically, regulatory policies governing utilities have more commonly compensated utilities for building infrastructure (e.g., power plants, transmission lines, pipelines) and selling energy, while discouraging energy efficiency, even when the energy-saving measures may cost less. Within the existing regulatory processes, utilities, regulators, and stakeholders have a number of opportunities to create the incentives for energy efficiency investments by utilities and customers. A variety of mechanisms have already been used. For example, parties can decide to provide incentives for energy efficiency similar to utility incentives for new infrastructure investments, and provide rewards for prudent management of energy efficiency programs.

Options to Consider:

- Addressing the typical utility throughput incentive and removing other regulatory and management disincentives to energy efficiency.

- Providing utility incentives for the successful management of energy efficiency programs.

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 maintain customer awareness and support.

Options to Consider:

- Establishing funding requirements for delivering long-term, cost-effective energy efficiency.

- Designating which organization(s) is responsible for administering the energy efficiency programs.

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 benefits are not fully documented nor recognized by customers, utilities, regulators, or 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 (e.g., return on equity, earnings per share, and 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, other appropriate level addressing customer, utility, and societal perspectives.

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

Recommendation: Provide sufficient, timely, 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 long-term funding to recover program costs and implement the energy efficiency measures that have been demonstrated to be available and cost-effective. A number of states are now linking program funding to the achievement of energy savings.

Options to Consider:

- Deciding on and committing to a consistent way for program administrators to recover energy efficiency costs in a timely manner.

- 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.

- Establishing funding for multi-year periods.

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3: Energy Resource Planning Processes

Including energy efficiency in the resource planning process is essential to realizing its full value and setting resource savings and funding targets accordingly. Many utilities, states, and regions are estimating and verifying the wide range of benefits from energy efficiency and are successfully integrating energy efficiency into the resource planning process. This chapter of the National Action Plan for Energy Efficiency Report discusses the barriers that obstruct incorporating energy efficiency in resource planning and presents six regional approaches to demonstrate how those barriers have been successfully overcome.

Overview

Planning is a core function of all utilities: large and small, natural gas and electric, public and private. The decisions made in planning affect customer costs, reliability of service, risk management, and the environment. Many stakeholders are closely involved and participate in planning processes and related decisions. Active participants often include utilities, utility regulators, city councils, state and local policy-makers, regional organizations, environmental groups, and customer groups. Regional planning processes organized through regional transmission organizations (RTOs) also occur with the collaborations of utilities and regional stakeholders.

Different planning processes are employed within each utility, state, and region. Depending on a utility's purpose and context (e.g., electric or gas utility, vertically integrated or restructured), different planning decisions must be made. Local and regional needs also affect planning and resource requirements and the scope of planning processes. Further, the role of states and regions in planning affects decisions and prescribes goals for energy portfolios, such as resource priority, fuel diversity, and emissions reduction.

Through different types of planning processes, utilities analyze how to meet customer demands for energy and capacity using supply-side resource procurement (including natural gas supply contracts and building new generation), transmission, distribution, and demand-side resources (including energy efficiency and demand response). Such planning often requires iteration and testing to find the combination of resources that offer maximum value over a range of likely future scenarios, over the short- and long-term. The value of each of these resources is determined at the utility, local, state and regional level, based on area-specific needs and policy direction. In order to fully integrate the value of all resources into planning—including energy efficiency—resource value and benefits must be determined early in the planning process and projected over the life of the resource plan.

Planning processes focus on two general areas: (1) energy-related planning, such as electricity generation and wholesale energy procurement; and (2) capacity-related planning, such as construction of new pipelines, power plants, or electric transmission and distribution projects. The value of energy efficiency can be integrated into

Leadership Group Recommendations Applicable to Energy Resource Planning Processes

- 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.
- Provide sufficient, timely, and stable program funding to deliver energy efficiency where cost-effective.

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

resource planning decisions for both of these areas.

This chapter identifies common challenges for integrating energy efficiency into existing planning processes and describes examples of successful energy efficiency planning approaches that are used in six regions of the country. Finally, this chapter summarizes ways to address barriers and offers recommendations and several options to consider for specific actions that would facilitate incorporation of energy efficiency into resource planning.

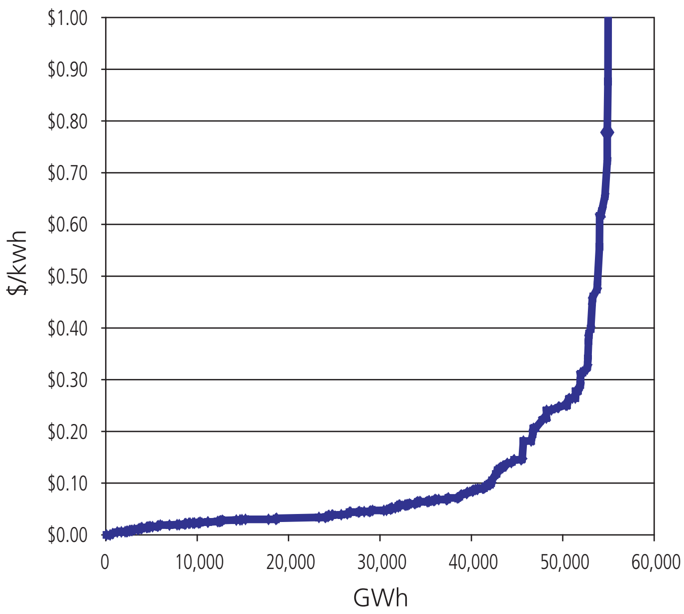
Challenges to Incorporating Energy Efficiency into Planning

The challenges to incorporating energy efficiency into resource planning have common themes for a wide range of utilities and markets. This section describes these challenges in the context of two central questions: A) determining the value of energy efficiency in the resource planning, and B) setting energy efficiency targets and allocating budgets, which are guided by resource planning, as well as regulatory and policy decisions.

Determining the Value of Energy Efficiency

It is generally accepted that well-designed efficiency measures provide measurable resource savings to utilities. However, there are no standard approaches on how to appropriately quantify and incorporate those benefits into utility resource planning. Also, there are many different types of energy efficiency programs with different characteristics and target customers. Energy efficiency can include utility programs (rebates, audits, education, and outreach) as well as building efficiency codes and standards improvements for new construction. Each type of program has different characteristics that should be considered in the valuation process. The program information gathered in an energy efficiency potential study can be used to create an energy efficiency supply curve, as illustrated in Figure 3-1.

Figure 3-1. Energy Efficiency Supply Curve - Potential in 2011 (Levelized Cost in $/kWh Saved)



Source: McAuliffe, 2003

Common Challenges to Incorporating Energy Efficiency into Planning
A. Determining the Value of Energy Efficiency
Energy Procurement
Estimating energy savings
Valuing energy savings
Capacity & Resource Adequacy
Estimating capacity savings
Valuing capacity benefits
Factors in achieving benefits
Other Benefits
Incorporating non-energy benefits
B. Setting Targets and Allocating Budget
Quantity of EE to implement
Estimating program effectiveness
Institutional difficulty in reallocating budget
Cost expenditure timing vs. benefits
Ensuring program costs are recaptured

The analysis commonly used to value energy efficiency compares the costs of energy efficiency resources to the costs of the resources that are displaced by energy efficiency. The sidebar shows the categories of benefits for electric and gas utilities that are commonly evaluated. The approach is to forecast expected future costs with and without energy efficiency resources and then estimate the level of savings that energy efficiency will provide. This analysis can be conducted with varying levels of sophistication depending on the metrics used to compare alternative resource plans. Typically, the evaluation is made based on the expected cost difference; however, "portfolio" approaches also evaluate differences in cost variance and reliability, which can provide additional rationale for including energy efficiency as a resource.

The resource benefits of energy efficiency fall into two general categories:

(1) Energy-related benefits that affect the procurement of wholesale electric energy and natural gas, and delivery losses.

(2) Capacity-related benefits that affect wholesale electric capacity purchases, construction of new facilities, and system reliability.

The energy-related benefits of energy efficiency are relatively easy to forecast. Because utilities are constantly adjusting the amount of energy purchased, short-term deviations in the amount of energy efficiency achieved can be accommodated. The capacity-related benefits occur when construction of a facility needed to reliably serve customers can be delayed or avoided because the need has already been met. Therefore, achieving capacity benefits requires much more certainty in the future success of energy efficiency programs (particularly the measures targeting peak loads) and might be harder to achieve in practice. However, the ability to provide capacity benefits has been a focus in California, the Pacific Northwest, and other regions, and it should become easier to assess capacity savings as more programs gain experience, and capacity savings are measured and verified. Current methods for estimating energy benefits and capacity benefits are presented below.

Estimating Energy Benefits

Estimating energy benefits requires established methods for estimating the quantity of energy savings and the benefits of these savings to the energy system.

- *Estimating Quantity of Energy Savings.* Savings estimates for a wide variety of efficiency measures have been well studied and documented. Approaches to estimate the level of free-riders and program participants who would have implemented the energy efficiency on their own have been established. Similarly, the expected useful lives of energy efficiency measures and their persistence are commonly evaluated and included in the analysis. Detailed databases of efficiency measures have been developed for several regions, including California and the Pacific Northwest. However, it is often necessary to investigate and validate the methods and assumptions behind those estimates to build consensus around measured savings that all stakeholders find credible. Savings estimates can be verified through measurements and load research. Best practices for measurement and verification (M&V) are discussed in more detail in Chapter 6: Energy Efficiency Program Best Practices.

Benefits of Energy Efficiency in Resource Planning

	Electricity	Natural Gas
Energy-related benefits	Reduced wholesale energy purchases	Reduced wholesale natural gas purchases
	Reduced line losses	Reduced losses and unaccounted for gas
	Reduced air emissions	Reduced air emissions
Capacity-related benefits	Generation capacity / resource adequacy / regional markets	Production and liquified natural gas facilities
	Operating reserves and other ancillary services	Pipeline capacity
	Transmission and distribution capacity	Local storage and pressure
Other benefits	Market price reductions (consumer surplus)	
	Lower portfolio risk	
	Local / in-state jobs	
	Low-income assistance and others	

- *Quantifying Value of Energy Savings.* The most readily available benchmark for the value of energy savings is the prevailing price of wholesale electricity and natural gas. Even for a vertically-integrated utility with its own production, energy efficiency might decrease the need to make market purchases; or if the utility has excess energy, energy efficiency can allow the utility to sell more into the market. In cases when the market prices are not appropriate benchmarks (because of contract limitations on reselling energy or limited market access), contract prices or production costs can be used. In addition, the value of losses and other variable costs associated with energy delivery can be quantified and are well known.

  The challenge that remains is in forecasting future energy costs beyond the period when market data are available or contracts are in place. Long-run forecasts vary in complexity from a simple escalation rate to market-based approaches that forecast the cost of new resource additions, to models that simulate the system of existing resources (including transmission constraints) and evaluate the marginal cost of operating the system as new generation is added to meet the forecasted load growth. Most utilities have an established approach to forecast long-term market prices, and the same forecasting technique and assumptions should be used for energy efficiency as are used to evaluate supply-side resource options. In addition to a forecast of energy prices, some regions include the change in market prices as a result of energy efficiency. Estimating these effects requires modeling of complex interactions in the energy market. Furthermore, reduced market prices are not necessarily a gain from a societal perspective because the gains of consumers result in an equal loss to producers; therefore, whether to include these savings is a policy decision.

Estimating Capacity Benefits

Estimating capacity benefits requires estimating the level of capacity savings and the associated benefits. If energy efficiency's capacity benefits are not considered in the resource plan, the utility will overinvest in capital assets, such as power plants and transmission and distribution, and underinvest in energy efficiency.

- *Estimating Capacity Savings.* In addition to energy savings, electric efficiency reduces peak demand and the need for new investments in generation, transmission, and distribution infrastructure. Natural gas efficiency can reduce the need for a new pipeline, storage, liquefied natural gas (LNG) facility, or other investments necessary to maintain pressure during high-load periods. Because of the storage and pressure variation possible in the natural gas system, capacity-related costs are not as extreme in the natural gas system as they are for electricity. In both cases, estimating reductions of peak demand is more difficult for electricity than it is for natural gas, and timing is far more critical. For peak demand savings to actually be realized, the targeted end-use load reductions must occur, and the efficiency measure must provide savings coincident with the utility's peak demand. Therefore, different energy efficiency measures that reduce load at different times of day (e.g., commercial vs. residential lighting) may have different capacity values. Area- and time-specific marginal costing approaches have been developed to look at the value of coincident peak load reductions, which have significantly higher value during critical hours and in constrained areas of the system (see sidebar on page 3-5).

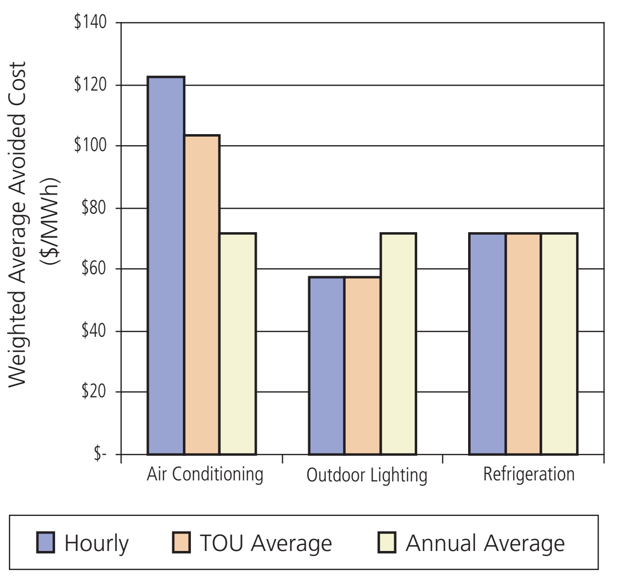
  A critical component of the resource planning process, whether focused on demand-or supply-side resources, is accurate, unbiased load forecasting. Inaccurate load forecasts either cause excessive and expensive investment in resources if too aggressive or create costly shortages if too low. Similarly, tracking and validation of energy efficiency programs are important for increasing the accuracy of estimates of their effects in future resource plans.

  Estimating the capacity savings to apply to load growth forecasts requires estimating two key factors. The first is determining the amount of capacity reduced by energy efficiency during critical or peak hours. The second factor is estimating the "equivalent reliability" of the load reduction. This measure captures both the probability that the savings will actually occur and that the savings will occur during system-constrained hours. Applying estimates of equivalent reliability to various types of resources allows comparison on an equal basis with traditional capacity investments. This approach is similar in concept to the equivalent capacity factor used to compare renewable resources such as wind and solar with traditional fossil-fueled generation. In markets where capacity is purchased, "counting" rules for different resource types determine the equivalent reliability. The probability that savings will actually occur during peak periods is easier to estimate with some certainty for a large number of distributed efficiency measures (e.g., air conditioners) as opposed to a limited number of large, centralized measures (e.g., water treatment plants).

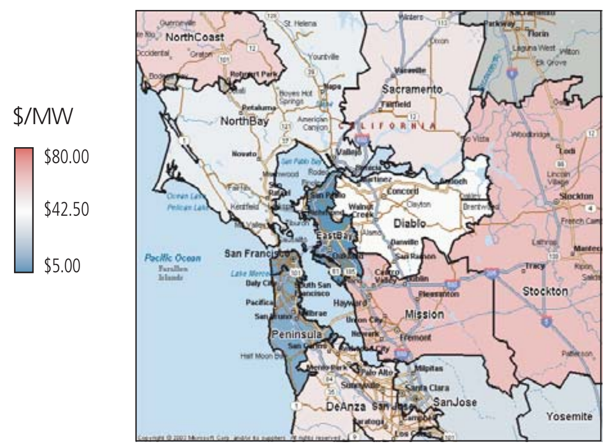
California Avoided Costs by Time and Location

California is a good example of the effect of area and time-differentiation for efficiency measures that have dramatically different impact profiles. The average avoided cost for efficiency (including energy and capacity cost components) in California is $71/megawatt-hour (MWh). Applying avoided costs for each of six time of use (TOU) periods (super-peak, mid-peak and off-peak for summer and winter seasons) increases the value of air conditioning to $104/MWh or 45 percent and lowers the value of outdoor lighting to $57/MWh or 20 percent. Refrigeration, with its consistent load profile throughout the day and year, is unaffected. Applying avoided costs by hour captures the extreme summer peak prices and increases the value of air conditioning savings still further to $123/MWh. Incorporating hourly avoided costs increases the total benefits of air conditioning load reduction by more than $50/MWh. This type of hourly analysis is currently being used in California's avoided cost proceedings for energy efficiency.

Comparison of Avoided Costs for Three Implementation Approaches



Greater San Francisco Bay Area Avoided Distribution Costs



Avoided distribution capacity costs are also estimated by region in California. The Greater San Francisco Bay Area region is shown above in detail. In San Francisco and Oakland, avoided capacity costs are low because those areas are experiencing little load growth and have little need for new distribution investment. The Stockton area, on the other hand, is experiencing high growth and has significant new distribution infrastructure requirements.

- *Valuing Capacity Benefits.* The value of capacity benefits lies in the savings of not having to build or purchase new infrastructure, or make payments to capacity markets for system reliability. Because reliability of the nation's energy infrastructure is critical, it is difficult to make the decision to defer these investments without some degree of certainty that the savings will be achieved. Disregarding or undervaluing the transmission and generation capacity value of energy efficiency can, however, lead to underinvestment in energy efficiency. Realizing energy efficiency's capacity savings requires close coordination between efficiency and resource planners[1] to ensure that specific planned investments can actually be deferred as a result of energy efficiency programs. In the long term, lower load levels will naturally lead to lower levels of infrastructure requirements without a change in existing planning processes.

Targeted implementation of energy efficiency designed to defer or eliminate traditional reliability investments in the short term (whether generation, transmission, or distribution) requires that energy efficiency ramp up in time to provide sufficient peak load savings before the new infrastructure is needed. States with existing efficiency programs can use previous experience to estimate future adoption rates. In states that do not have previous experience with energy efficiency, however, the adoption rate of efficiency measures is difficult to estimate, making it is hard to precisely quantify the savings that will be achieved by a certain date. Therefore, if the infrastructure project is critical for reliability, it is difficult to rely on energy as an alternative. The value of the targeted reductions and project deferrals can also be a challenge to quantify because of the uncertainty in the future investment needs and costs. However, there are examples of how to overcome this challenge, such as the Bonneville Power Authority's (BPA's) transmission planning process (described later). Vermont Docket 7081 is another collaborative process—initiated at the direction of the legislature—that is working on a new transmission planning process that will explicitly incorporate energy efficiency (Vermont Public Service Board, 2005). Both BPA and Vermont Docket 7081 stress the need to start well in advance of the need for reductions to allow the energy efficiency program to be developed and validated. In addition, by starting early, conventional alternatives can serve as a back-stop if needed. Starting early is also easier organizationally if alternatives are initiated before project proponents are vested in building new transmission lines.

The deferral of capacity expenditures can produce the same reliability level for customers. In cases when an energy efficiency program changes the expected reliability level (either higher or lower), the value to customers must be introduced as either a benefit or cost. A typical approach is to use the customer's Value of Lost Load (VOLL) as determined through Value of Service (VOS) studies and multiply by the expected change in customer outage hours. However, VOS studies based on customer surveys typically show wide-ranging results and are often difficult to substantiate.

In regions with established capacity markets, the valuation process is easier because the posted market prices are the value of capacity. The approach to value these benefits is therefore similar to the market price forecasting approach described to value energy benefits. Regional planning processes can also include energy efficiency in their resource planning. Regional electricity planning processes primarily focus on developing adequate resources to meet regional reliability criteria as defined in each of the North American Electric Reliability Council (NERC) regions. Establishing capacity and ancillary service market rules that allow energy efficiency and customer load response to participate can bring energy efficiency into the planning process. For example, Independent System Operator (ISO) New England Demand Resources Working Group will be including

[1] The transmission planning process requires collaboration of regional stakeholders including transmission owners, utilities, and regulators. Distribution planning departments of electric utilities typically make the decisions for distribution-level and local transmission facilities. Planning and development of high-voltage transmission facilities on the bulk-supply system is done at the independent system operator (ISO)/regional transmission organization (RTO) and North American Electric Reliability Council (NERC) regional levels. At a minimum, transmission adequacy must uphold the established NERC reliability standards.

energy efficiency and demand response as qualifying resources for the New England Forward Capacity Market. Another example is PJM Interconnection (PJM), which has recently made its Economic Load Response Program a permanent feature of the PJM markets (in addition to the Emergency Load Response Program that was permanently established in 2002) and has recently opened its Synchronized and Non-Synchronized Reserve markets to demand response providers.

Other Benefits

Energy efficiency provides several types of non-energy benefits not typically included in traditional resource planning. These benefits include environmental improvement, support for low-income customers, economic development, customer satisfaction and comfort, and other potential factors such as reduced costs for bill collection and service shut-offs, improvements in household safety and health, and increased property values. As an economic development tool, energy efficiency attracts and retains businesses, creates local jobs, and helps business competitiveness and area appeal.

Environmental benefits, predominantly air emissions reductions, may or may not have specific economic value, depending on the region and the pollutant. The market price of energy will include the producer's costs of obtaining required emission allowances (e.g., nitrogen oxides, sulfur oxides), and emission reduction equipment. Emissions of carbon dioxide (CO_2), also are affected by planning decisions of whether to consider the value of unregulated emissions. The costs of CO_2 were included in California's assessment of energy efficiency on the basis that these costs might become priced in the future and the expected value of future CO_2 prices should be considered when making energy efficiency investments.[2] Even without regulatory policy guidance, several utilities incorporate the estimated future costs of emissions such as CO_2 into their resources planning process to control the financial risks associated with future regulatory changes.[3] For example, Idaho Power Company includes an estimated future cost of CO_2 emissions in its resource planning and in determining the cost-effectiveness of efficiency programs.

Many of these benefits do not accrue directly to the utility, raising additional policy and budgeting issues regarding whether and how to incorporate those benefits for planning purposes. Municipal utilities and governmental agencies have a stronger mandate to include a wider variety of non-energy benefits in energy efficiency planning than do investor-owned utilities. Regulators of investor-owned utilities might also determine that these benefits should be considered. Many of the benefits are difficult to quantify. However, non-energy benefits can also be considered qualitatively when establishing the overall energy efficiency budget and in developing guidelines for targeting appropriate customers (e.g., low income or other groups).

Setting Energy Efficiency Targets and Allocating Budget

One of the biggest barriers to energy efficiency is developing a budget to fund energy efficiency, particularly at utilities or in states that haven't had significant programs, historically. This is a not strictly a resource planning issue, but a regulatory, policy, and organizational issue as well. The two main organizational approaches for funding energy efficiency are resource planning processes, which establish the energy efficiency budget and targets within the planning process, and public goods-funded charges, which create a separate budget to support energy efficiency through a rate surcharge. There are successful examples of both approaches, as well as examples that use both mechanisms (California, BPA, PacifiCorp, and Minnesota).

Setting targets for energy efficiency resource savings and budgets is a collaborative process between resource planning staff, which evaluates cost-effectiveness, and other key stakeholders. Arguably, all energy efficiency

[2] California established a cost of $8/ton of CO2 in 2004, escalating at 5% per year (CPUC, 2005).

[3] For further discussion, see Bokenkamp, et al., 2005.

measures identified as cost effective in an integrated resource plan should be implemented.[4] In practice, a number of other factors must be considered. For example, the achievable level of savings and costs, expertise and labor, and ability to ramp up programs also affects the size, scope, and mix of energy efficiency programs. All of these considerations, plus the cost-effectiveness of energy efficiency, should be taken into account when establishing the funding levels for energy efficiency. The funding process might also require an iterative process that describes the alternative plans to regulators and other stakeholders. Some jurisdictions use a policy directive such as "all cost-effective energy efficiency" (California) while others allocate a fixed budget amount (New York), specify a fixed percentage of utility revenue (Minnesota and Oregon), or a target load reduction amount (Texas).

Implementation of a target for electric and gas energy savings, or Energy Efficiency Resources Standard (EERS) or Energy Efficiency Portfolio Standard (EEPS), such as the Energy Efficiency Goal adopted in Texas (PUCT Subst. R. §25.181), is an emerging policy tool adopted or being considered in a number of states (ACEEE, 2006). Some states have adopted standards with flexibility for how utilities meet such targets, such as savings by end users, improvements in distribution system efficiency, and market-based trading systems.

Resource Planning Process

If energy efficiency is considered as a resource, then the appropriate amount of energy efficient funding will be allocated through the utility planning process, based on cost-effectiveness, portfolio risk, energy and capacity benefits, and other criteria. Many utilities find that a resource plan that includes energy efficiency yields a lower cost portfolio, so overall procurement costs should decline more than the increase in energy efficiency program costs, and the established revenue requirement of the utility will be sufficient to fund the entire supply and demand-side resource portfolio.

A resource planning process that includes energy efficiency must also include a mechanism to ensure cost-recovery of energy efficiency spending. Most resource planning processes are collaborative forums to ensure that stakeholders understand and support the overall plan and its cost recovery mechanism. In come cases, utility costs might have to be shifted between utility functions (e.g., generation and transmission) to enable cost recovery for energy efficiency expenditures. For example, transmission owners might not see energy efficiency as a non-wires solution to transmission system deficiencies because it is unclear to what extent energy efficiency costs can be collected in the Federal Energy Regulatory Commission (FERC) transmission tariff. Therefore, even if energy efficiency is less costly than the transmission upgrade, it is unclear whether the transmission upgrade budget can be shifted to energy efficiency and still collected in rates. Another challenge for collecting efficiency funding in the transmission tariff is allocation of energy efficiency costs across multiple transmission owners, particularly if energy efficiency costs are incurred by a single transmission owner, while transmission costs are shared among several owners.

These examples demonstrate that in order to implement integrated resource planning, the regulatory agency responsible for determining rates must allow rates designed to support transmission, distribution, or other functions to be used for efficiency. The transmission companies in Connecticut have been allowed to include reliability-driven energy efficiency in tariffs, although this is noted as an emergency situation not to be repeated as a normal course of business. These interactions between regulatory policy and utility resource planning demonstrate that utilities cannot be expected to act alone in increasing energy efficiency through their planning process.

Public Purpose- or System Benefits Charge-Funded Programs

One way to fund energy efficiency is to develop a separate funding mechanism, collected in rates, to support

[4] Established cost-effectiveness tests, such as the total resource cost test, are commonly used to determine the cost-effectiveness of energy efficiency programs. Material from Chapter 6: Energy Efficiency Program Best Practices describes these tests in more detail.

investment in energy efficiency. In deregulated markets with unbundled rates, this mechanism can appear as a separate customer charge, often referred to as a system benefits charge (SBC). Establishing a public purpose charge has the advantage of ensuring policy-makers that there is an allocation of funding towards energy efficiency and can be necessary in deregulated markets where the delivery company cannot capture the savings of energy efficiency. This approach separates the energy efficiency budget from the resource planning process, however.

Developing a new rate surcharge or expanding an existing surcharge also raises many of the questions addressed in Chapter 2: Utility Ratemaking & Revenue Requirements. For example, are the customer segments paying into SBCs receiving a comparable level of energy efficiency assistance in return, or are the increases a cross-subsidy? Often, industrial customers prefer to implement their own efficiency rather than contribute to a pool. Also, if the targets are used to set shareholder incentives, the incentives should be appropriate for the aggressiveness of the program. Additionally, because the targeted budget allocation in public purpose-funded programs is often set independently of the utility's overall resource planning process (and is not frequently changed), utilities might not have funding available to procure all cost-effective savings derived from energy efficiency measures. This type of scenario can result in potentially higher costs for customers than would occur if each cost-effective efficiency opportunity were pursued.

Overcoming Challenges: Alternative Approaches

Successful incorporation of energy efficiency into the resource planning process requires utility executives, resource planning staff, regulators, and other stakeholders to value energy efficiency as a resource and to be committed to making it work within the utility or regional resource portfolio. To illustrate approaches to overcoming these barriers, we highlight several successful energy efficiency programs by California, the New York State Energy Research and Development Authority (NYSERDA), BPA, Minnesota, Texas, and PacifiCorp. The energy efficiency programs in these six regions demonstrate several different ways to incorporate energy efficiency into planning processes; in each example, the economics generally work well for efficiency programs.

The primary driver of energy efficiency in planning is the low levelized cost of energy savings. Table 3-1 shows the reported levelized cost of electricity and natural gas efficiency from three of the regions surveyed. The reported utility cost of efficiency ranges between \$0.01/kWh and \$0.03/kWh for Pacific Gas & Electric (PG&E), NYSERDA, and the Northwest Power and Conservation Council (NWPCC). When including both utility program costs and customer costs, the range is \$0.03/kWh to \$0.05/kWh. The range of reported benefits for electric energy efficiency is from \$0.06/kWh to \$0.08/kWh. For natural gas, only P&GE reported specific natural gas efficiency measures; these show similarly low levelized costs relative to benefits.

Table 3-1: Levelized Costs and Benefits from Four Regions

	Electric ($/kWh)			Natural Gas ($/therm)		
	Utility Cost	Utility & Customer Cost	Benefit	Utility Cost	Utility & Customer Cost	Benefit
PG&E (1)	0.03	0.05	0.08	0.28	0.56	0.81
NYSERDA (2)	0.01	0.03	0.06	N/A	N/A	N/A
NWPCC (3)	0.024	N/A	0.060	N/A	N/A	N/A
Texas (4)	0.025[5]	N/A	0.060[6]	N/A	N/A	N/A

(1) PG&E, 2005

(2) NYSERDA, 2005

(3) NWPCC, 2005

(4) Calculated based on Texas Utility Avoided Cost (PUCT Substantive Rule §25.18 of 2000; Frontier Associates, 2005)[7]

5 Based on 2004 spending of \$87 million, 448 GWh annual. assumed life of 10 years (PUCT Substantive Rule §25.181 of 2000).

6 Based on PUCT Deemed Avoided Costs of \$0.0268/kWh for energy and \$78.50/kW-year for capacity; 448GWh and 193MW of peak load reduction

7 \$0.0268/kWh for energy and \$78.50/kW-year for capacity converted to \$/kWh based on assumption of 10-year measure life, load factor of 26.4 percent, which is calculated from Texas' 2004 efficiency-based reductions of 193 MW of peak demand and 448 GWh of energy (Frontier Associates, 2005).

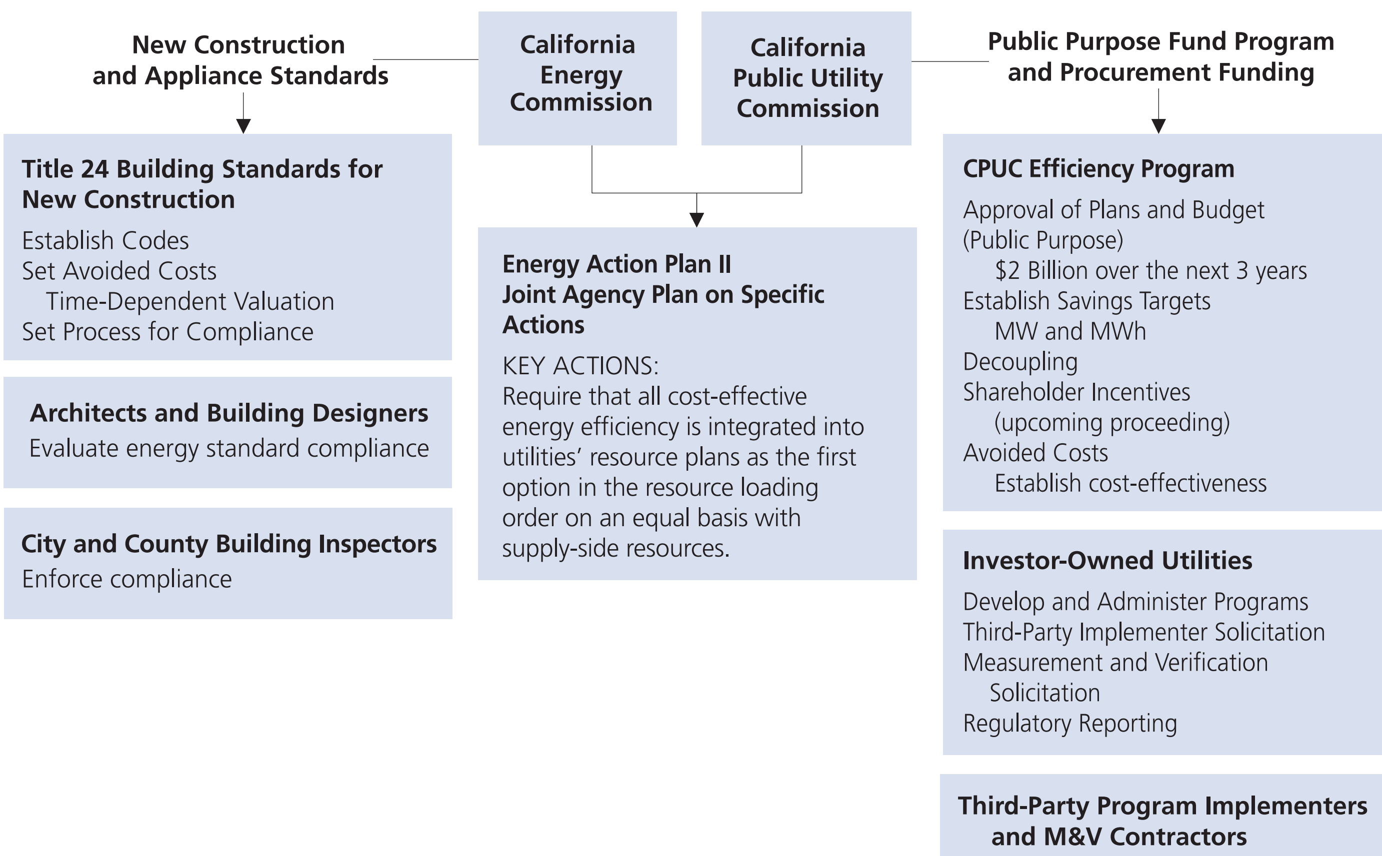
California

California has had a continued commitment to energy efficiency since the late 1970s. Two major efforts are currently being coordinated in the state that address energy use in new buildings as well as efficiency upgrades in existing buildings. Figure 3-2 shows the policy structure, with the California Energy Commission (CEC) leading the building codes and standards process, and the California Public Utility Commission (CPUC) leading the investor-owned utility and third-party administered efficiency programs. Jointly, the agencies publish the Energy Action Plan that explicitly states a goal to integrate "all cost-effective energy efficiency." Recently, the CPUC approved an efficiency budget of $2 billion over the next three years to serve a population of approximately 35 million.

The process for designing and implementing efficiency programs in California by the investor-owned utilities is to develop the programs (either by the utility or through third-party solicitation), evaluate cost-effectiveness, establish and gain approval for the program funding, and evaluate the program's success through measurement and verification. Figure 3-2 illustrates this approach.

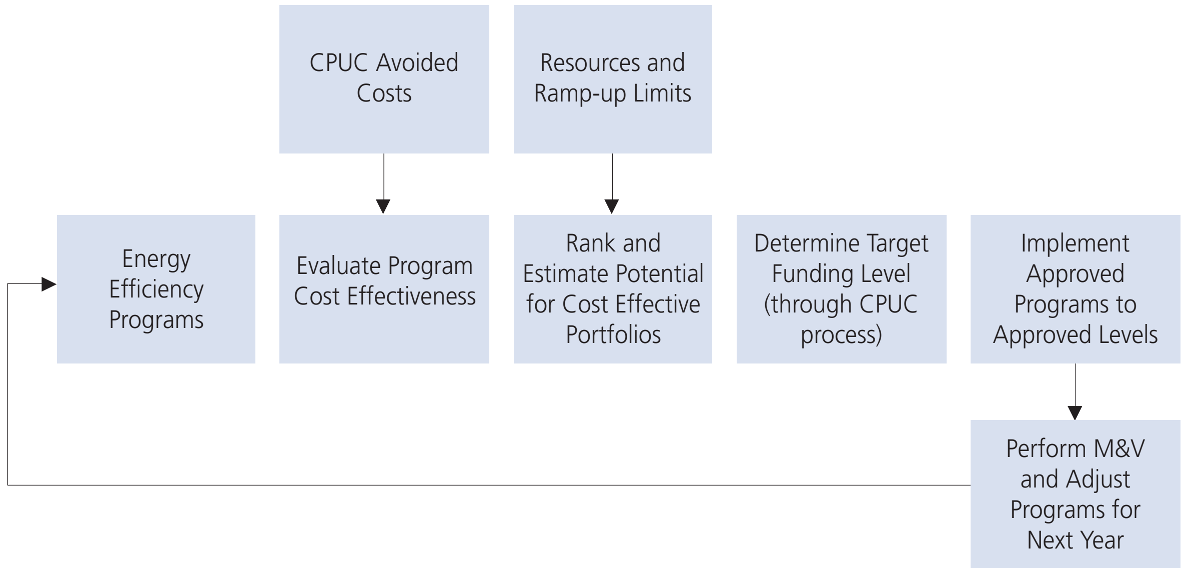
Table 3-2 describes how California addresses barriers for incorporating energy efficiency in planning for the investor-owned utility process.

Figure 3-2. California Efficiency Structure Overview



Source: Energy and Environmental Economics, Inc.

Figure 3-3. California Investor-Owned Utility Process



Source: Energy and Environmental Economics, Inc.

Table 3-2. Incorporation of Energy Efficiency in California's Investor-Owned Utilities' Planning Processes

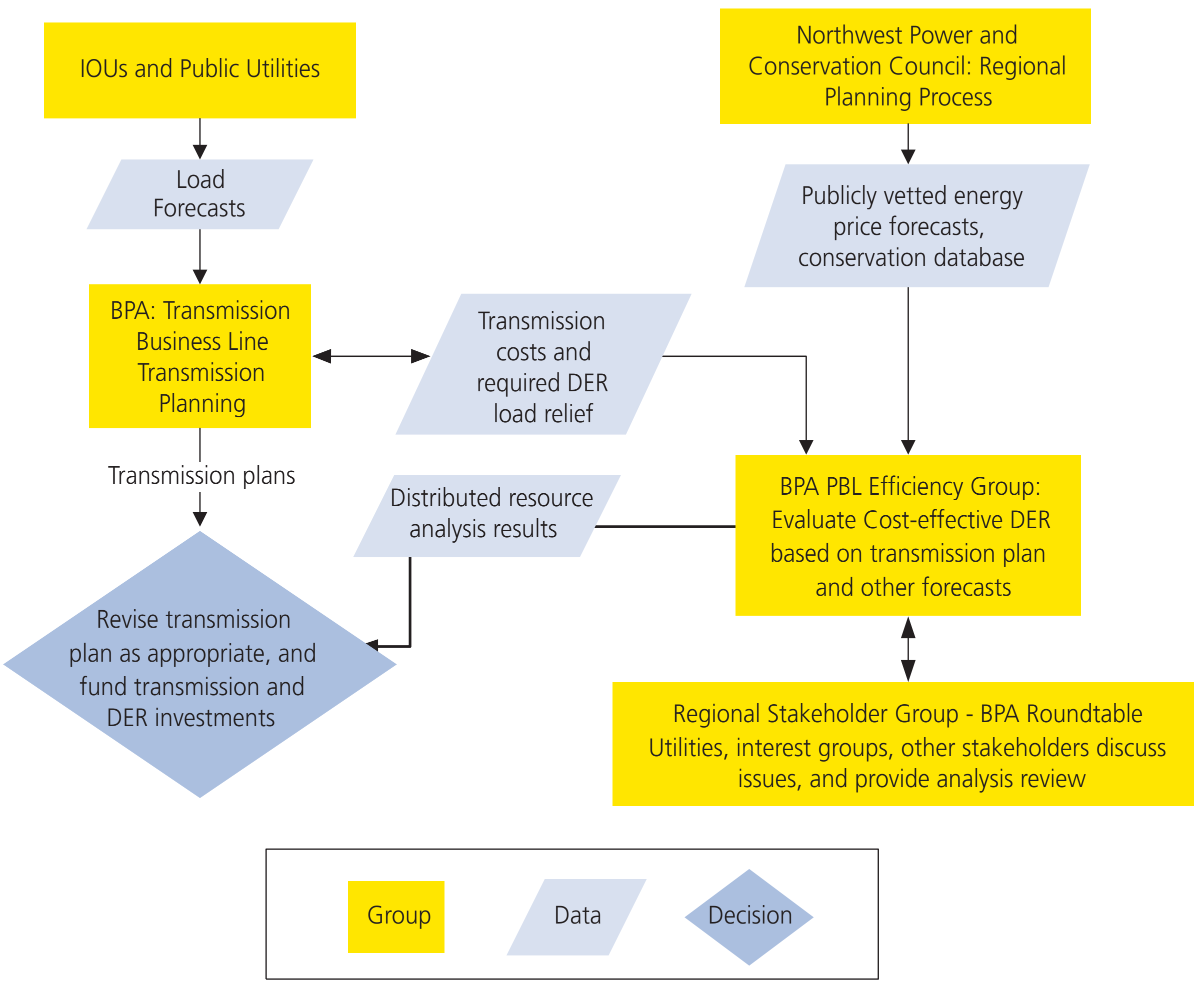
Barriers	California CPUC-Administered Programs
A. Determining the Value of Energy Efficiency	
Energy Procurement	
Estimated energy savings	Customer adoption rates are forecast into the energy efficiency plans with monthly or quarterly reporting of program success for tracking.
Valuing energy savings	Energy savings are based on market prices of future electricity and natural gas, adjusted by loss factors. Emission savings are based on expected emission rates of marginal generating plants in each hour (electricity) or emissions for natural gas.
Capacity & Resource Adequacy	
Estimating capacity savings	Capacity savings are evaluated using the load research data for each measure.
Valuing capacity benefits	Each capacity-related value is estimated by climate zone of the state and incorporated into an "all-in" energy value. Transmission and distribution capacity for electricity is allocated based on weather in each climate zone, and by season for natural gas. California's energy market (currently) includes both energy and capacity so there is no explicit capacity value for electric generation.
Factors in achieving benefits	Capacity benefits are based on the best forecast of achieved savings. There is no explicit link between forecasted benefits of energy efficiency and actual capacity savings.
Other Benefits	
Incorporating non-energy benefits	Non-energy benefits are considered in the development of the portfolio of energy efficiency, but not explicitly quantified in the avoided cost calculation.
B. Setting Targets and Allocating Budget	
Quantity of energy efficiency to implement	CPUC has approved budget and targets for the state's efficiency programs, which are funded through both a public purpose charge and procurement funding.
Estimating program effectiveness	A portion of the public purpose funds are dedicated to evaluation, measurement, and verification with the goal of improving the understanding and quantification of savings and benefit estimates.
Institutional difficulty in reallocating budget	By using public purpose funds, budget doesn't have to be reallocated from other functions for energy efficiency.
Cost expenditure timing vs. benefits	Capacity benefits are based on the best forecast of achieved savings.
Ensuring the program costs are recaptured	CPUC requires that the utilities integrate energy efficiency into their long-term procurement plans to address this issue.

Bonneville Power Administration Transmission Planning and Regional Roundtable

In the Northwest, BPA has been leading an industry roundtable to work with distribution utilities, local and state government, environmental interests, and other stakeholders to incorporate energy efficiency and other distributed energy resources (DER) into transmission planning. DER includes energy efficiency as well as distribution generation and other nonwires solutions. Figure 3-4 illustrates the analysis approach and data sources. Within BPA, the Transmission Business Line (TBL) works with the energy efficiency group in Power Business Line (PBL) to develop an integrated transmission plan. The process includes significant stakeholder contributions in both input data assumptions (led by NWPCC) and in reviewing the overall analysis at the roundtable.[8]

Table 3-3 describes how BPA works with stakeholders to address barriers for incorporating energy efficiency in planning processes.

Figure 3-4. BPA Transmission Planning Process



Source: Energy and Environmental Economics, Inc.

[8] NWPCC conducts regional energy efficiency planning. More information can be found at <www.nwcouncil.org>.

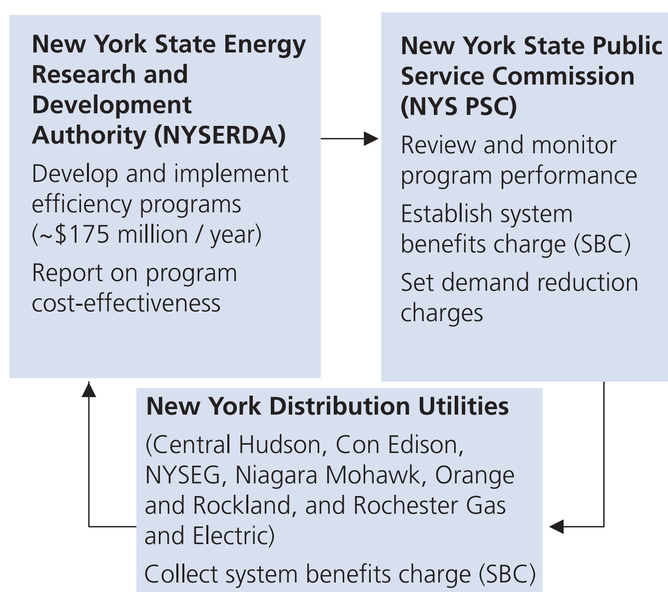
Table 3-3. Incorporation of Energy Efficiency in BPA's Planning Processes	
Barriers	**BPA-Administered Programs**
A. Determining the Value of Energy Efficiency	
Energy Procurement	
Estimated energy savings	The process uses the NWPCC database to define the measure impact and costs. NWPCC maintains a publicly available regional efficiency database that is well regarded and has its own process for stakeholder collaboration. Adoption rates are estimated based on a range of historical program success.
Valuing energy savings	Energy savings are valued based on the NWPCC long-run forecast of energy value for the region, plus marginal losses.
Capacity & Resource Adequacy	
Estimating capacity savings	Capacity savings are based on expected NWPCC efficiency measure coincident peak impacts.
Valuing capacity benefits	The deferral value of transmission investments is used to evaluate the transmission capacity value, which is the focus of these studies. The approach is to calculate the difference in present value revenue requirement before and after the energy efficiency investment (Present Worth Method).
Factors in achieving benefits	The BPA energy efficiency and transmission planning staff work together to ensure that the revised plan with Non-Construction Alternatives (NCAs) satisfies reliability criteria. Ultimately the decision to defer transmission and rely on NCAs will be approved by transmission planning.
Other Benefits	
Incorporating non-energy benefits	The analysis includes an evaluation of the environmental externalities, but no other non-energy benefits.
B. Setting Targets and Allocating Budget	
Quantity of energy efficiency to implement	The target for NCAs is established by the amount of load that must be reduced to defer the transmission line and maintain reliability. This target is driven by the load growth forecasts of the utilities in the region.
Estimating program effectiveness	BPA has been doing demonstrations and pilots of high-potential NCAs to refine the estimates of program penetration, cost, necessary timeline for achieving load reductions, customer acceptance, and other factors. The results of these pilots will help to refine the estimates used in planning studies.
Institutional difficulty in reallocating budget	If NCAs have lower cost than transmission, transmission capital budget will be reallocated to support NCA investments up to the transmission deferral value. Additional costs of NCAs that are justified based on energy value are supported by other sources (BPA energy efficiency, local utility programs, and customers).
Cost expenditure timing vs. benefits	Both transmission and NCAs require upfront investments so there is no significant time lag between costs and benefits. The transmission savings benefit is achieved concurrently with the decision to defer the transmission investment. Energy benefits, on the other hand, occur over a longer timeframe and are funded like other energy efficiency programs.
Ensuring the program costs are recaptured	By developing an internal planning process to reallocate budget, it is easier to ensure that the savings occur.

New York State Energy Research and Development Authority (NYSERDA)

In the mid-1990s, New York restructured the electric utilities and moved responsibility for implementing energy efficiency programs to the NYSERDA. The following figure shows an overview of the NYSERDA process. The programs are funded through the SBC funds (approximately $175 million per year), and NYSERDA reports on the program impact and cost-effectiveness to the New York State Public Service Commission (NYS PSC) annually.

Table 3-4 describes how NYSERDA addresses the barriers to implementing energy efficiency.

Figure 3-5. New York Efficiency Structure Overview



Source: Energy and Environmental Economics, Inc.

Table 3-4. Incorporation of Energy Efficiency in NYSERDA's Planning Processes	
Barriers	**NYSERDA-Administered Programs**
A. Determining the Value of Energy Efficiency	
Energy Procurement	
Estimating energy savings	NYSERDA internally develops estimates of savings for individual energy efficiency programs and the portfolio in aggregate. In addition, NYSERDA accounts for free-riders and spillover effects ("net to gross" ratio) when estimating energy savings. Savings estimates are verified and refined with a measurement and verification (M&V) program.
Valuing energy savings	A long-run forecast of electricity demand is developed using a production simulation model, which is then calibrated to market prices. An estimate of reduced market prices due to decreased demand is also included as a benefit.
Capacity & Resource Adequacy	
Estimating capacity savings	Similar to energy savings, capacity savings are estimated for individual energy efficiency programs and the portfolio in aggregate. Savings estimates are verified and refined with an M&V program.
Valuing capacity benefits	The value of generation capacity in New York is established by examining historical auction clearing prices in the NYISO's unforced capacity market. The baseline values are then escalated over time using a growth rate derived from NYSERDA's electric system modeling results. These capacity costs are used to value those NYSERDA programs that effectively lower system peak demand.
Factors in achieving benefits	The capacity value is included as the best estimate of future capacity savings by New York utilities. There is no direct link, howvever, between the forecasted savings and the actual change in utility procurement budgets.
Other Benefits	
Incorporating non-energy benefits	The cost-effectiveness of NYSERDA programs is estimated using four scenarios of increasing NEB levels from (1) energy savings benefits, (2) adding market price effects, (3) adding non-energy benefits, and (4) adding macro-economic effects of program spending.
B. Setting Energy Efficiency Targets	
Quantity of energy efficiency to implement	The overall size of the NYSERDA program is determined by the aggregate funding level established by the NYS PSC. NYSERDA, with advice from the SBC Advisory Group, recommends specific sub-program funding levels for approval by the staff at NYS PSC.
Estimating program effectiveness	NYSERDA prepares an annual report on program effectiveness including estimated and verified impacts and cost effectiveness, which is then reviewed by the SBC Advisory Group and submitted to the NYS PSC.
Institutional difficulty in reallocating budget	By establishing a separate state research and development authority to administer energy efficiency, the institutional problems of determining and allocating budget towards energy efficiency are eliminated. NYSERDA is supported primarily by system benefit charges collected by the utilities at direction of NYS PSC.
Cost expenditure timing vs. benefits	Similarly, by funding the programs through an SBC, the customers are directly financing the program, thereby making the timing of benefits less important.
Ensuring the program costs are recaptured	Forecasts of savings are based on the best estimate of future savings. There is no direct link to ensure these savings actually occur.

Minnesota

The Minnesota legislature passed the Conservation Improvement Program (CIP) in 1982. State law requires that (1) electric utilities that operate nuclear-power plants devote at least 2 percent of their gross operating revenue to CIP, (2) other electric utilities devote at least 1.5 percent of their revenue, and (3) natural gas utilities devote at least 0.5 percent. Energy is supplied predominantly by two utilities: Xcel, which provides 49 percent of the electricity and 25 percent of the natural gas, and CenterPoint Energy, which provides 45 percent of the natural gas. Facilities with a peak electrical demand of at least 20 megawatts are permitted to opt out of CIP and avoid paying the program's rate adjustment in their electric and natural gas bills (10 facilities have done so). While the Minnesota Department of Commerce oversees the CIP programs of all utilities in the state, the department only has the authority to order changes in the programs of the investor-owned utilities.

Utilities are required to file an Integrated Resource Plan every 2 years, using 5-, 10- and 15-year planning horizons to determine the need for additional resources. The statutory emphasis is on demand-side management and renewable resources. A utility must first show why these resources will not meet future needs before proposing traditional utility investments. The plans are reviewed and approved by the Minnesota Public Utilities

Commission. CIP is the primary mechanism by which the electric utilities achieve the conservation targets included in their integrated resource plans.

The Department of Commerce conducts a biennial review of the CIP plan for each investor-owned utility. Interested parties may file comments and suggest alternatives before the department issues a decision approving or modifying the utility's plan. Utilities that meet or exceed the energy savings goals established by the Department of Commerce receive a financial bonus, which they are permitted to collect through a rate increase. Both electric utilities have exceeded their goals for the last several years. Table 3-5 describes how the Minnesota Department of Commerce addresses barriers to implementing energy efficiency.

Table 3-5. Incorporation of Energy Efficiency in Minnesota's Planning Processes

Barriers	Minnesota-Administered Programs
A. Determining the Value of Energy Efficiency	
Energy Procurement	
Estimating energy savings	Energy savings and avoided costs are determined independently by each utility, resulting in a wide range of estimates that are not consistent. Energy costs are considered a trade secret and not disclosed publicly.
Valuing energy savings	
Capacity & Resource Adequacy	
Estimating capacity savings	Capacity savings and avoided costs are determined independently by each utility, resulting in a wide range of estimates that are not consistent. Power plant, transmission, and distribution costs are considered trade secrets and are not disclosed publicly.
Valuing capacity benefits	
Factors in achieving benefits	There is no direct link between the forecasted capacity savings and the actual change in utility procurement budgets.
Other Benefits	
Incorporating non-energy benefits	Differences in the utilities' valuation methods produce varying estimates. In addition, the Department of Commerce incorporates an externality avoided cost in the electric societal cost benefit test, providing utilities with values in $/ton for several emissions, which the utilities translate to amounts in $/MWh based on each utility's emissions profile.
B. Setting Targets and Allocating Budget	
Quantity of energy efficiency to implement	The Department of Commerce approves budget and targets for each utility. Funding levels are determined by state law, which requires 0.5 percent to 2 percent of utility revenues be dedicated to conservation programs, depending on the type of utility.
Estimating program effectiveness	Program effectiveness is handled by each utility. Minnesota's IOUs rely on the software tools DSManager and BENCOST to measure electric and gas savings respectively.
Institutional difficulty in reallocating budget	Budget is not reallocated from other functions. Funding is obtained via a surcharge on customer bills.
Cost expenditure timing vs. benefits	By using a percentage of revenue set-aside, utility customers are directly financing the program; therefore timing of benefits is not critical.
Ensuring the program costs are recaptured	State law requires that each utility file an IRP with the Public Utilities Commission. The conservation plans approved by the Department of Commerce are the primary mechanism by which utilities meet conservation targets included in their IRPs.

Texas

Texas Senate Bill 7 (1999), enacted in the 1999 Texas legislature, mandates that at least 10 percent of an investor-owned electric utility's annual growth in electricity demand be met through energy efficiency programs each year. The Public Utility Commission of Texas (PUCT) Substantive Rule establishes procedures for meeting this legislative mandate, directing the transmission and distribution (T&D) utilities to hire third-party energy efficiency providers to deliver energy efficiency services to every customer class, using "deemed savings" estimates for each energy efficiency measure (PUCT, 2000). Approved program costs are included in the IOU's transmission and distribution rates, and expenditures are reported separately in the IOU's annual energy efficiency report to the PUCT. Actual energy and capacity savings are verified by independent experts chosen by the PUCT. Incentives are based on prescribed avoided costs, which are set by the

PUCT. El Paso Electric Company will be included in the program beginning with an efficiency target of 5 percent of growth in 2007 and 10 percent of growth in 2008.

The 2004 report on Texas program accomplishments highlights the level of savings and success of the program: "In 2004, the investor-owned utilities in Texas achieved their statewide goals for energy efficiency once again. 193 MW of peak demand reduction was achieved, which was 36% above its goal of 142 MW. In addition, 448 GWh of demand reduction was achieved. These energy savings correspond to a reduction of 1,460,352 pounds of nitrogen oxide (NO_X) emissions. Incentives or rebates were provided to project sponsors to offset the costs of a variety of energy efficiency improvements. Two new energy efficiency programs were voluntarily introduced by the Texas utilities." Table 3-6 describes how Texas utilities address barriers to implementing energy efficiency.

Table 3-6. Incorporation of Energy Efficiency in Texas' Planning Processes	
Barriers	**Texas-Administered Programs**
A. Determining the Value of Energy Efficiency	
Energy Procurement	
Estimating energy savings	Energy savings are based on either deemed savings or through M&V. All savings estimates are subject to verification by a commission-appointed M&V expert.
Valuing energy savings	Avoided costs shall be the estimated cost of new gas turbine, which for energy was initially set in PUCT section 25.181-5 to be $0.0268 /kWh saved annually at the customer's meter.
Capacity & Resource Adequacy	
Estimating capacity savings	Capacity savings are based on either deemed savings or through M&V. All savings estimates are subject to verification by a commission-appointed M&V expert.
Valuing capacity benefits	Avoided costs shall be the estimated cost of new gas turbine, which for capacity was initially set in PUCT section 25.181-5 to be $78.5/kW saved annually at the customer's meter.
Other Benefits	
Incorporating non-energy benefits	Environmental benefits of up to 20 percent above the cost effectiveness standard can be applied for projects in an area that is not in attainment of ambient air quality standards.
B. Setting Energy Efficiency Targets	
Quantity of energy efficiency to implement	Senate Bill 7 (SB7) mandates that, beginning in 2004, at least 10 percent of an investor-owned electric utility's annual growth in electricity demand be met through energy efficiency programs each year (based on historic five-year growth rate for the firm). Funding for additional programs is available if deemed cost-effective.
Estimating program effectiveness	Each year, the utility submits to the PUCT an energy efficiency plan for the year ahead and an energy efficiency report for the past year. The plan must be approved by the commission, and the year-end report must include information regarding the energy and capacity saved. Also, independent M&V experts selected by the commission to verify the achieved savings as reported in each utility's report.
Institutional difficulty in reallocating budget	Funds required for achieving the energy efficiency goal are included in transmission and distribution rates, and energy efficiency expenditures are tracked separately from other expenditures.
Cost expenditure timing vs. benefits	By using a percentage of revenue set aside, utility customers directly finance the program; therefore timing of benefits is not critical.
Ensuring the program costs are recaptured	The annual energy efficiency report submitted by the IOU to the PUCT includes energy and capacity savings, program expenditures, and unspent funds. There is no verification that the estimated avoided costs are captured in utility savings.

PacifiCorp

PacifiCorp is an investor-owned utility with more than 8,400 megawatts of generation capacity that serves approximately 1.6 million retail customers in portions of Utah, Oregon, Wyoming, Washington, Idaho, and California. PacifiCorp primarily addresses its energy efficiency planning objectives as part of its IRP process. Efficiency-based measures are evaluated based on their effect on the overall cost of PacifiCorp's preferred resource portfolio, defined as the overall supply portfolio with the best balance of cost and risk.

Additionally, some states that are in PacifiCorp's service territory, such as Oregon and California, also mandate that the company allocate funds for efficiency under related statewide public goods regulations. "In Oregon, SB 1149 requires that investor-owned electric companies collect from all retail customers a public purpose charge equal to 3% of revenues collected from customers. Of this amount, 57% (1.7% of revenues) goes towards Class 2 [energy efficiency-based] demand side management (DSM). The Energy Trust of Oregon (ETO) was set up to determine the manner in which public purpose funds will be spent"(PacifiCorp, 2005). Using the IRP model to determine investment in energy efficiency, however, PacifiCorp allocates more money to efficiency than required by state statute.

As of the 2004 IRP, PacifiCorp planned to implement a base of 250 average megawatts of energy efficiency and to seek an additional 200 average megawatts of new efficiency programs if cost-effective options could be identified. PacifiCorp models the impact of energy efficiency as a shaped load reduction to their forecasted load, and computes the change in supply costs with and without the impact of demand-side management (DSM). This approach allows different types of DSM to receive different values based on the alternative supply costs in different parts of the PacifiCorp service territory. For example, the IRP plan indicates that "residential air conditioning decrements produce the highest value [in the

Table 3-7. Incorporation of Energy Efficiency in PacifiCorp's Planning Processes

Barriers	PacifiCorp-Administered Programs
A. Determining the Value of Energy Efficiency	
Energy Procurement	
Estimating energy savings	The load forecast in the IRP is reduced by the amount of energy projected to be saved by existing programs, existing programs that are expanded to other states, and new cost-effective programs that resulted from the 2003 DSM request for proposals. These load decrements have hourly shapes based on the types of measures installed for each program.
Valuing energy savings	Efficiency-based (or Class 2) DSM programs are valued based on cost effectiveness from a utility cost test perspective, minimizing the present value revenue requirement. The IRP (using the preferred portfolio of supply-side resources) is run with and without these DSM decrements, and their value in terms of cost-savings is calculated as the difference in revenue requirements for that portfolio with and without these Class 2 load reductions.
Capacity & Resource Adequacy	
Estimating capacity savings	PacifiCorp explicitly evaluates the capacity value of dispatchable and price-based DSM, or 'Class 1' DSM, and the ability to hit target reserve margins in the system with these resources. The IRP resulted in a recommendation to defer three different supply-side projects. The capacity benefits of more traditional energy efficiency programs are not explicitly evaluated; however, the planned energy efficiency reductions are used to update the load forecast in the next year's IRP, which could result in additional deferrals.
Valuing capacity benefits	Capacity savings are valued at the forecasted costs of displaced generation projects. By integrating the evaluation of DSM into the overall portfolio, the value of energy efficiency is directly linked to specific generation projects. It does not appear that PacifiCorp evaluates the potential for avoided transmission and distribution capacity.
Other Benefits	
Incorporating non-energy benefits	Non-energy benefits are considered in the selection of a preferred portfolio of resources, but the non-energy benefits of efficiency are not explicitly used in the IRP.
B. Setting Energy Efficiency Targets	
Quantity of energy efficiency to implement	As part of the 2004 IRP, PacifiCorp determined that a base of 250 MWa of efficiency should be included in the goals for the next 10 years and that an additional 200 MWa should be added if cost-effective programs could be identified.
Estimating program effectiveness	Measurement methodology for new projects is not explicitly identified in the IRP, but values from existing programs and the forecasted load shapes for PacifiCorp's customers will be used to predict benefits.
Institutional difficulty in reallocating budget	Funding is integrated into the overall process of allocating budget to resource options (both supply side and demand side) and faces only challenges associated with any resource option, namely proof of cost-effective benefit to the resource portfolio.
Cost expenditure timing vs. benefits	The IRP process for PacifiCorp seeks to gain the best balance of cost and risk using the present value of revenue requirements, which accounts for timing issues associated with any type of resource evaluated, including efficiency.
Ensuring the program costs are recaptured	Successive IRPs will continue to evaluate the cost-effectiveness of energy efficiency programs to determine their effect on overall costs of the resource portfolio.

East and West]. Programs with this end use impact provide the most value to PacifiCorp's system because they reduce demand during the highest use hours of the year, summer heavy load hours. The commercial lighting and system load shapes with the highest load factors provide the lowest avoided costs." It does not appear that PacifiCorp recomputes the overall risk of its portfolio with increased energy efficiency. Table 3-7 describes how PacifiCorp addresses barriers to implementing energy efficiency.

Key Findings

This section describes the common themes in the approaches used to navigate and overcome the barriers to incorporating energy efficiency in the planning process. While there are many approaches to solving each issue, the following key findings stand out:

- *Cost and Savings Data for Energy Efficiency Measures Are Readily Available.* Given the long history of energy efficiency programs in several regions, existing resources to assist in the design and implementation of energy efficiency programs are widely available. Both California and the Northwest maintain extensive, publicly available online databases of energy efficiency measures and impacts: the Database for Energy Efficiency Resources (DEER) in California[9] and NWPCC Database in the Northwest.[10] DEER includes both electricity and natural gas measures while NWPCC contains only electric measures. These databases incorporate a number of factors affecting savings estimates, including climate zones, building type, building vintage, and customer usage patterns. Energy efficiency and resource planning studies containing detailed information on efficiency measures are available for regions throughout the United States. It is often possible to adjust existing data for use in a specific utility service area with relatively straightforward assumptions.

- *Energy, Capacity, and Non-Energy Benefits Can Justify Robust Energy Efficiency Programs.* Energy savings alone are usually more than sufficient to justify and fund a wide range of efficiency measures for electricity and natural gas. However, the capacity and non-energy benefits of energy efficiency are important factors to consider in assessing energy efficiency measures on an equal basis with traditional utility investments. In practice, policy, budget, expertise, and human resources are the more limiting constraints to effectively incorporating energy efficiency into planning.

  — Estimating the quantity and value of energy savings is relatively straightforward. Well-established methods for estimating the quantity and value of energy savings have been used in many regions and forums. All of the regional examples for estimating energy and capacity savings for energy efficiency evaluate the savings for an individual measure using either measurements or engineering simulation, and then aggregate these by the expected number of customers who will adopt the measure. Both historical and forward market prices are readily available, particularly for natural gas where long-term forward markets are more developed.

  — Estimating capacity savings is more difficult, but challenges are being overcome. Capacity savings depend more heavily on regional weather conditions and timing of the peak loads and, therefore, are difficult to estimate. Results from one region do not readily transfer to another. Also, publicly available market data for capacity are not as readily available as for energy, even though the timing and location of the savings are critical. Because potential capacity savings are larger for electricity energy efficiency than natural gas, capturing capacity value is a larger issue for electric utilities. Production simulation

9 The DEER Web site, description, and history can be found at: http://www.energy.ca.gov/deer/. The DEER database of measures can be found at: http://eega.cpuc.ca.gov/deer/.

10 The NWPCC Web site, comments, and efficiency measure definition can be found at: http://www.nwcouncil.org/comments/default.asp.

can explicitly evaluate the change in power plant investment and impact of such factors as re-dispatch due to transmission constraints, variation in load growth, and other factors. But these models are analytically complex and planning must be tightly integrated with other utility planning functions to accurately assess savings. These challenges can and have been overcome in different ways in regions with a long track-record of energy efficiency programs (e.g., California, BPA, New York).

— Estimating non-energy benefits is an emerging approach in many jurisdictions. Depending on the jurisdiction, legislation and regulatory commission policies might expressly permit and even require the consideration of non-energy benefits in cost-effectiveness determinations. However, specific guidelines regarding the quantification and inclusion of non-energy benefits are still under discussion or in development in most jurisdictions. The consideration of both non-energy and capacity benefits of energy efficiency programs is relatively new, compared to the long history of valuing energy savings.

- *A Clear Path to Funding Is Needed to Establish a Budget for Energy Efficiency Resources.* There are three main approaches to funding energy efficiency investments: 1) utility resource planning processes, 2) public purpose funding, and 3) a combination of both. In a utility resource planning process, such as the BPA non-construction alternatives process, efficiency options for meeting BPA's objectives are compared to potential supply-side investments on an equal basis when allocating the available budget. In this type of resource planning process, budget is allocated to efficiency measures from each functional area according to the benefits provided by efficiency programs. The advantage of this approach is that the budget for efficiency is linked directly to the savings it can achieve; however, particularly in the case of capacity-related benefits, which have critical timing and load reduction targets to maintain reliability, it is a difficult process.

The public purpose funding and system benefits charge approaches in New York, Minnesota, and other states are an alternative to budget reallocation within the planning process. In California, funding from both planning processes and public purpose funding is used. Public purpose funds do not have the same direct link to energy savings, so programs might not capture all the savings attributed to the program. Funding targets might be set before available efficiency options have been explored, so if other cost-effective efficiency measures are later identified, additional funding might not be available. This situation can result in customer costs being higher than they would have been if all cost-effective efficiency savings opportunities had been supported. Using public purpose funding significantly simplifies the planning process, however, and puts more control over the amount of energy efficiency in the control of regulators or utility boards. As compared to resource planning, far less time and effort are required on the part of regulators or legislators to direct a specific amount of funding to cost-effective efficiency programs.

- *Integrate Energy Efficiency Early in the Resource Planning Process.* In order to capture the full value of deferring the need for new investments in capacity, energy efficiency must be integrated early in the planning process. This step will avoid sunk investment associated with longer lead-time projects. Efficiency should also be planned to target investments far enough into the future so that energy efficiency programs have the opportunity to ramp up and provide sufficient load reduction. This timeline will allow the utility to build expertise and establish a track record for energy efficiency as well as be able to monitor peak load reductions. Starting early also allows time to gain support of the traditional project proponents before they are vested in the outcome.

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 resource planning and provides a number of options for consideration for consideration by utilities, regulators and stakeholders *(as presented in the Executive Summary)*.

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, these existing planning processes might need to be adapted or even 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.

Options to Consider:

- Establishing policies to establish energy efficiency as a priority resource.
- Integrating energy efficiency into utility, state, and regional resource planning activities.
- 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 maintain customer awareness and support. Some steps may 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 measurement and verification 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 measurement and verification 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 benefits are not fully documented nor recognized by customers, utilities, regulators, or 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 (e.g., return on equity, earnings per share, and 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 customer, utility, and societal perspectives.

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

Recommendation: Provide sufficient, timely, 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 has 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 long-term funding to recover program costs and implement the energy efficiency measures that have been demonstrated to be available and cost-effective. A number of states are now linking program funding to the achievement of energy savings.

Options to Consider:

- Deciding on and committing to a consistent way for program administrators to recover energy efficiency costs in a timely manner.

- Establishing funding mechanisms for energy efficiency from among the available options such as revenue requirements or resource procurement funding, system benefits charges, rate-basing, shared-savings, incentive mechanisms, etc.

- Establishing funding for multi-year periods.

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4: Business Case for Energy Efficiency

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

Overview

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

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

Leadership Group Recommendation Applicable to the Business Case for Energy Efficiency

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

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

Key Findings from the Eight Business Cases Examined

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

- The costs of energy efficiency and reduced sales volume may 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 yield a net benefit to society—on the order of hundreds of millions of dollars in net present value for the illustrative case studies (small- to medium-sized utilities).

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

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

Business Cases Evaluated

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

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

Cases 3 and 4: Electric Power Plant Deferral

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

Cases 5 and 6: Investor-Owned Electric Utility Structure

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

Cases 7 and 8: Publicly- and Cooperatively-Owned Electric Utilities

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

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

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

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

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

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

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

	Case 1: Low-Growth Electric Utility	Case 2: High-Growth Electric Utility	Case 3: Low-Growth with Plant Deferral	Case 4: High-Growth with Plant Deferral	Case 5: Vertical Utility	Case 6: Delivery Utility	Case 7: Electric Public/Coop Debt Coverage Ratio	Case 8: Electric Public/Coop Cash Position	Case 1: Low-Growth Gas Utility	Case 2: High-Growth Gas Utility
Utility Size										
Annual Revenue ($mil) - Year 0	$284	$284	$284	$284	$284	$284	$284	$284	$344	$344
Peak Load (MW) or Sales (BCF) - Year 0	600 MW	600 MW	600 MW	600 MW	600 MW	600 MW	600 MW	600 MW	33 BCF	33 BCF
Parameter Tested	Load Growth	Load Growth	Load Growth	Load Growth	Vertical Utility	Delivery Utility	Debt Coverage Ratio	Cash Position	Load Growth	Load Growth
Assumptions that Differ Between Cases										
Load Growth Assumption	1%	5%	1%	5%	2%	2%	2%	2%	0%	2%
Average Rate - Year 1	$0.16/kWh	$0.15/kWh	$0.16/kWh	$0.15/kWh	$0.16/kWh	$0.16/kWh	$0.12/kWh	$0.10/kWh	$0.91/therm	$0.90/therm
EE Program	EE Program results do not change when decoupling is activated.									
Cumulative Savings (EE vs No EE case)	8,105 GWh	8,105 GWh	8,105 GWh	8,105 GWh	8,105 GWh	8,105 GWh	8,105 GWh	8,105 GWh	31 BCF	31 BCF
Utility Spending as Percent of Revenue (%)	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	0.5%	0.5%
Annual Utility Spending (NPV in $mil)	$70	$70	$70	$70	$70	$70	$70	$70	$21	$21
EE Project Life Term (years)	15	15	15	15	15	15	15	15	15	15
Percent of Growth Saved	142%	21%	142%	21%	66%	66%	66%	66%	#NA	18%
Total Cost of EE in Year 0 ($/MWh or $/MMBtu)	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00	$35.00	$3.00	$3.00
Utility Cost in Year 0 ($/MWh or $/MMBtu)	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$20.00	$1.50	$1.50
Customer Cost in Year 0 ($/MWh or $/MMBtu)	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$15.00	$1.50	$1.50
Business Case Results (NPV in $mil)	Revenue Requirement and Net Societal Savings do not change with decoupling. Business Case results are the difference between the No EE and EE cases.									
Reduction in Revenue Requirement ($mil)	$396	$318	$476	$338	$359	$348	$347	$323	$139	$142
% of Total Revenue Requirement	5.5%	3.0%	6.0%	3.0%	4.9%	4.4%	4.8%	5.1%	2.5%	2.2%
Net Customer Savings - no decoupling ($mil)	$407	$342	$503	$364	$373	$363	$292	$280	$123	$129
% of Total Customer Bills	7.1%	5.8%	8.7%	6.2%	6.4%	6.3%	6.6%	7.3%	2.6%	2.7%
Net Customer Savings - decoupling ($mil)	$247	$236	$319	$275	$307	$222	$98	$240	$19	$64
% of Total Customer Bills	4.3%	4.0%	5.5%	4.7%	5.3%	3.8%	2.2%	6.2%	0.4%	1.3%
Net Societal Savings ($mil)	$289	$258	$332	$269	$263	$271	$271	$271	$118	$119
% of Total Societal Cost	8.2%	4.5%	8.4%	4.4%	9.2%	7.0%	7.0%	7.0%	4.7%	3.7%
Air Emission Savings	Air Emission Savings are the difference between No EE and EE cases and do not change when decoupling is activated.									
1000 Tons CO2	311	311	311	311	311	311	311	311	128	128
Tons NOx	61	61	61	61	61	61	61	61	107	107

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

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

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

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

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

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

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

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

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

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

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

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

Business Case Results

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

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

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

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

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

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

In both electric and natural gas Case 1 and Case 2, average customer bills decline over time. The average bill is lower beginning in the 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.

[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.

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—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 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.

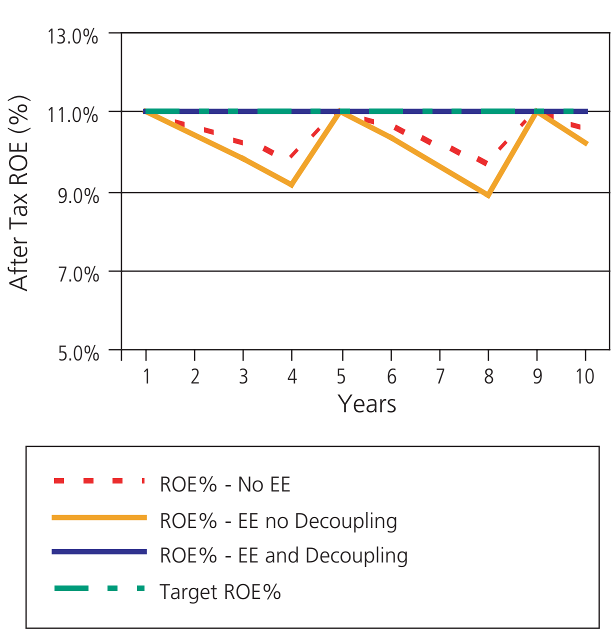
Table 4-2. High- and Low-Growth Results: Electric Utility

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.

Investor-Owned Utility Comparison of Return on Equity

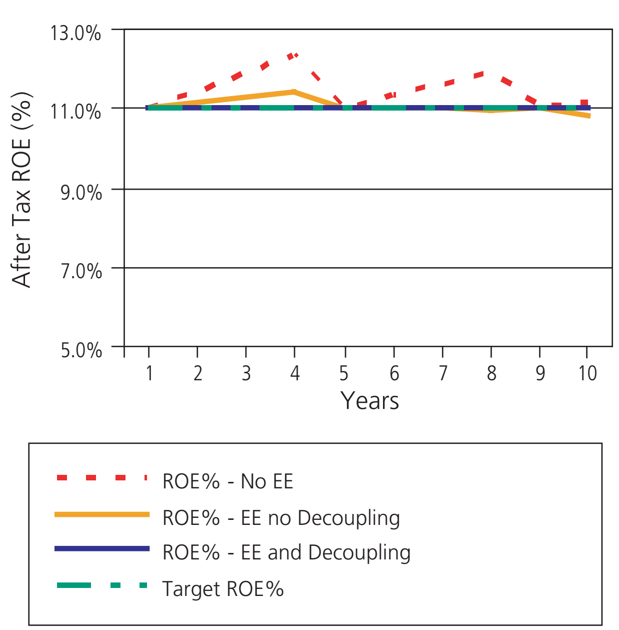


Case 2: High-Growth (5%)

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



[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.

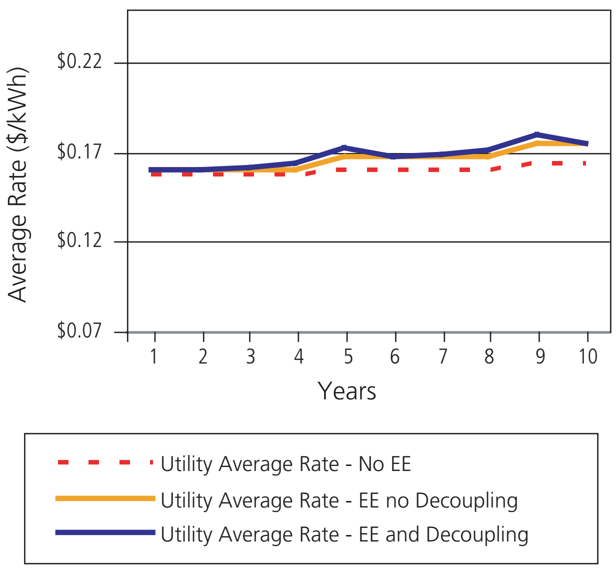
Table 4-2. High- and Low-Growth Results: Electric Utility (continued)

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.

Comparison of Average Rate



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

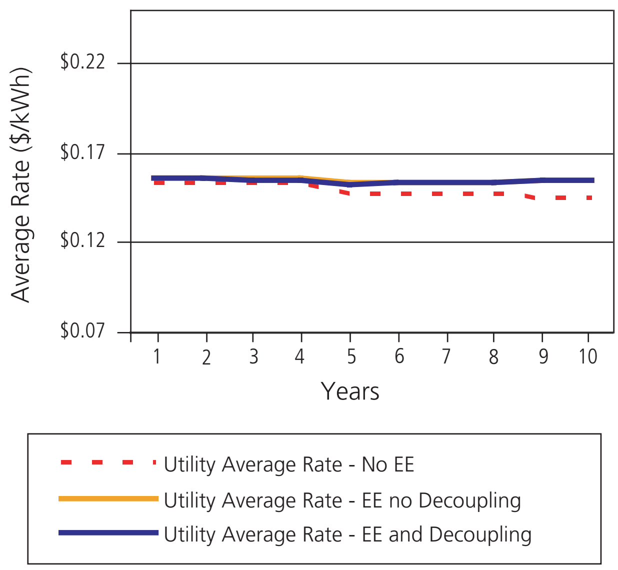
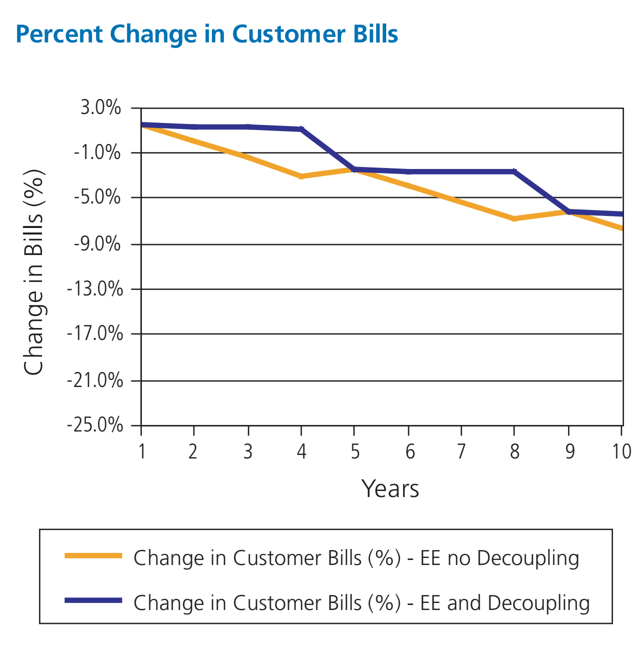


Table 4-2. High- and Low-Growth Results: Electric Utility (continued)

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.

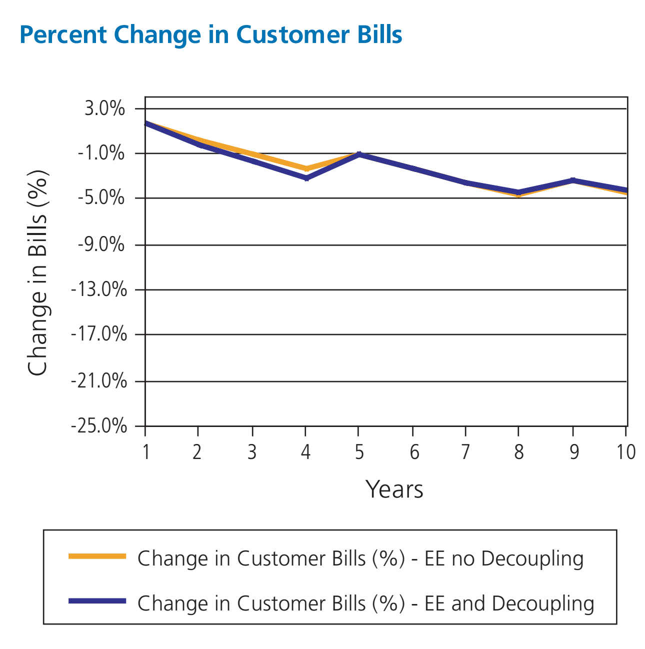


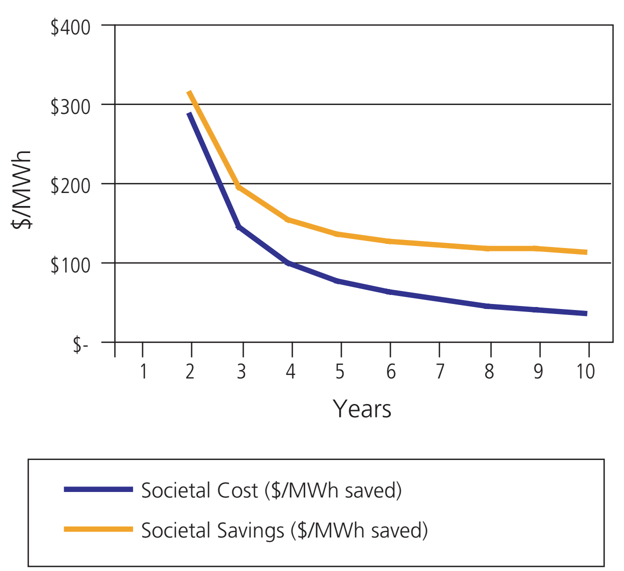
Table 4-2. High- and Low-Growth Results: Electric Utility (continued)

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.

Delivered Costs and Benefits of EE

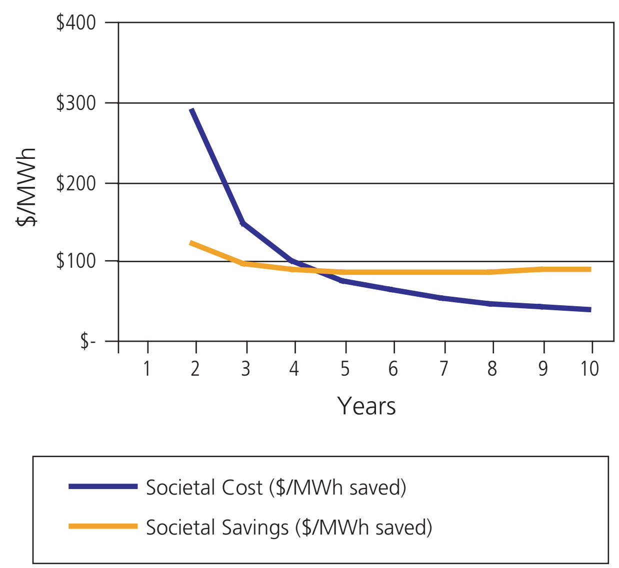


Case 2: High-Growth (5%)

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



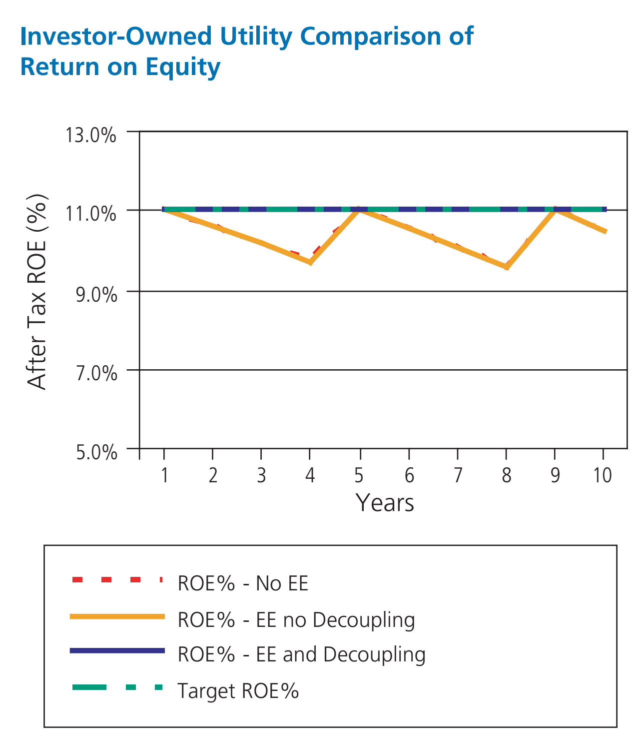
Energy efficiency has a similar effect upon natural gas utilities, as shown in Table 4-3.

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.

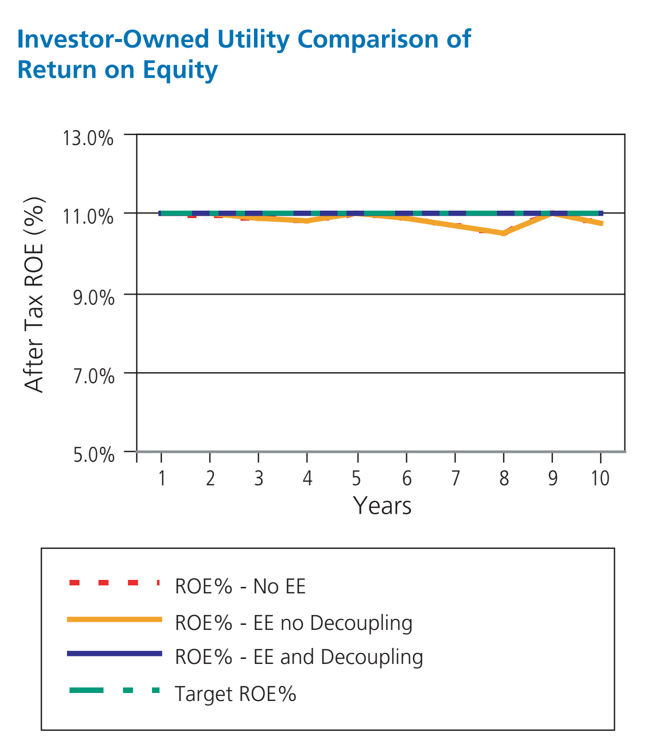
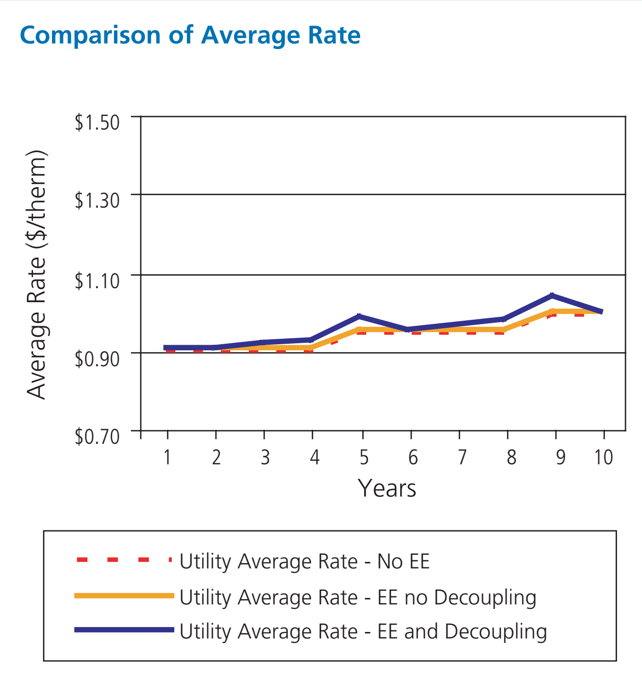


Table 4-3. High- and Low-Growth Results: Natural Gas Utility (continued)

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.

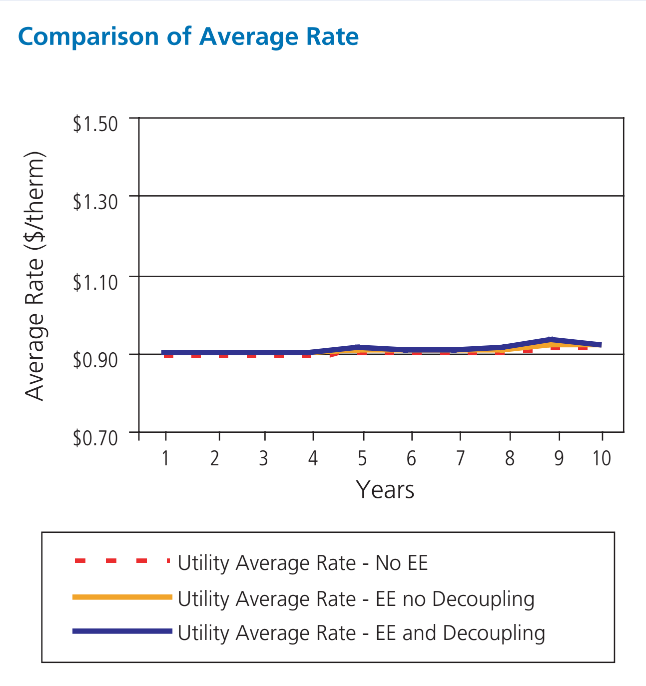


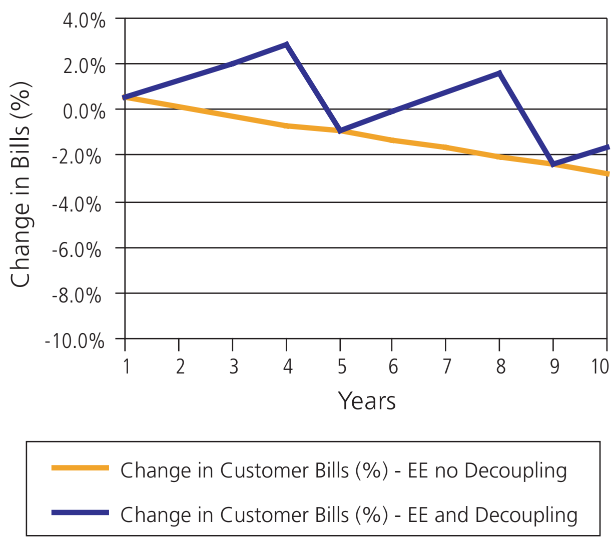
Table 4-3. High- and Low-Growth Results: Natural Gas Utility (continued)

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 target level and spending increases on efficiency.

Percent Change in Customer Bills



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

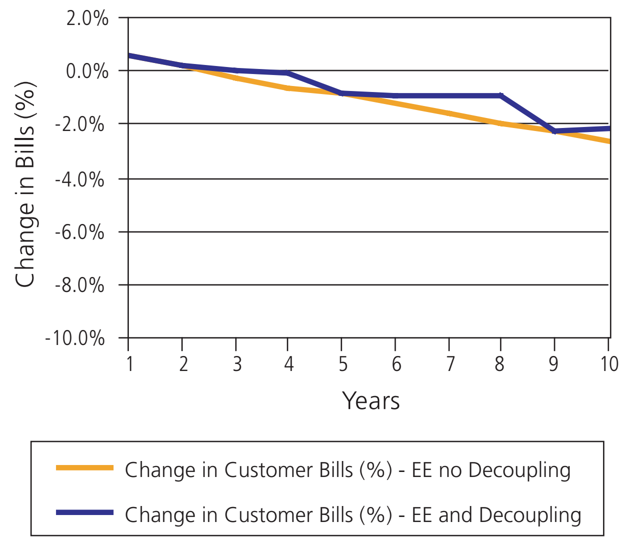


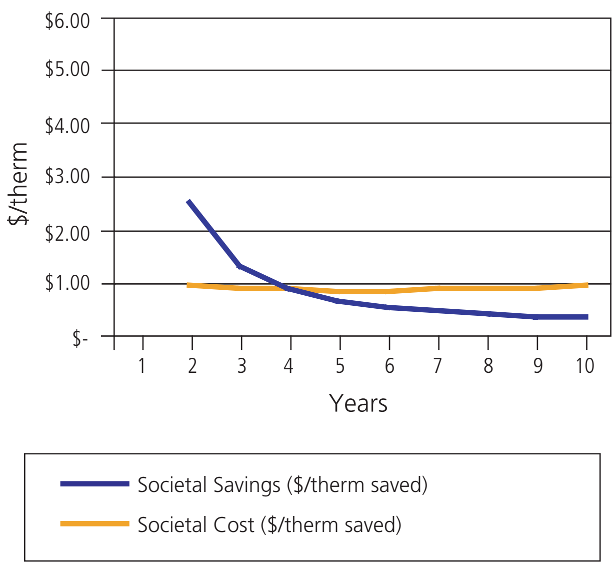
Table 4-3. High- and Low-Growth Results: Natural Gas Utility (continued)

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.

Delivered Costs and Benefits of EE

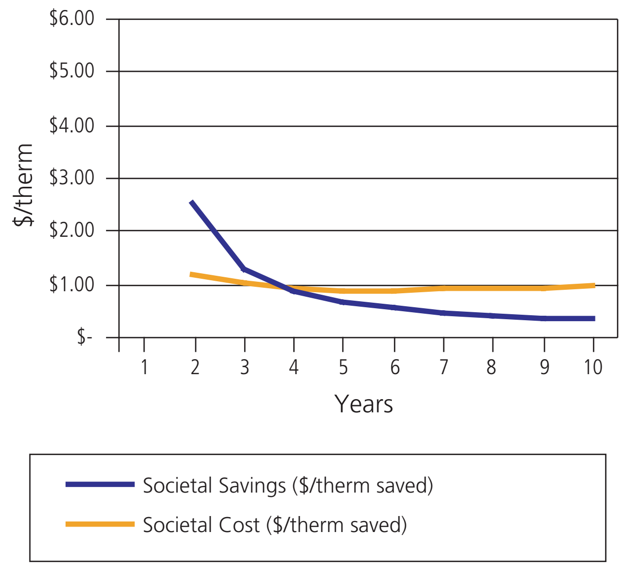


Case 2: High-Growth (2%)

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

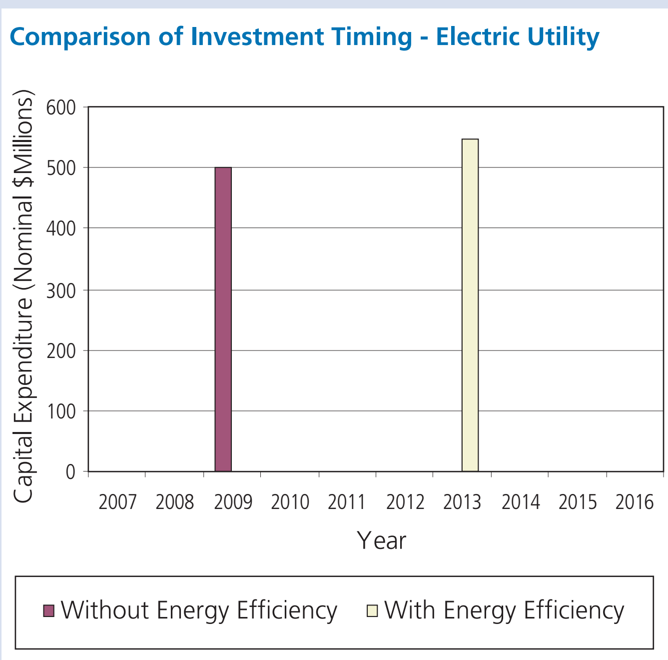
This case study examines an electric investor-owned utility with a large capital project (modeled here as a 500-MW combined-cycle power plant, although the conclusions are similar for other large capital projects), planned for construction in 2009.[9] Again the effect of a 1 percent growth rate (Case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

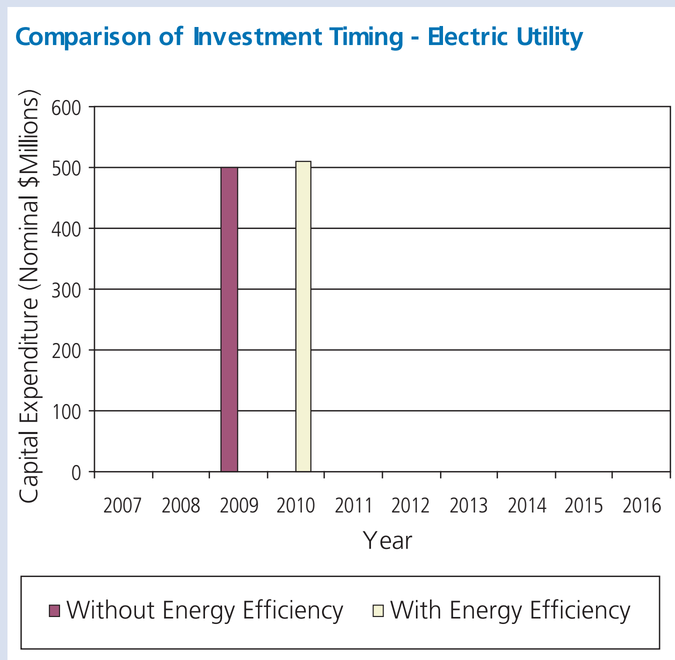
In Case 3, the energy efficiency program causes a greater reduction in revenue requirement—a 30-year reduction of $476 million rather than Case 4 reduction of $338 million—providing benefits from a customer perspective. From a societal perspective, the low-growth case energy efficiency program yields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

Figure 4-1. Comparison of the 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 (NPV, $MM)	$476	$338
Net Customer Savings – decoupling (NPV, $MM)	$319	$275
Net Societal Benefit (NPV, $MM)	$332	$269

[9] For simplification, this case illustrates deferring a single 500 MW combined cycle power plant investment, energy efficiency, including efforts to reduce peak capacity requirements, can defer additional 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 the 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 the Case 4, the deferral provides present value savings of $11 million for the one-year deferral.

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.

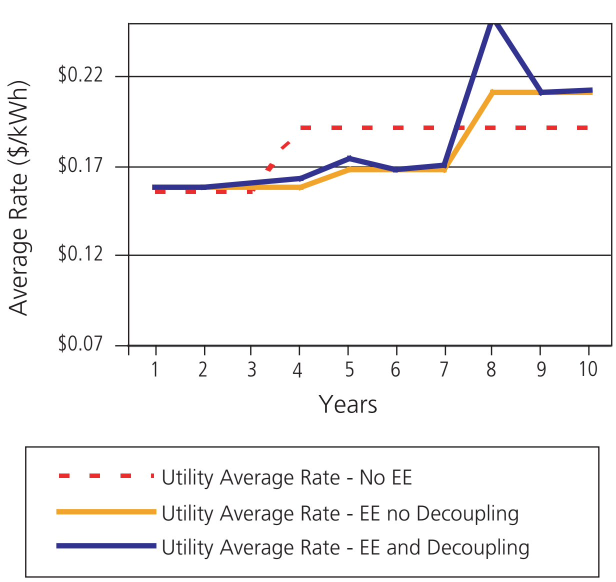
Other Capital Expenditures

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.

Comparison of Average Rate



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.

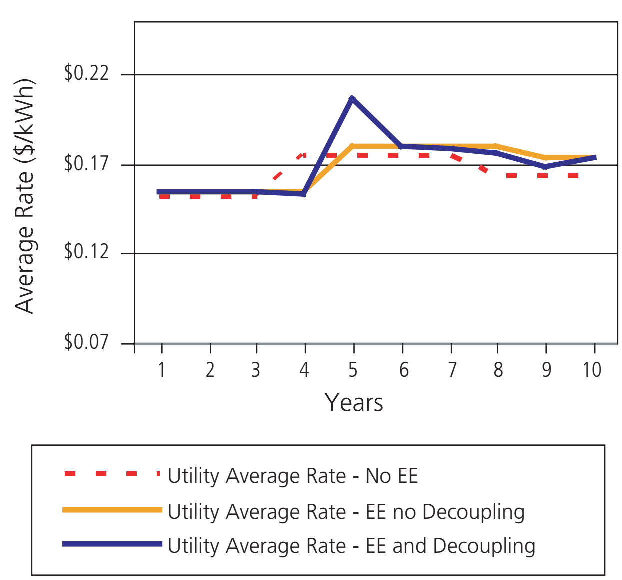
Other Capital Expenditures

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



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]

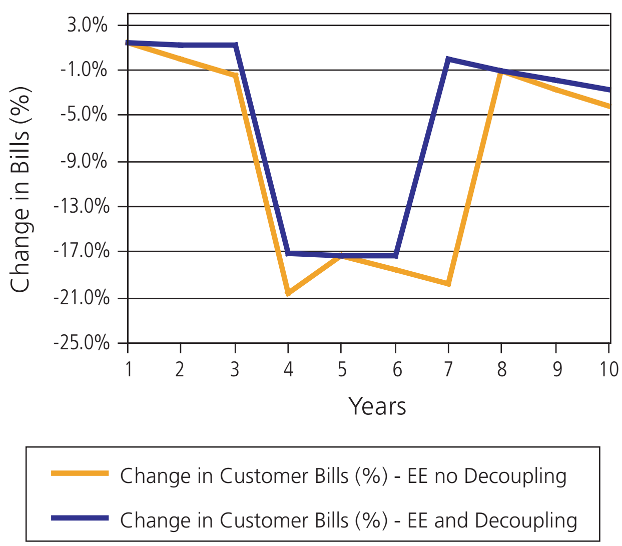
Table 4-4. Power Plant Deferral Results (continued)

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.

Percent Change in Customer Bills

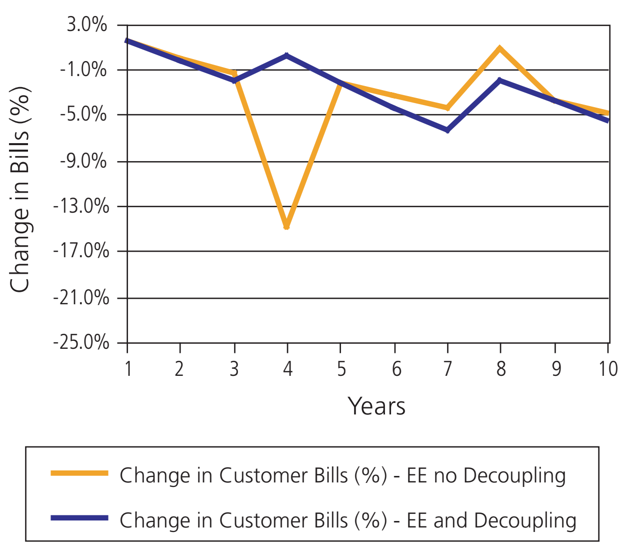


Case 4: High-Growth (5%)

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



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

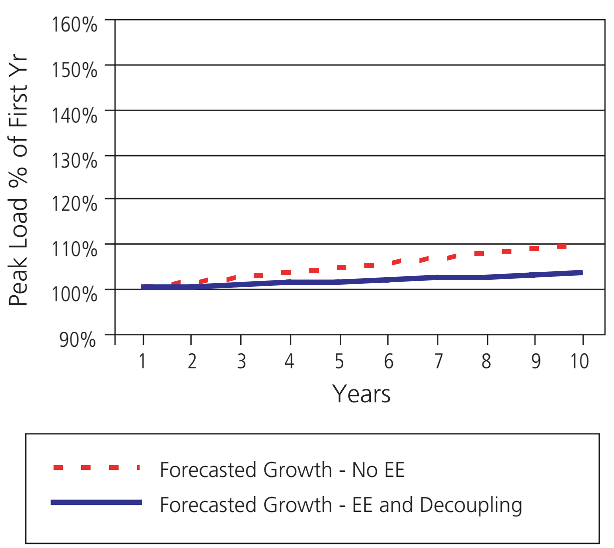
Table 4-4. Power Plant Deferral Results (continued)

Case 3: Low-Growth (1%)

Load Impact

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

Comparison of Peak Load Growth

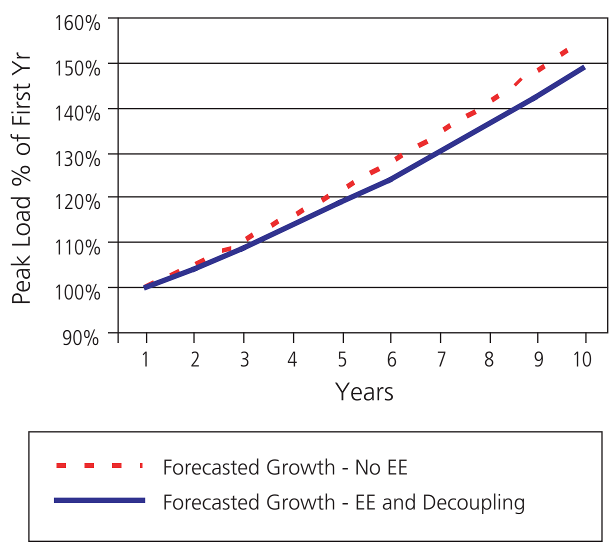


Case 4: High-Growth (5%)

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



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 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 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.

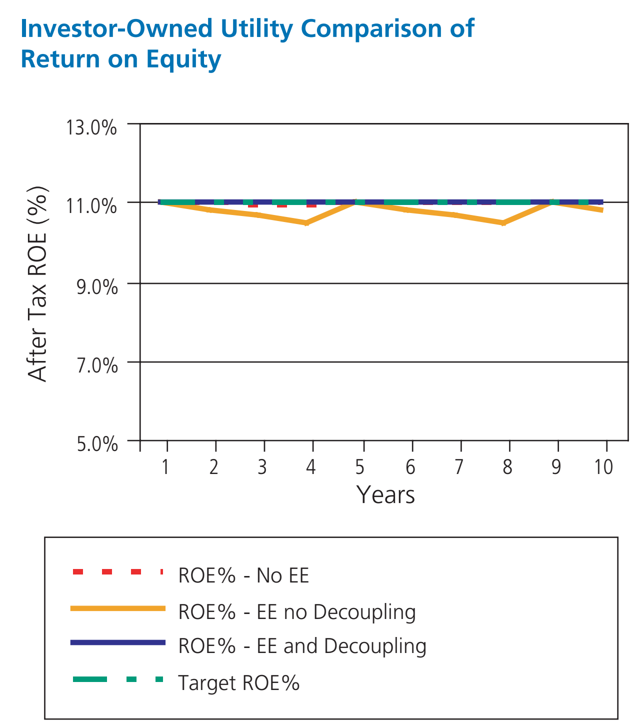
Table 4-5 summarizes the comparison of ROE, rates, bills and societal benefits. Without implementing energy efficiency, both utilities are relatively financially healthy achieving near their target rate of return in each year; however, introducing energy efficiency reduces ROE and earnings for both utilities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

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.

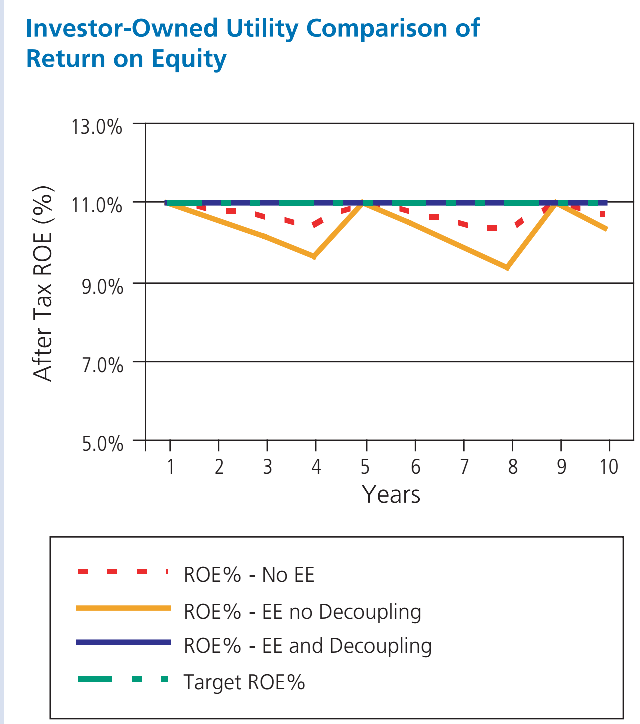


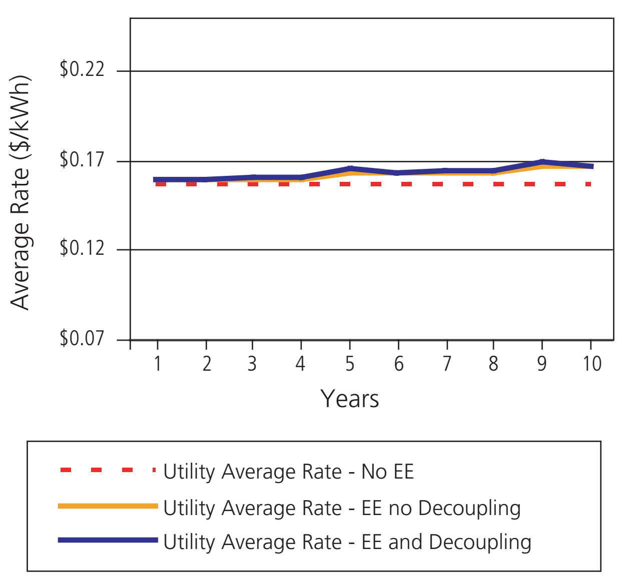
Table 4-5. Vertically Integrated and Delivery Company Results (continued)

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.

Comparison of Average Rate



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

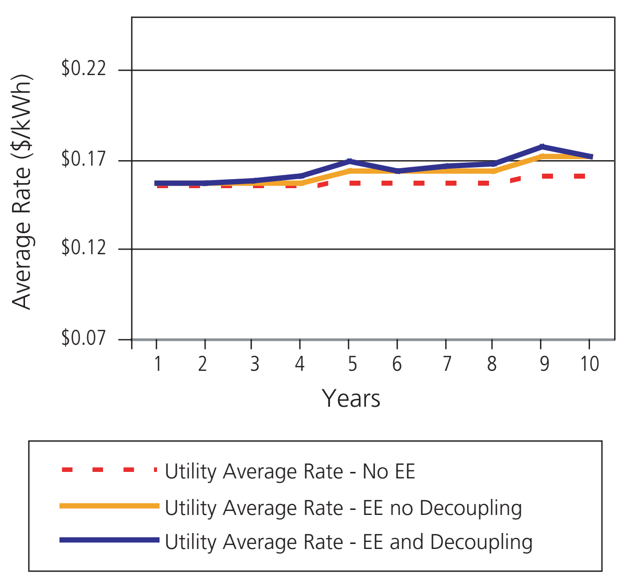
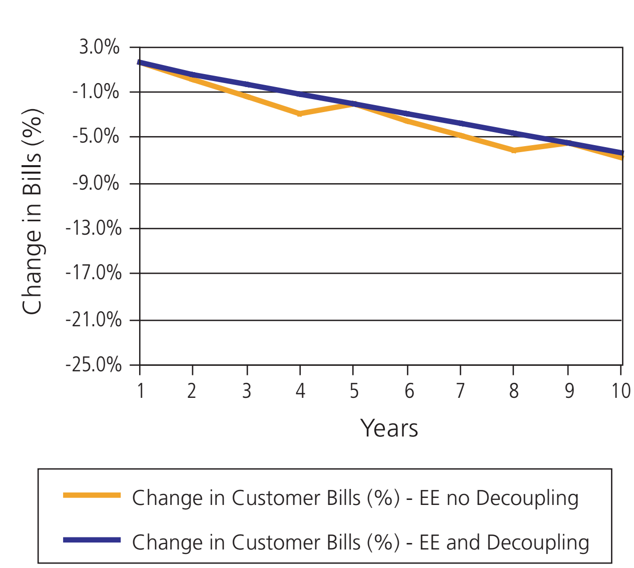


Table 4-5. Vertically Integrated and Delivery Company Results (continued)

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.

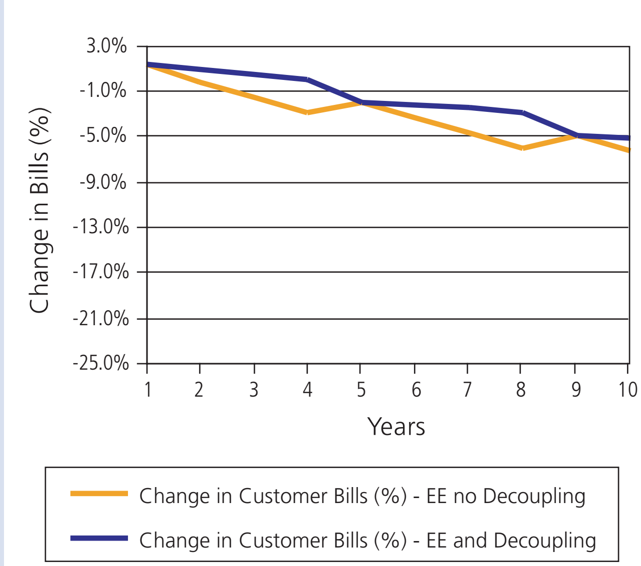
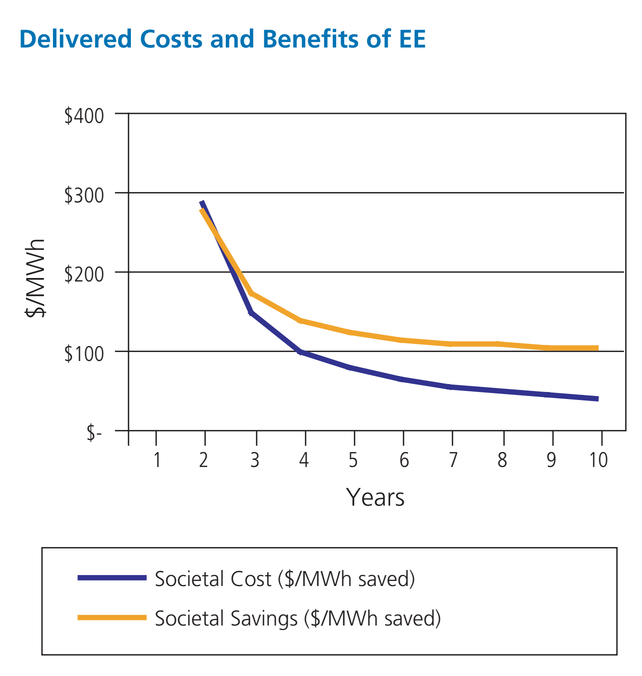


Table 4-5. Vertically Integrated and Delivery Company Results (continued)

Case 5: Vertically-Integrated

Net Societal Benefits

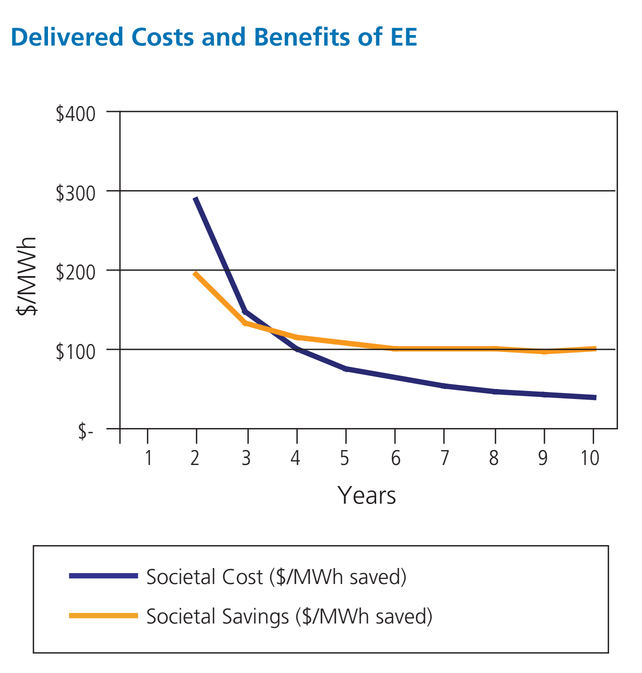
Over time, the savings from energy efficiency exceed the annual costs. The societal cost and societal savings are the same with and without decoupling.



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 as for the distribution company.



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.

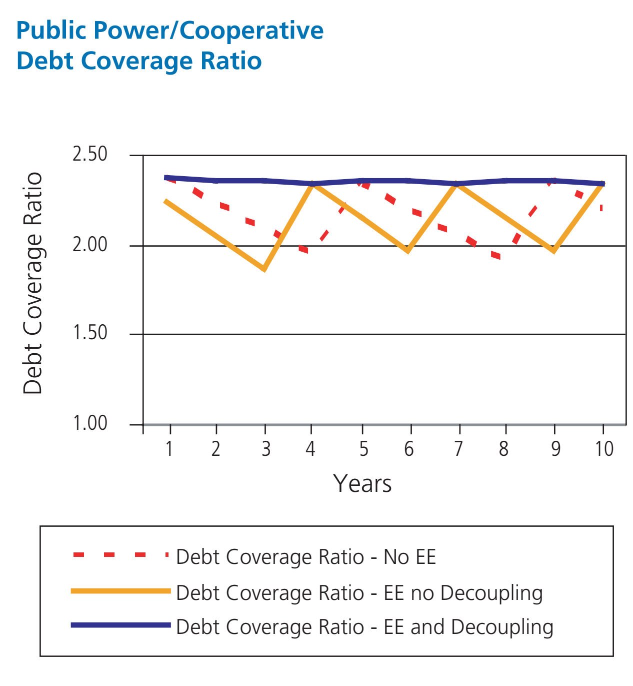
The financial position of publicly-owned utilities is evaluated primarily based on either the debt coverage ratio (which is critical to maintaining a high bond rating and

Table 4-6. Publicly and Cooperatively Owned Utility Results

Case 7: Minimum Debt Coverage Ratio

Utility Financial Health

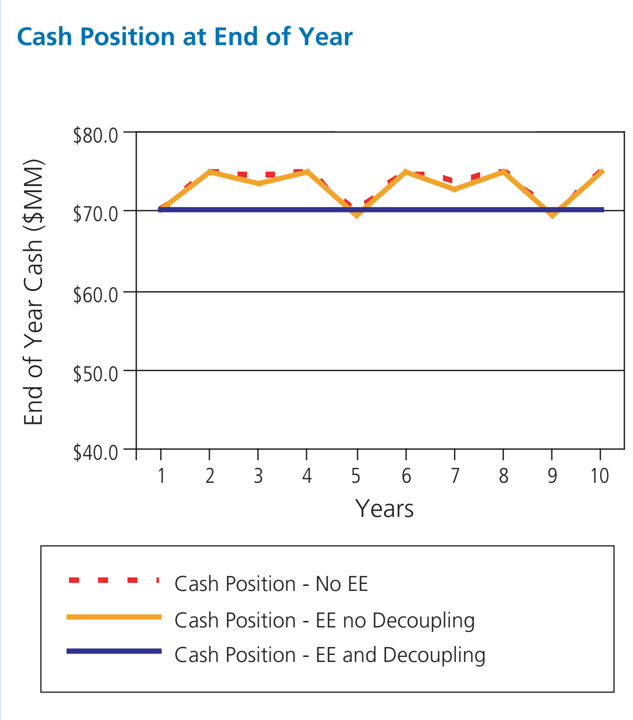
A decoupling mechanism stabilizes the utility's ability to cover debt by adjusting rates for variations in throughput. Without decoupling, rates are adjusted whenever the debt coverage rate falls below a threshold (ratio 2 in the example). The rate adjustment is required earlier in the energy efficiency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



low cost capital) or the minimum cash position (for utilities with no debt). Table 4-6 shows the results of a public or cooperative 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 public power and cooperative utilities will experience similar financial health problems as investor-owned utilities if they do not adjust rates.

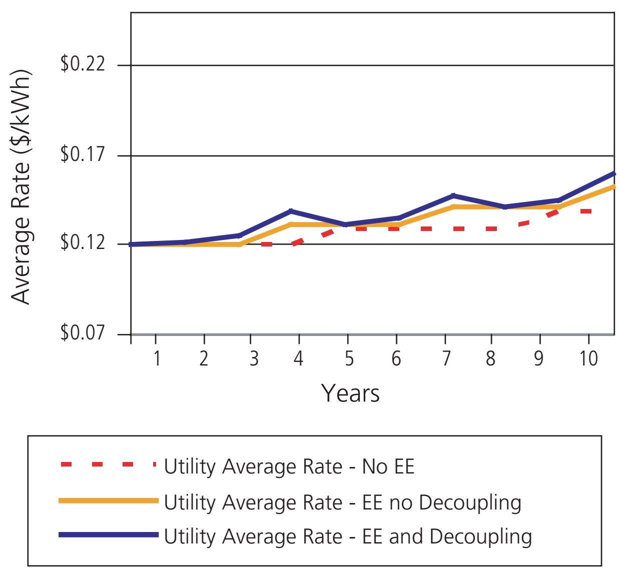
Table 4-6. Publicly and Cooperatively Owned Utility Results (continued)

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.

Comparison of Average Rate



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

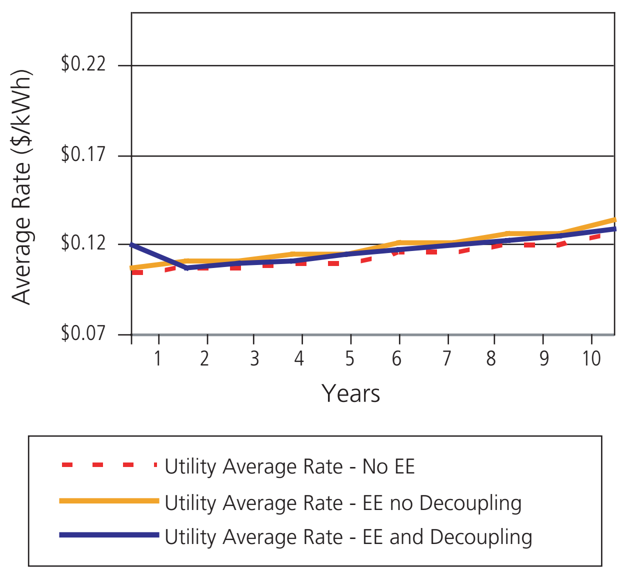
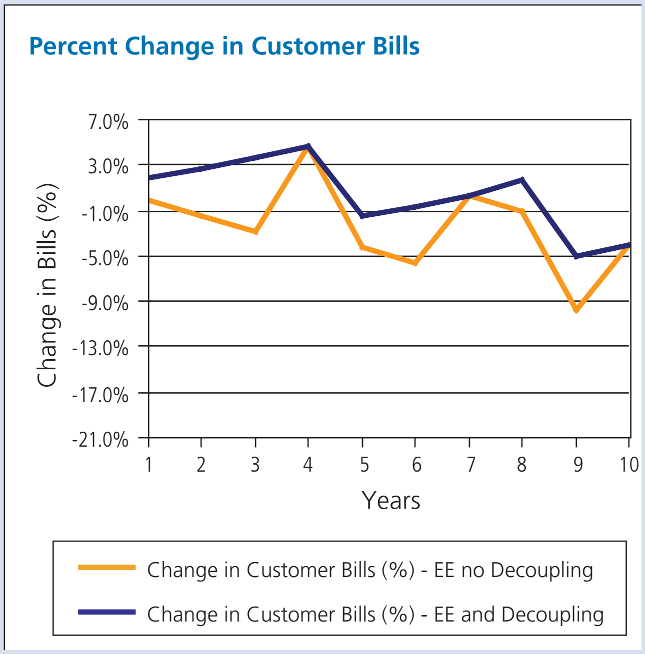


Table 4-6. Publicly and Cooperatively Owned Utility Results (continued)

Case 7: Minimum Debt Coverage Ratio

Customer Bills

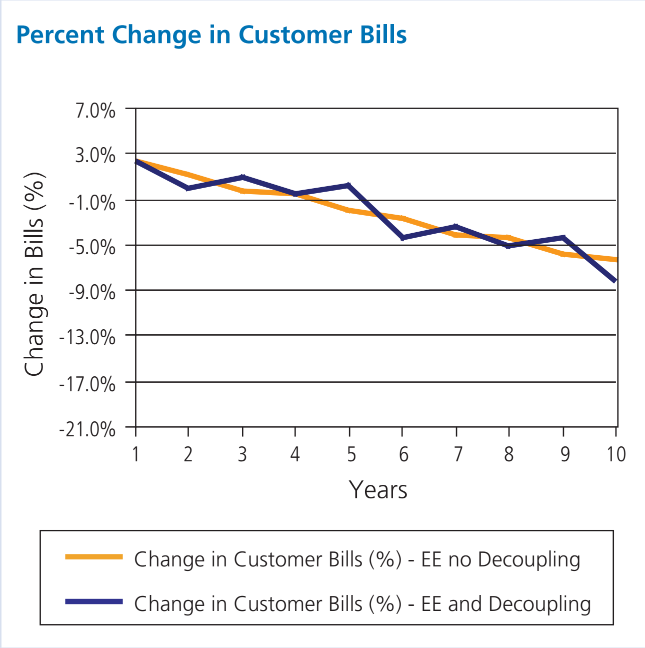
Average customer bills decline with energy efficiency investments with and without decoupling. The 'randomness' in the bill change is due to different timing of rate adjustments in the energy efficiency and no energy efficiency cases. However, overall the trend is downward.



Case 8: Minimum Cash Position

Customer Bills

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



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 may 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 yield a net benefit to society—on the order of hundreds of millions of dollars in net present value 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, 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.

References

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

5: Rate Design

Retail electricity and natural gas utility rate structure 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 rate-making 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 rate-making 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 includes 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 may 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 may be relatively little rate-making flexibility. In several states, restructuring has created transmission and distribution- only utilities, so the regulator's ability to affect full electricity rates may 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-term 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 rate-making 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 may 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

[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).

not necessarily low-usage customers, so a lifeline rate may not protect all low-income customers from energy bills.

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

Time of use (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, since 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

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

Utility Name	State	Tariff URL
Florida Power and Light	FL	www.fpl.com/access/contents/how_to_read_your_bill.shtml
CECONY	NY	www.coned.com/documents/elec/201-210.pdf
Pacific Gas & Electric	CA	www.pge.com/res/financial_assistance/medical_baseline_life_support/understanding/index.html#topic4
Southern California Edison	CA	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	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	www.mid.org/services/tariffs/rates/ums-d-residential.pdf
Turlock Irrigation District	CA	www.tid.org/Publisher_PDFs/DE.pdf
Granite State Electric Co	NH	www.nationalgridus.com/granitestate/home/rates/4_d.asp
Vermont Electric Cooperative, Inc	VT	www.vtcoop.com/PageViewer.aspx?PageName=Rates%20Summary
City of Boulder	NV	www.bcnv.org/utilities.html#electric,waterandsewer

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

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 "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 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 may 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 the 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. 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 may 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

[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 required phased transition to mitigate bill impacts.
Time of Use (TOU) http://www.nationalgridus.com/masselectric/home/rates/4_tou.asp	**Pro:** (a) Low implementation cost; (b) Tracks expected marginal costs. **Con:** Unclear if marginal costs should be short- or long-run.	**Pro:** Can achieve peak load relief. **Con:** May 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 mitigated by a careful design.	**Pro:** Extensive industry experience with TOU rate. **Con:** (a) If mandatory, likely opposed by customers, but not necessarily the utility; (b) 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:** (a) Tracks day-ahead or day-of short-run marginal cost for economically efficient daily consumption decisions; (b) RTP rates can be set to help allocate capacity in an economically efficient manner during emergencies. **Con:** (a) No long-run price signal for investment decisions.	**Pro:** Can achieve peak load relief. **Con:** (a) Not applicable to gas; (b) Might not achieve substantial annual energy reductions or produce significant emissions benefits.	Same as above.	Same as above.	**Con:** (a) If mandatory, likely opposed by customers and the utility due to complexity and implementation cost; (b) 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:** (a) Tracks short-run marginal cost shortly before emergency; (b) 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:** (a) If mandatory, likely opposed by customers and the utility due to high implementation cost; (b) 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:** (a) Provides emergency load relief to support system reliability; (b) Implements efficient rationing. **Con:** (a) Does not track costs; (b) Potentially high implementation cost.	**Pro:** (a) Can achieve load reductions to meet system needs; (b) 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:** (a) If optional, non-participants would not object unless discount is "excessive"; (b) 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 2" 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 2" rate form. **Con:** (a) Customers may not be accustomed to the concept; (b) 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:** (a) If mandatory, likely opposed by customers and the utility due to high implementation cost; (b) 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 may be smaller than those attainable through mandatory rate programs.	**Pro:** (a) Provides direct incentive for program participation, plus ongoing bill reductions (for most options); (b) Does not require rate changes. **Con:** Existing rate forms may 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 customers who qualify.	**Pro:** (a) Links payment of incentive directly to metered energy savings; (b) Easy to measure and verify. **Con:** Focused on throughput and not capacity savings.	**Pro:** (a) Provides a clear incentive to customers to reduce their energy usage, motivates customers, and gets them thinking about their energy usage; (b) Can provide significant bill savings; (c) 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.

was based on the measure's expected annual kWh savings and a schedule of lifecycle savings per kWh (PacifiCorp, 2002).

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,

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 (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 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
DSM Funding	System benefits charge and procurement payment. http://www.cpuc.ca.gov/static/energy/electric/energy+efficiency/ee_funding.htm	System benefits charge. http://www.wutc.wa.gov/webimage.nsf/8d712cfdd4796c8888256aaa007e94b4/0b2e39343c0be04a88256a3b007449fe!OpenDocument	System benefits charge. http://www.mass.gov/Eoca/docs/doer/pub_info/ee-long.pdf	System benefits charge. http://www.getenergysmart.org/AboutNYES.asp

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)

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. Two-part 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, 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 programming has been operating successfully in some parts of the country since the late 1980s. Best practice strategies 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 are presented based on a review of successful programs operating across the country under varying policy models.

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 more detailed list of options specific to the objective of 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 earns 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 may 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. *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[2] 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[3] 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). See box on page 6-3 for a description of the policy models and Table 6-1 for 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. The best practices are drawn from a review of organizations that have a sustained history of successful energy efficiency 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 *Energy efficiency* refers to using less energy to provide the same or improved level of service to the energy consumer, and to shifting the time of use of energy in an economically efficient way. The term energy efficiency as used here includes using less energy at any time, including at times of peak demand through demand response and peak shaving efforts.

3 *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

SBC Model

In this model, funding for programs comes from a system benefits charge (SBC) that is either determined by legislation or a regulatory process. The charge is usually a fixed amount per kilowatt-hour or million British thermal units 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.

IRP Model

In this model, energy efficiency is part of the utility's integrated resource plan (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.

RFP Model

In this case, a utility or an independent system operator (ISO) puts out a competitive solicitation [Request for Proposal (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, there is 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 generation, the energy efficiency resource can be part of an integrated resource plan. 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	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 • 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 state with existing programs to increase program activity
Municipal utility & electric cooperative: • SMUD (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

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 $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, 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, and resource planning (or cost of service) efforts.
- There are cost-effective energy efficiency programs for electricity and natural gas including programs that can be specifically targeted to reduce peak load.
- There are effective models for delivering gas and electric energy efficiency programs to all customer classes. Models may vary for some programs 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			
Avg Annual Budget (million $)	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 $/mcf	11	9	8
Cost of Energy Efficiency as % 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

The best practice strategies for program planning, design, implementation, and evaluation are divided into the four major groupings and organized as such throughout the remainder of this chapter. The four groupings are provided below. For the most part, the best practices presented are independent of the policy model in which the programs operate; where the 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. In order to realize this potential, leadership at multiple levels, organizational alignment, and an understanding of the nature and extent of the energy efficiency resource are needed.

- *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.[4]

- *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* creates the 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 appropriate to 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.

4 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 VT (VT)	MA Utilities (MA)	WI Department of Administration	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 (million $) [1]	138	14	123	63	317
Budget as % of Electric Revenue (from ACEEE) [2]	1.3%	3.3%	3.0%	1.4%	1.5%
Avg Annual budget Gas (million $)	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	$79 million bill reduction	37,200 CCF of water	$21 million bill reduction 2,090 new jobs created	Value of non-energy benefits: Residential: $6M C/I: $36M	NR
Avoided Emissions (tons) (may 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	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%

NA = Not Applicable; NR = Not Reported

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.

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).

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 Authority (BPA) (ID, MT, OR, WA)	MN Electric and Gas Investor owned Utilities (MN)
IRP with Portfolio STD	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 $550 M on bills	NR	lifetime savings of $430 M 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- 403,300 over lifetime	NO_X- 640 SO_2- 104 CO_2- 680,000 over lifetime	NR	NO_X- 1300 Particulates- 11655 CO_2- 28
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

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 may 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 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 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.

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 considered. 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, and the Union of Concerned Scientists, among 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, "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 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

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 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 integrated resource plan (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/or 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 (GWh)/yr and 63 MW (Holmes, 2006).

Source: Geller, 2006.

are critical as well. These internal champions motivate their fellow employees and embody making energy efficiency part of the corporate culture.

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 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 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 may 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 may 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 its 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 (with improved performance itself a performance 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 "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.

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:		**0.9%**		**1.3%**		**1.2%**

[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.

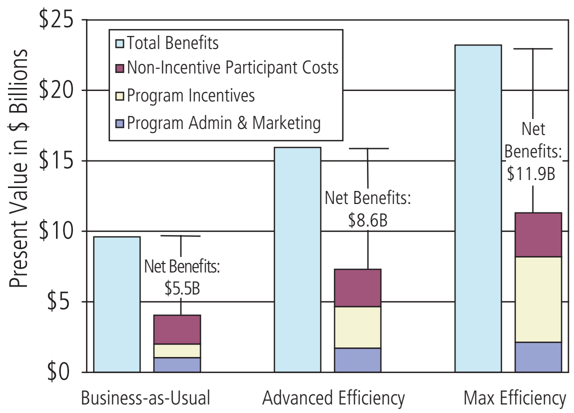
The output of technical and economic potential is the size of the energy efficiency resource in MW, MWh, MMBtu and other resources. The potential is built up from savings and cost data from hundreds of measures and is typically summarized by sector using detailed demographic information about the customer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

- Outlining what can be accomplished at what costs.

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

- Ensuring that potential state and federal codes and standards are modeled for 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 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 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 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) in cases 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) in cases 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 (i.e., whether there is a network of home energy raters, energy service companies, or certified heating, ventilation, and cooling [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.)

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

- 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.

- 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 then is 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, 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 metric cubic foot (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 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).

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 administrator 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.

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

	Benefits					Costs			
Test	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

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).

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.)

At the measure level, 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 identified as 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 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 Requirements 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 product 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 Planning and Conservation Council explicitly models both state codes and federal standards in its long-term plan (NPCC, 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

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

experimental technologies. Sometimes R&D funding 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, energy efficiency, 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 ener-

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 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 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).

gy and communications system on a continental scale. A key development by this consortium is the IntelliGrid Architecture, an open-standards-based architecture 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 the interactive exchange of information (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	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. They might increase demand.	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 more 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 able 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 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 on that specific area (PG&E, 1993). A recently approved settlement at Federal Energy Regulatory Commission allows energy efficiency along with load response and distributed generation to participate in the Independent System Operator (ISO) New England Forward Capacity Market (FERC, 2006; FERC, 2005). In addition, Consolidated Edison has successfully used an 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.

If a utility is looking at 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 is based on 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 goals overall and by program
  - Annual savings
  - Lifetime savings
- Benefits and costs overall and by program

Bonneville Power Administration (BPA) Transmission Planning

BPA has embarked on a new era in transmission planning. As plans take shape to address load growth and 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 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.

- Description of any shareholder incentive mechanisms

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 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

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 • 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
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 • 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: building, insulation • Homeowners	• Higher initial cost • Lack of information • Competing priorities • Inexperience or prior negative experience w/ technology (e.g., early CFL) • 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 organization • 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

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.

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.

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.

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, 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.

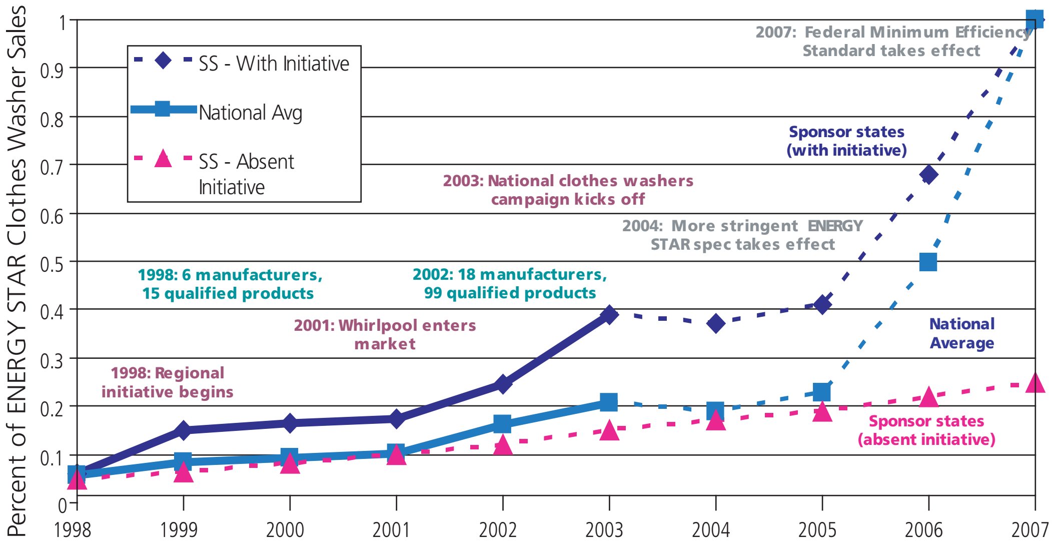
Promote the Other Benefits of Energy Efficiency and Energy Efficient Equipment

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 partnership (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*).

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



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), which have existing delivery channels that can 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 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. (See box on page 6-34 for additional information.) New Jersey and Minnesota provide examples of states that have leveraged ENERGY STAR.

- *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

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

LIPA's REAP 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 no more than 60 percent of the median household income level. **LIPA's REAP program has saved 2.5 MW and 21,520 megawatt-hours from 1999 to 2004 with spending of $12.4 million.**

Source: LIPA, 2004

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.**

- *Great River Energy, Minnesota.* In 2005, Great River Energy emphasized cost-effective energy conservation by offering appliance rebates to cooperative members who purchase high efficiency refrigerators, clothes washers, and dishwashers. Great River has provided its member cooperatives with nearly $2 million for energy

The ENERGY STAR Program

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 U.S. Department of Energy (DOE), has an extensive network of partners including equipment manufacturers, retailers, builders, energy service companies, 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.

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.

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 demand-side management/conservation program consists of:

– Cycled air conditioning

– Interruptible commercial

– Interruptible irrigation

– Air and ground source heat pumps

– ENERGY STAR high-efficiency-air conditioning rebate

– ENERGY STAR appliance rebates

– ENERGY STAR compact fluorescent light bulb 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 to confirm eligibility (equipment and customer) and track participation by customer for measurement and verification 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 frustrates 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, standalone 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 may 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.

KeySpan Example

KeySpan uses training and certification as a critical part 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.

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.

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.

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 that already occur in 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 on the following pages 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. Measurement and verification ensure 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

California Non-Residential Standard Performance Contract Program

The California Non-residential Standard Performance Contract (NSPC) program is targeted at customer efficiency projects and is managed on a statewide basis by Pacific Gas & Electric Company, Southern California Edison Company, and San Diego Gas & Electric Company. 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 kilowatt-hour, performance measurement protocols, payment terms, and other operating rules of the program were 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

developing and implementing all types of programs for 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 BOMA Energy Efficiency Program

The Building Owners & Managers Association (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. carbon dioxide 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 and 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. It 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, and 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 may need to be reduced or transition 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 training pro-

Table 6-11. Types of Financial Incentives

Financial Incentives	Description	Who Receives Incentive	Notes
Rebate			
prescriptive	per item	customer	
prescriptive	per item	retailer, contractor or distributor	may be invisible to consumer
prescriptive	per item – provided only if measures recommended in program audit	customer	
custom	tied to energy savings	customer	
custom or prescriptive	rebate on audit/technical assistance if measures are implemented	customer	
Performance contracting			
performance contracting	tied to savings	risk premium to financer	
performance contracting	tied to savings	no capital costs for customer	
Low-interest financing	covers project cost	customer	
Cooperative advertising	per advertisement	retailer or contractor	
Retailer buy-down	per item	retailer	lowers "shelf price" of item, invisible to consumer
MW Auction	per MW or MWh	third party or customer	successfully used in CT and NY

grams, most programs offer some type of financial incentive to customers or industry. 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, engineers, energy service companies, 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 spread 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, vocational training and outreach to universities, and incentives and or business referrals to spur technician training and certification.

Examples of programs that have leveraged the ESCO industry were provided above. 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 below for an example). The program can be applied in the gas or electric context and is effective at reducing peak load, since the program captures improvements in heating and cooling performance.

Austin Energy: Home Performance with ENERGY STAR

Austin Energy's Home Performance with ENERGY STAR program in Texas 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 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 (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 both process and 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.

Table 6-12. Sample Progression of Program Designs

Sector	Program Ramp Up			Energy & Environmental Co-Benefits (In Addition to kWh)			
	Early (6 Months -2 YRS)	**Midterm (2-3 YRS)**	**Longer Term (3 To 7 YRS)**	**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		NOTE all programs provide bill and emission savings regardless of state
		HVAC rebate	Add HVAC practices	X	S		
Residential: New Construction	ENERGY STAR Homes pilot (in areas w/out 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
Multi-Family	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 Wisconsin and Xcel Energy programs discussed on the next page 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 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 may be appropriate to lower or eliminate financial incentives altogether. It is not uncommon however for programs to continue 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.

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

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 assists 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		Key Best Practices
				Proven	Emerging	
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	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	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	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 predominate 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	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

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 VT (VT)	Electric Utilities (MA) NSTAR	WI Department of Administration	CA Utilities (CA)	MN Electric and Gas Investor-Owned Utilities (MN)	Bonneville Power Administration (BPA) (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 and Portfolio Standard	IRP and Conservation Improvement Program	Regional Planning Model
Program Budgeting Cycle	Annual	3 years	Annual from SBC	Annual	Current funding cycle is three years. Previous periods were only two years.	Currently a 2-year cycle, but a 4-year cycle is recommended. Natural gas submits plans one 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 three year evaluation with annual	reporting.	Funded as needed
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
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
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						Not Available	

Table 6-14. Evaluation Approaches (continued)

	NYSERDA (NY)	Efficiency VT (VT)	Electric Utilities (MA) NSTAR	WI Department of Administration	CA Utilities (CA)	MN Electric and Gas Investor owned Utilities (MN)	Bonneville Power Administration (BPA) (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	Not Available	<1%	2%	8% (increased 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, other demands.	Not Available	$160 million over 3 years.	Not Available	$1 million
Financial Evaluation	Internal State Comptroller CPA	CPA	Internal CPA	CPA	NA	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	Periodically (less frequent than funding cycle)	Not Available	2 years	Periodically
Test Used (RIM, TRC, Utility, Other - describe)	TRC Other	Utility Cost Test and Societal Cost-Benefit Test	TRC	Societal Also include 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 witn the Massachusetts Department of Telecommunications and Energy	WI Department of Administration	California Public Utilities Commission and the CEC	Department of Commerce	Power Council
Protocols	IPMVP	Not Available	NA	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 program's resulting energy or peak savings, or both. 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)**

Develop Program and Project Tracking Systems That Support Evaluation Needs

A well-designed tracking system should collect and detail the 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 a 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.* Equipment type, equipment size or quantity, efficiency level and estimated savings.
- *Program tracking information.* Rebates or other program services provided (for each participant), key program dates.
- *All program cost information* (usually in a separate data base) including 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

The selling of energy efficiency is fundamentally a marketing challenge as programs are trying to get energy consumers to invest in technologies they are not currently using. 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 in a box below 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 measurement and verification 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 (to program operations) evaluations to document savings.

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.

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.

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

Best practices in Evaluation Should Include:

- Incorporating an overall evaluation plan and budget into the program plan.
- Having a more detailed 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.
- 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).

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 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 New England 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 (*as presented in the Executive Summary*).

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, these existing planning processes might need to be adapted or even 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 may 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 measurement and verification 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 measurement and verification 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 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, 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 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, and 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 the energy savings.

Option to Consider:

- Establishing funding for multi-year periods.

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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. Under whichever 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 may 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 may 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 may 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 not capture 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 analysis that shows the benefits of energy efficiency to customers, the utility 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 MWh 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.

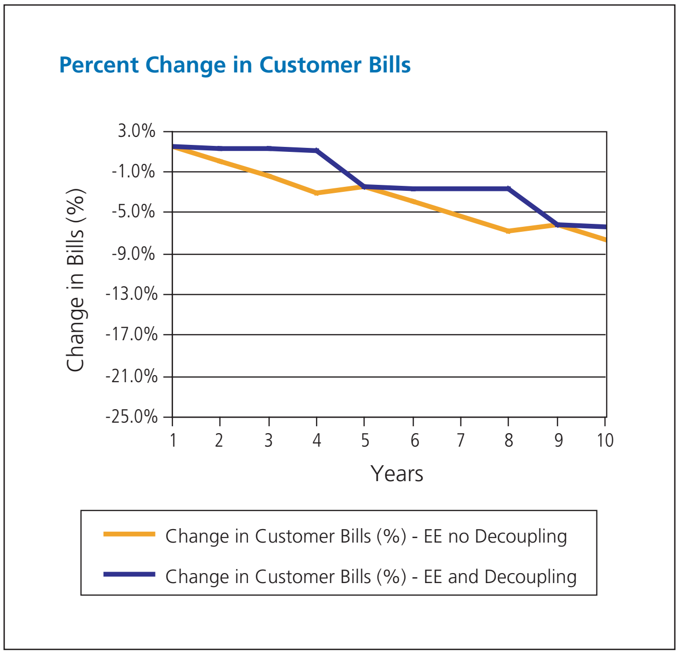
Case 1: Low-Growth Electric and Gas Utility

Customer Perspective

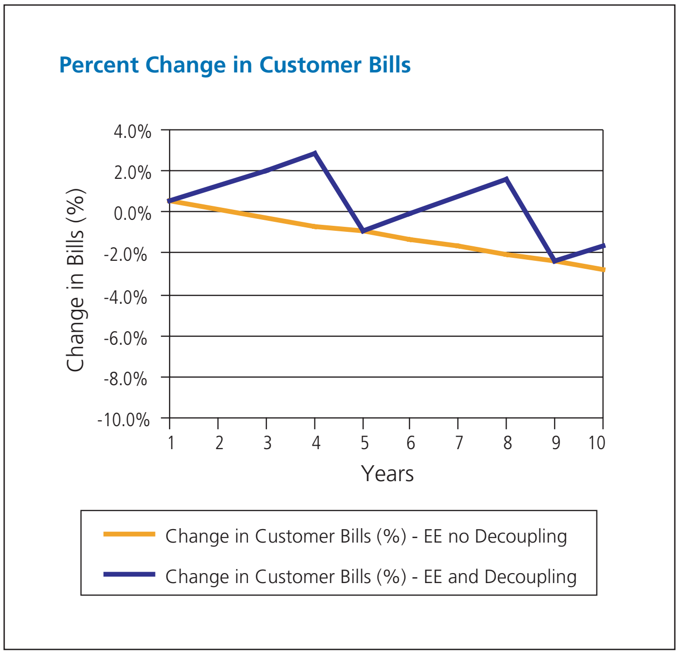
Customer Bills – Decrease

In the first year, customer utility bills increase because the cost of the energy efficiency (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

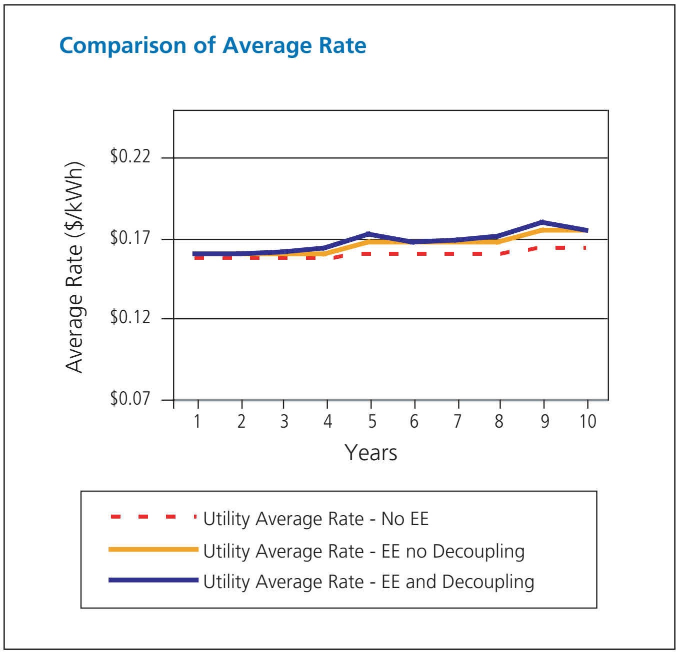


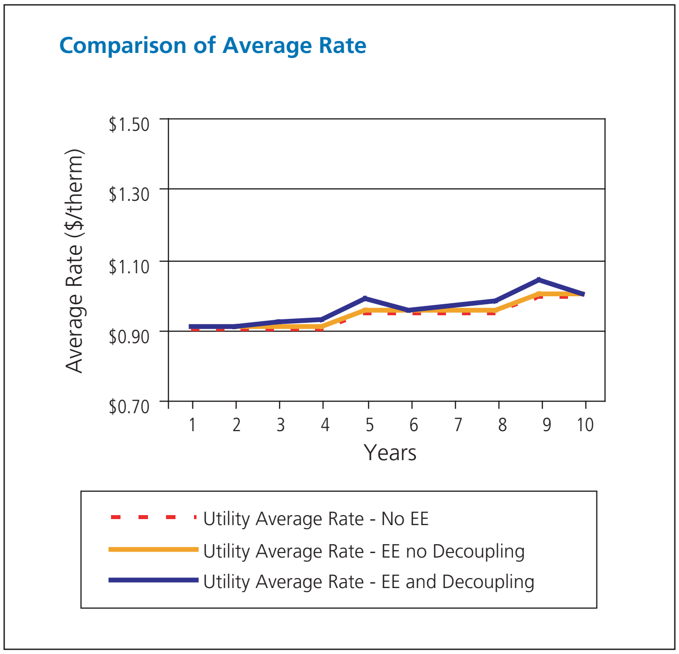
Gas



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.



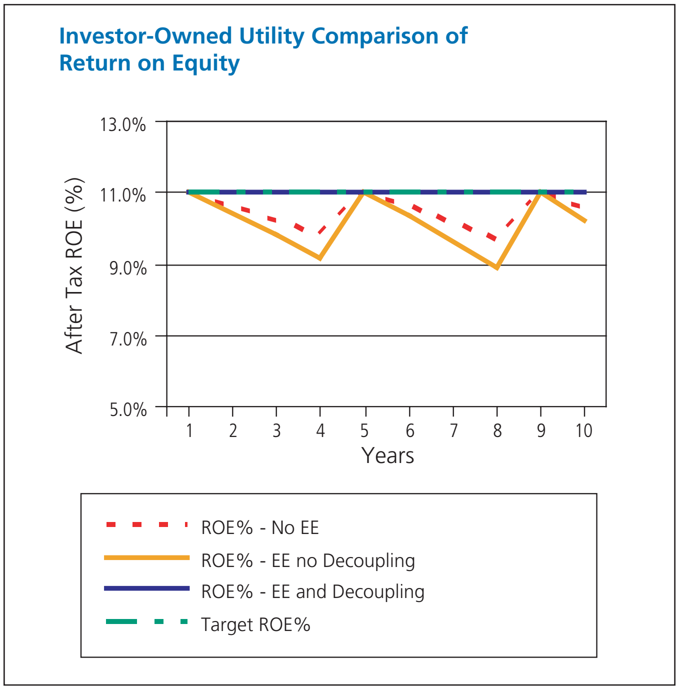


Utility Perspective

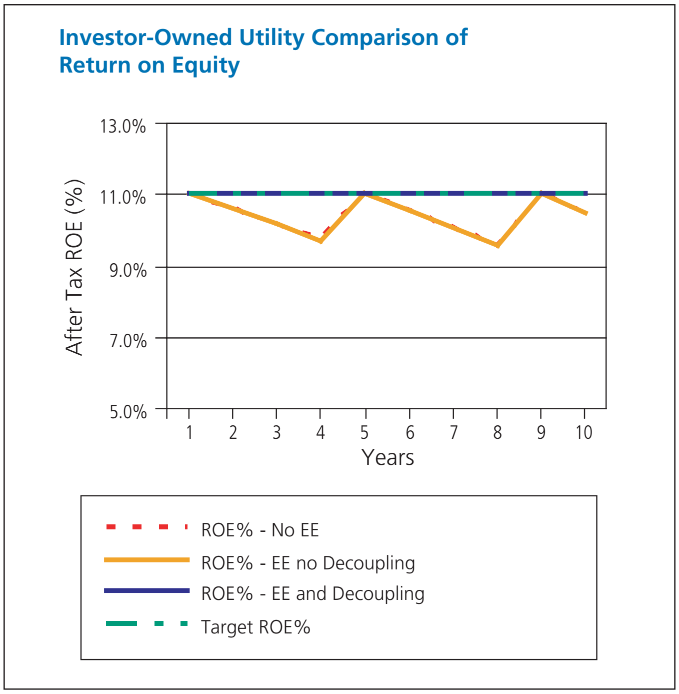
Utility Financial Health – Small Changes

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 - ROE, Publicly- or Cooperatively-Owned Utility - Cash Position or Debt Coverage Ratio.

Electric

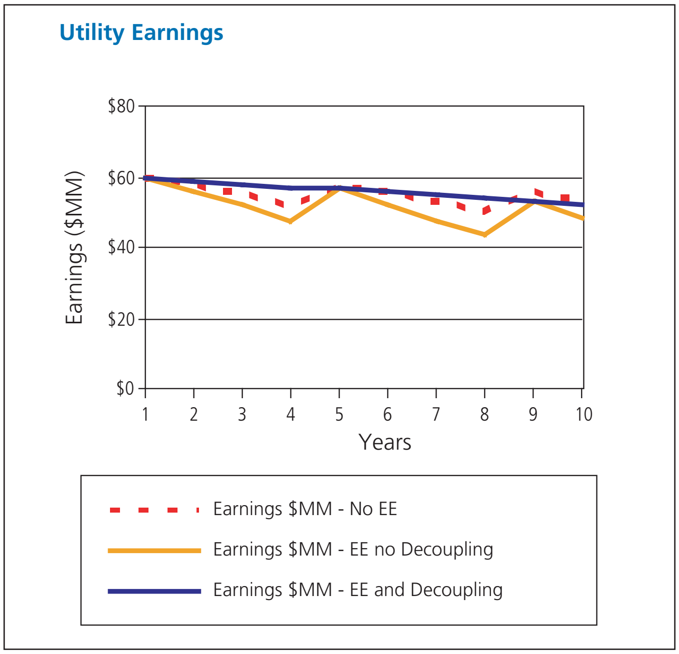


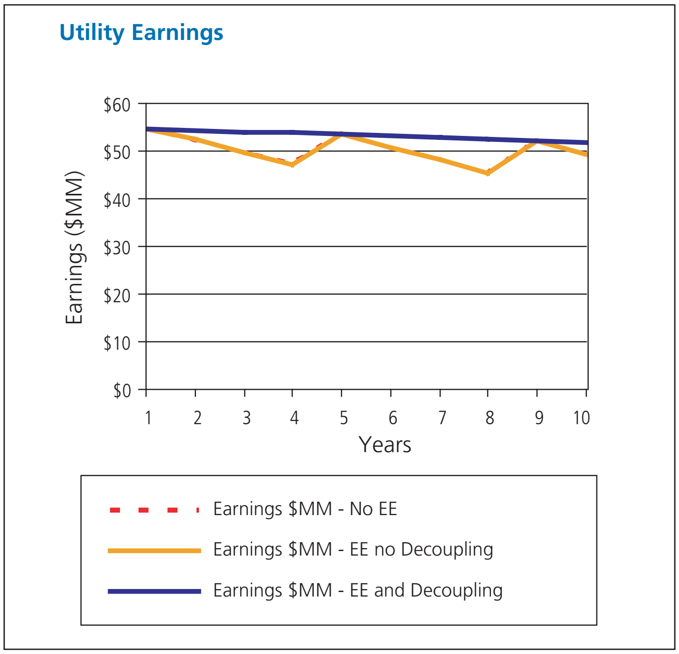
Gas



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.



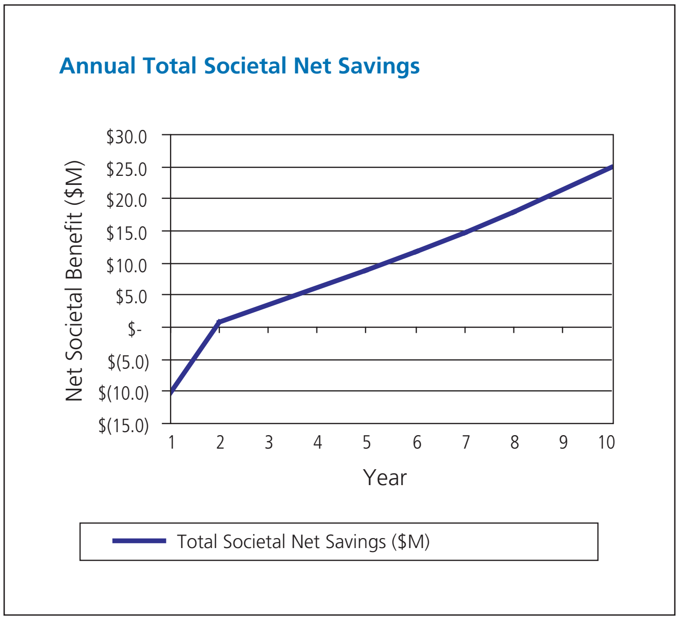


Community or Society Perspective

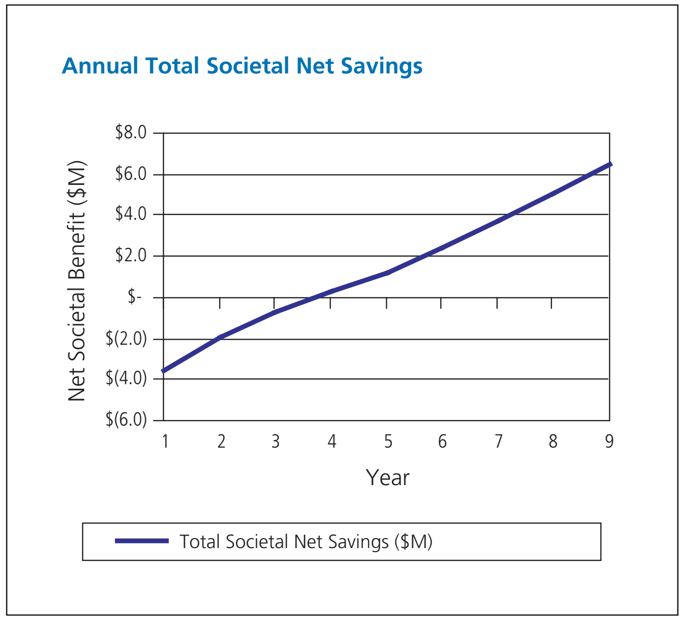
Societal Net Savings - Increase

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

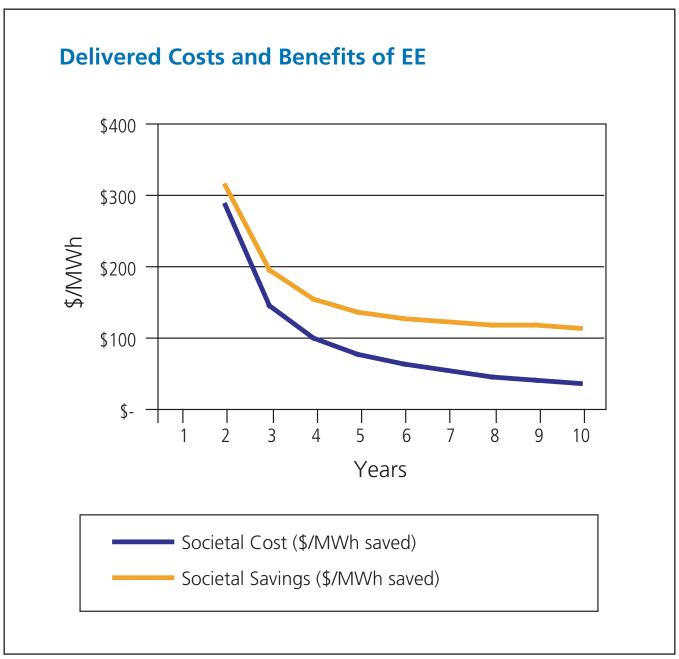


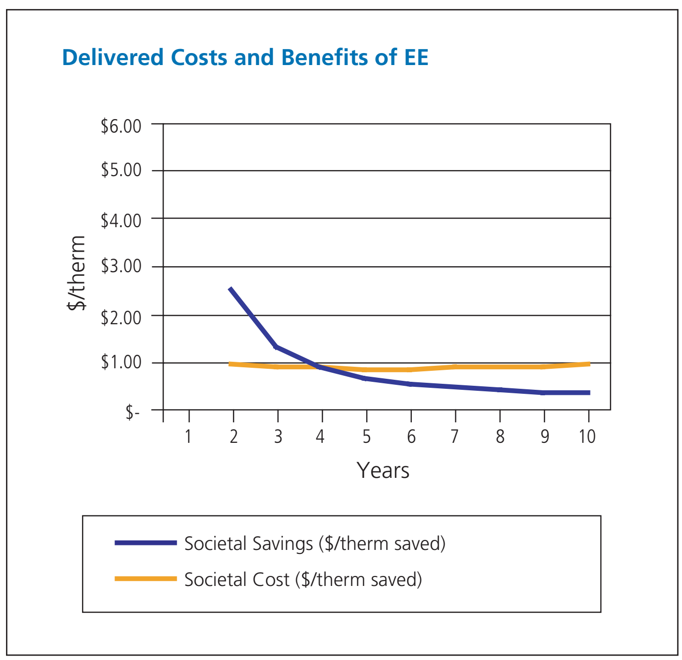
Gas



Total Societal Cost Per Unit - Declines

Total cost of providing each unit of energy (MWh, cf) 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.

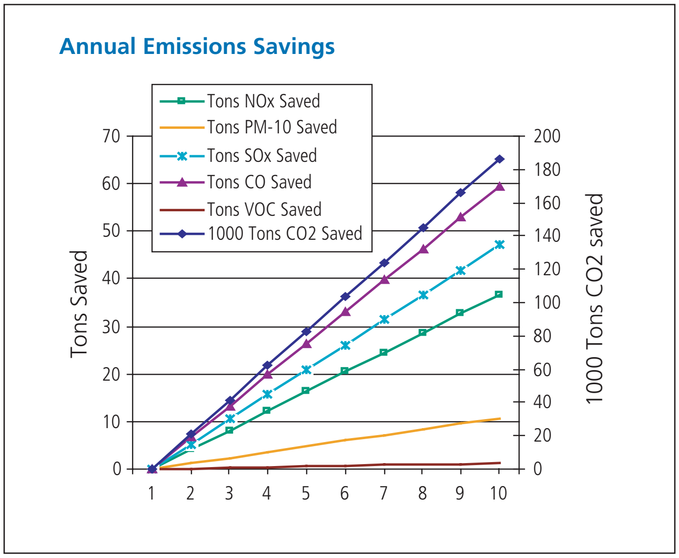




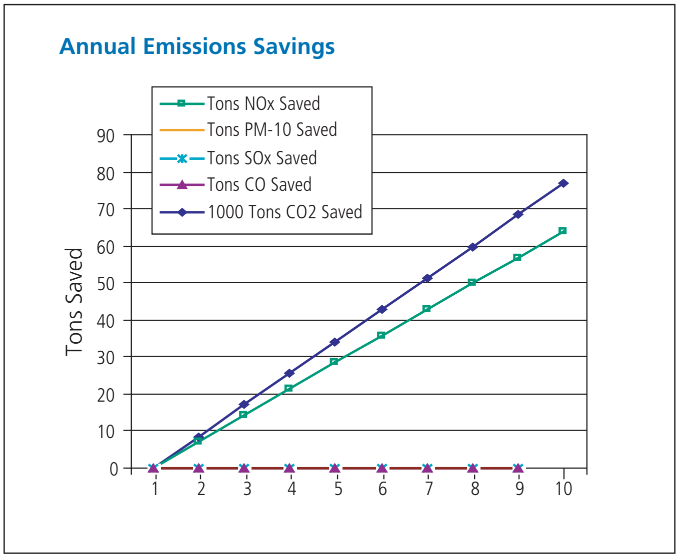
Emissions and Cost Savings - Increase

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, therefore only one case is shown.

Electric

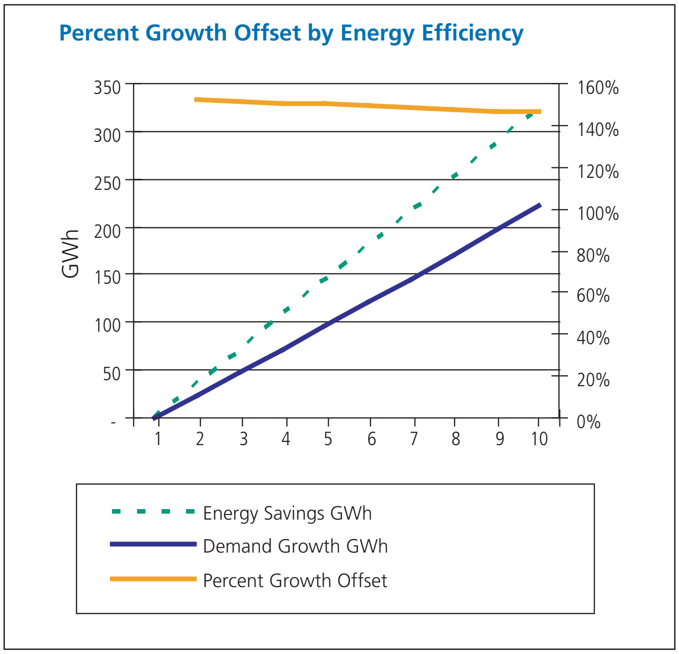


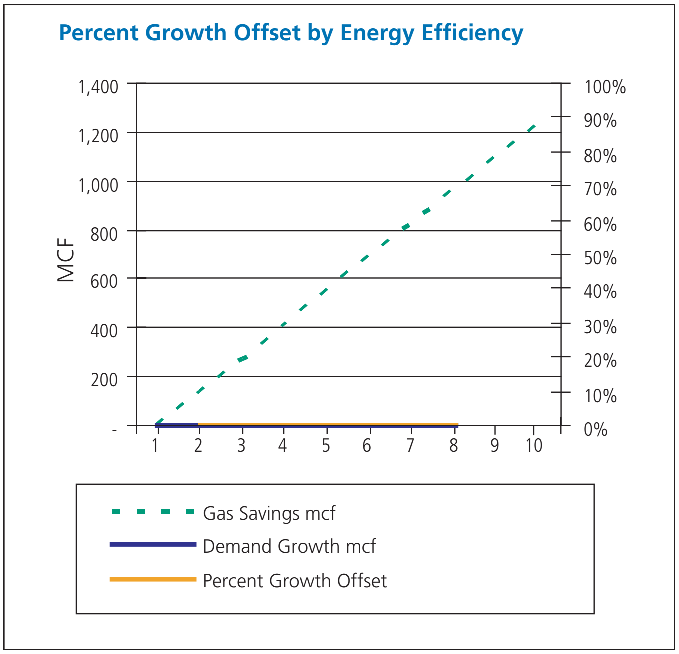
Gas



Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without the EE and illustrates the amount of EE relative to load growth. Demand growth and energy savings are not impacted by decoupling, therefore only one case is shown.

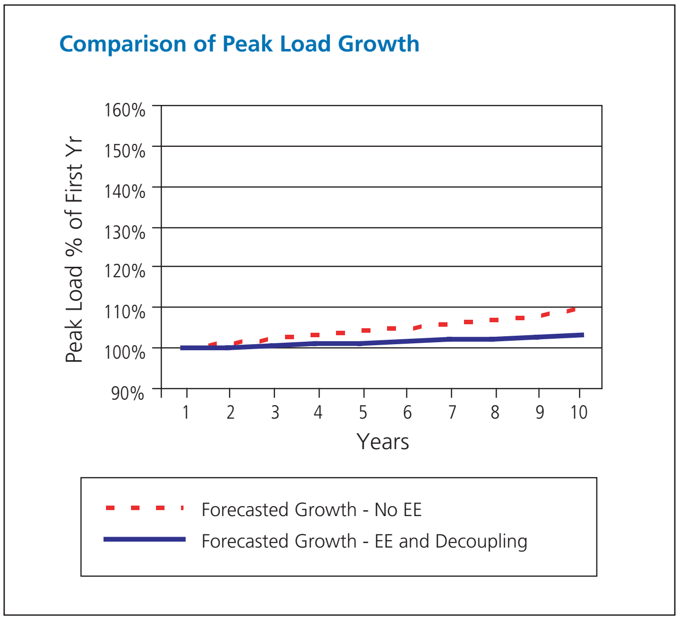




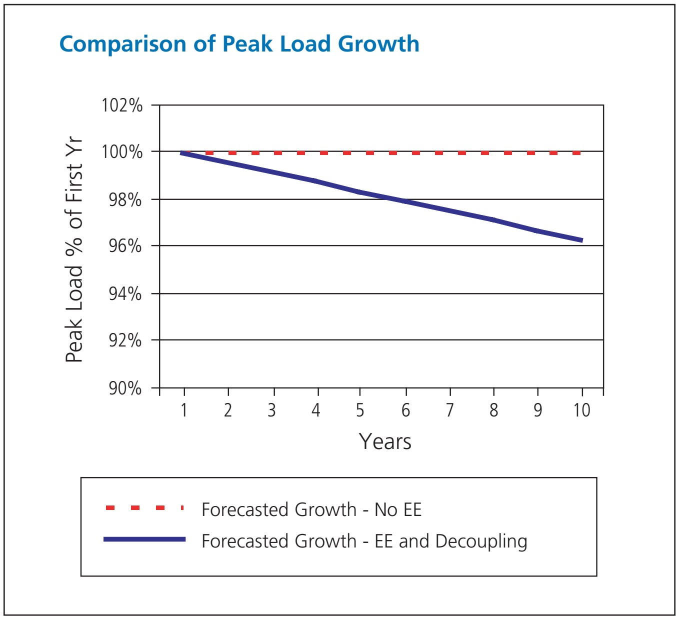
Peak Load Growth – Decrease

Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling, therefore only one case is shown.

Electric



Gas

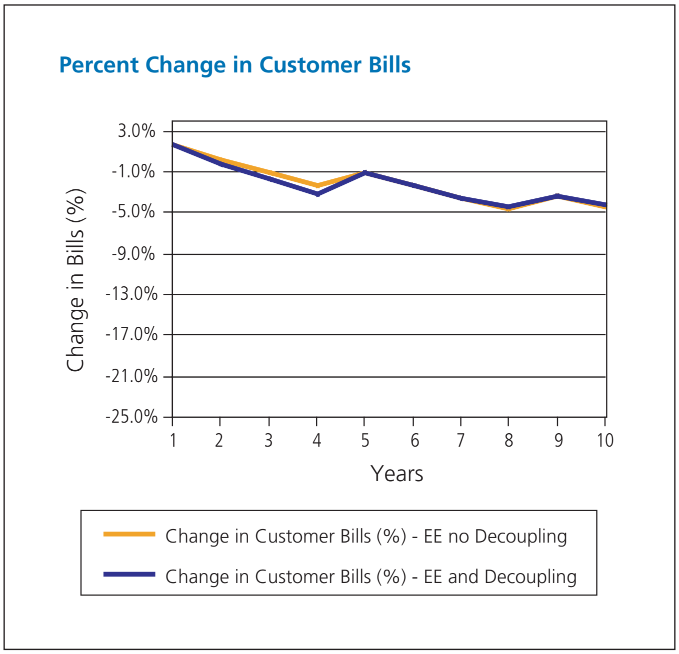


Case 2: High-Growth Electric and Gas Utility

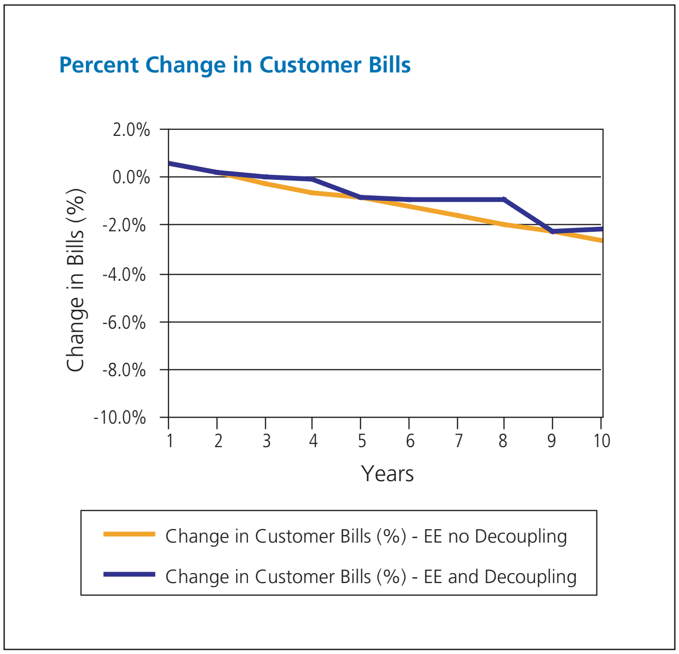
Customer Perspective

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.

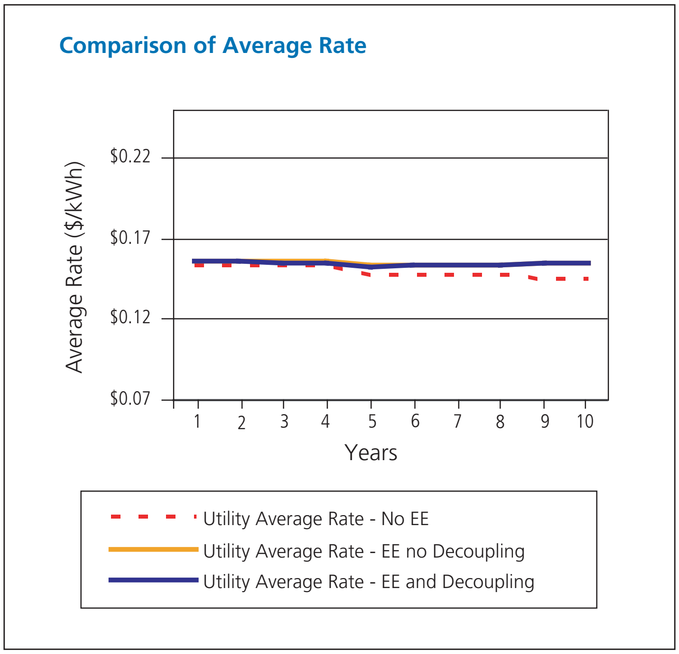
Electric

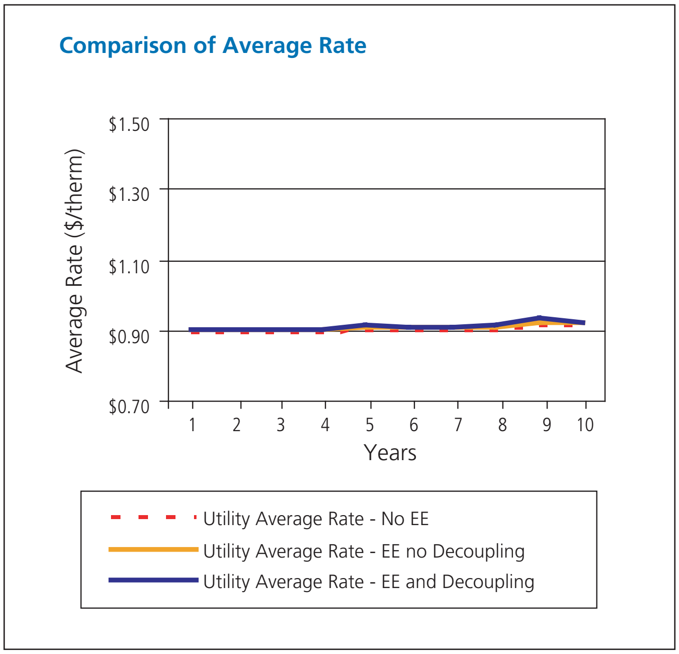


Gas



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.



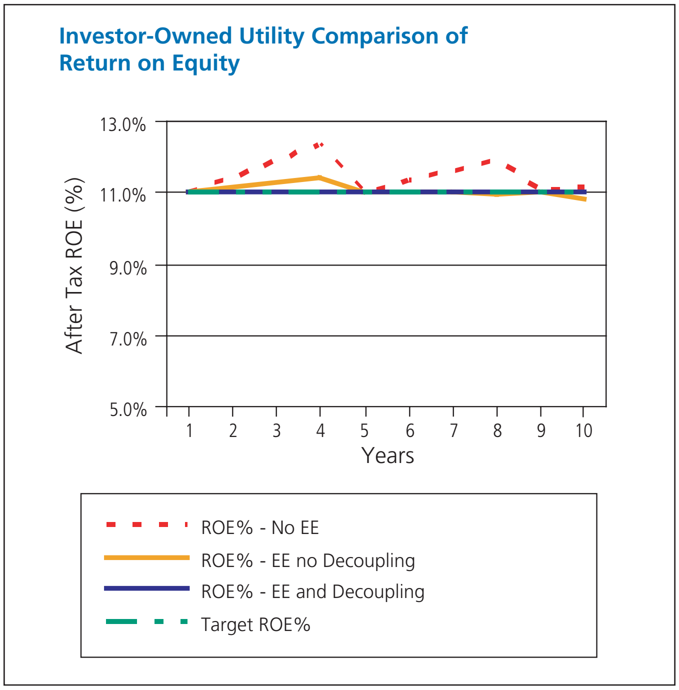


Utility Perspective

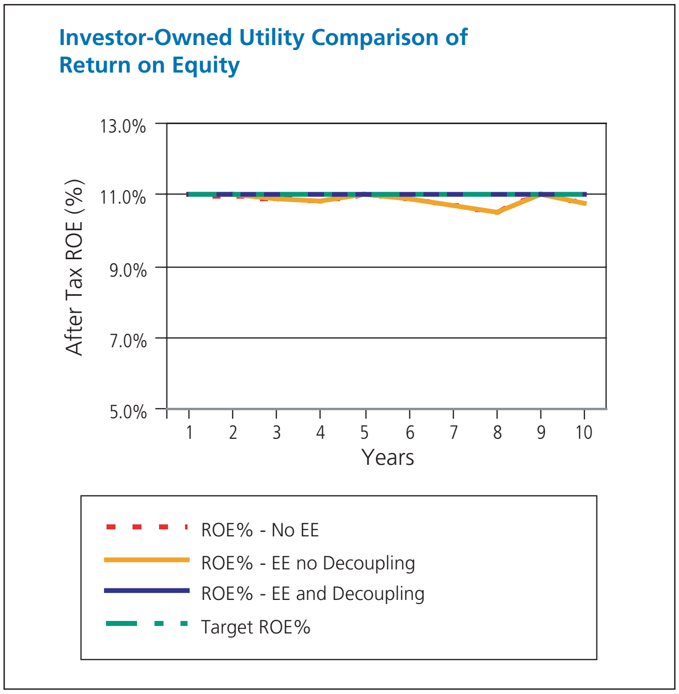
Utility Financial Health – Small Changes

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 - ROE, Publicly- or Cooperatively-Owned Utility - Cash Position or Debt Coverage Ratio.

Electric

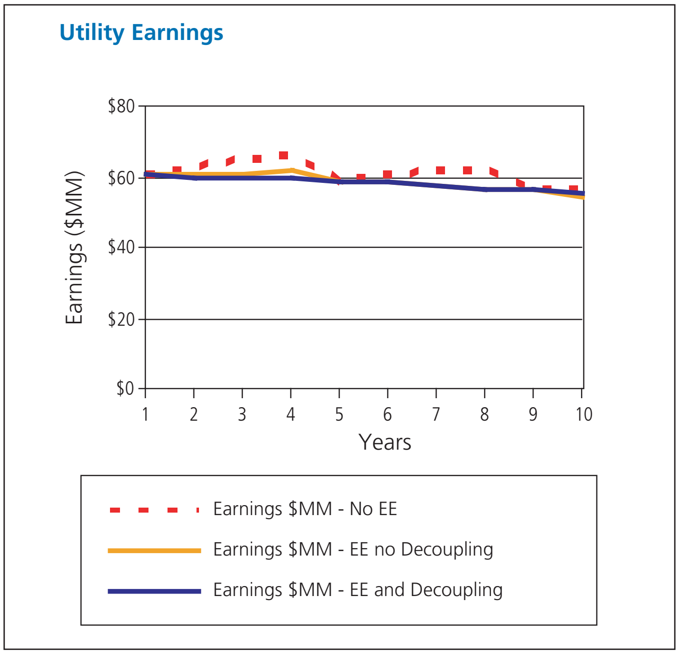


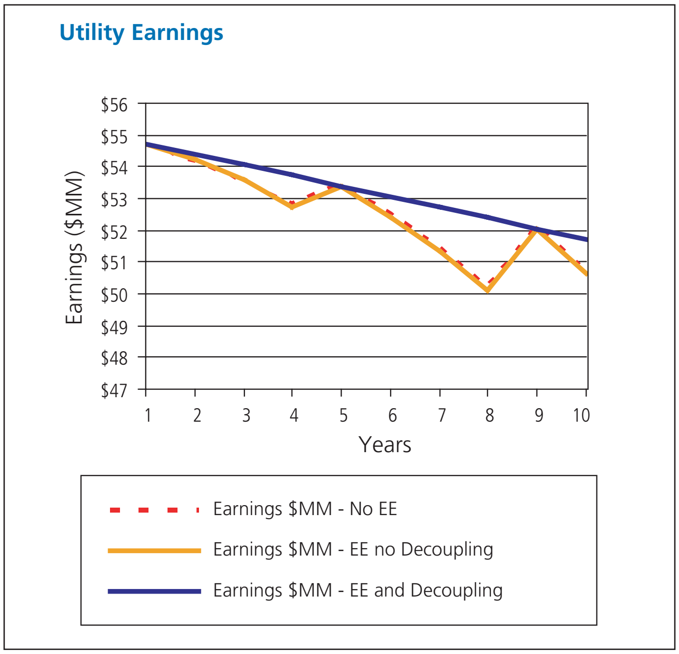
Gas



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.



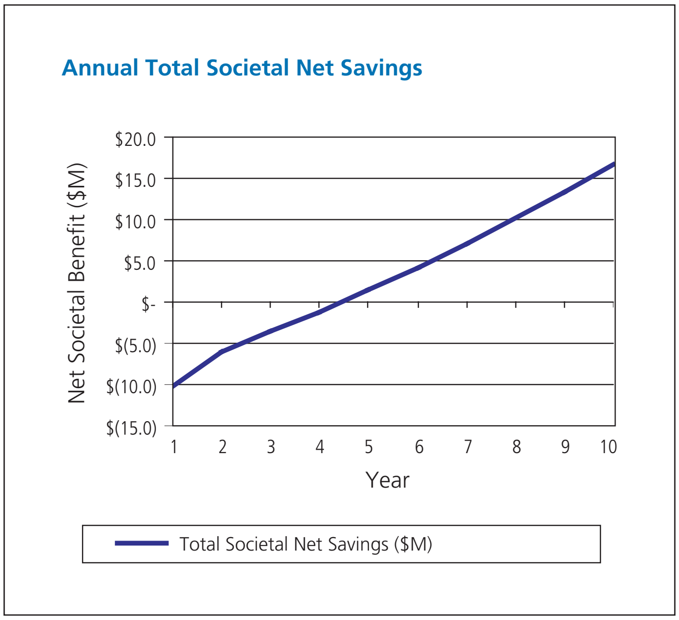


Community or Society Perspective

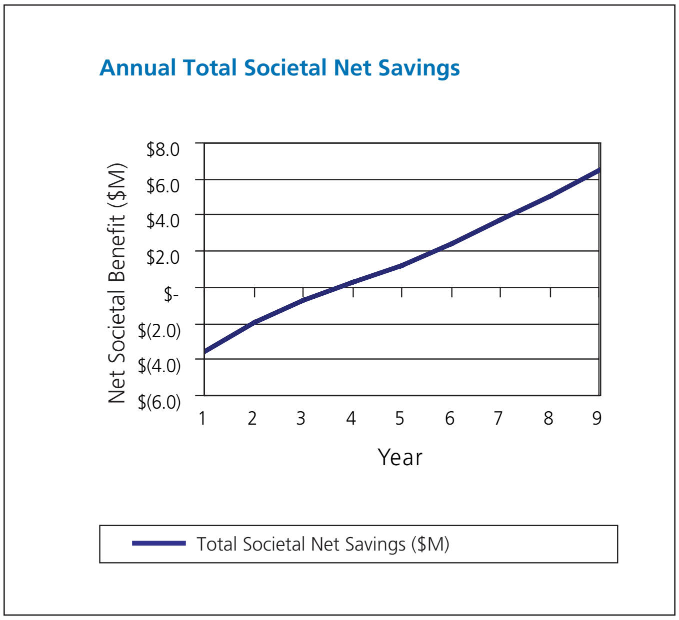
Societal Net Savings - Increase

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

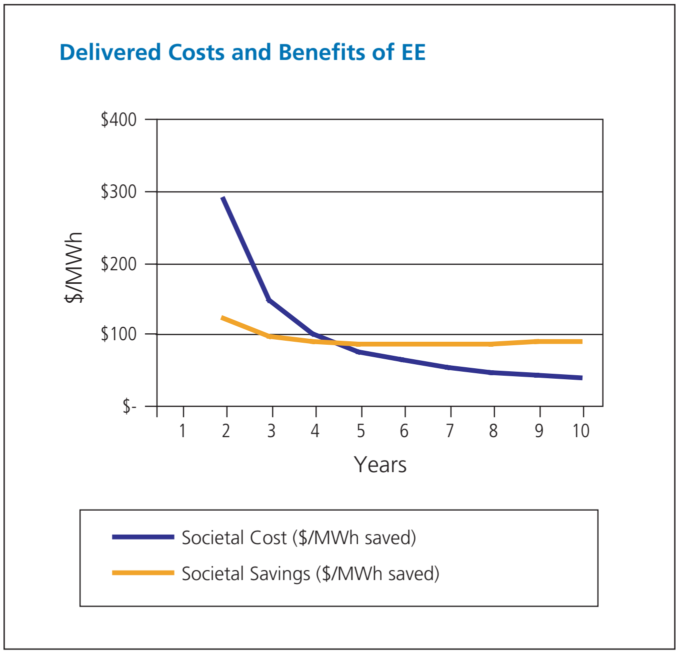


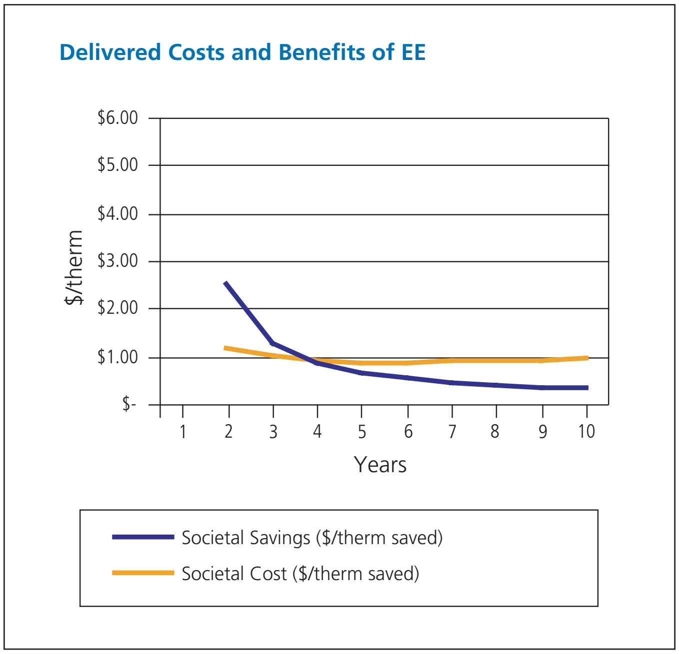
Gas



Total Societal Cost Per Unit - Declines

Total cost of providing each unit of energy (MWh, cf) 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.

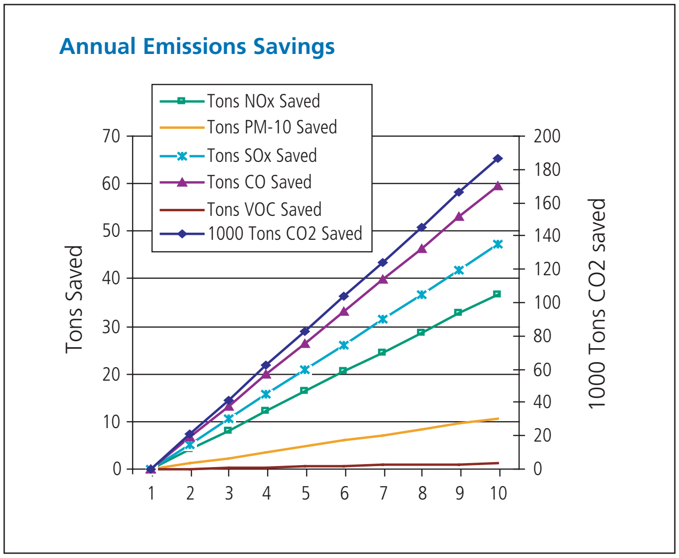




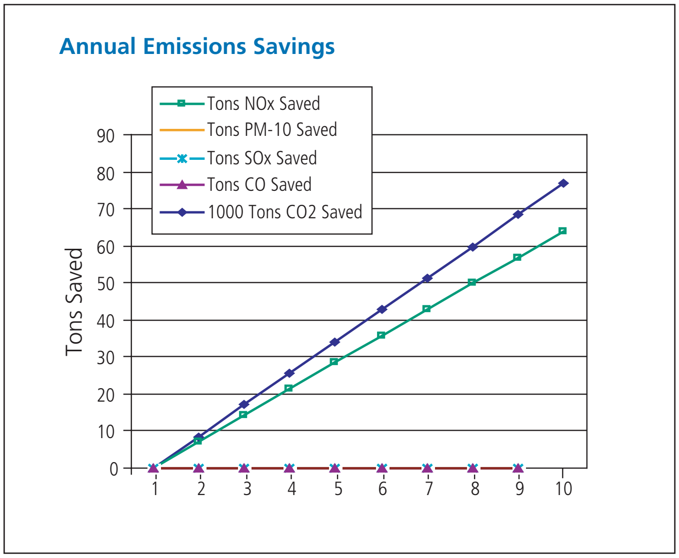
Emissions and Cost Savings - Increase

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, therefore only one case is shown.

Electric

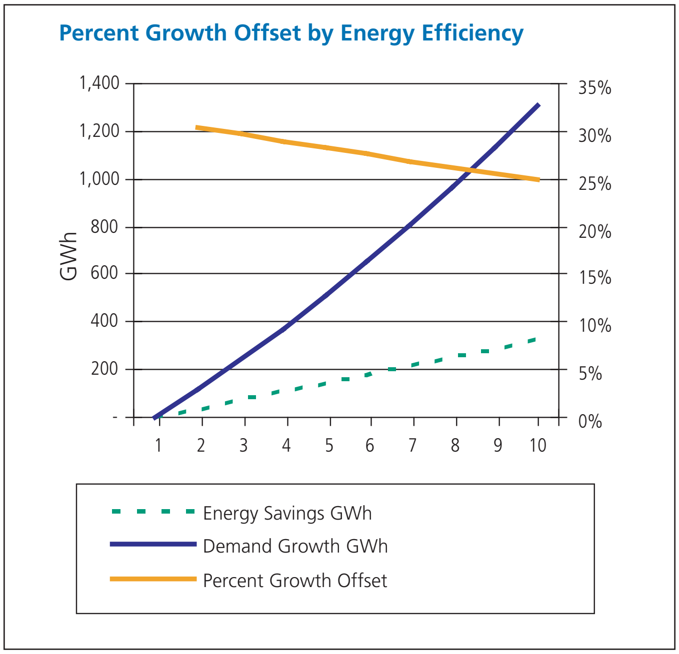


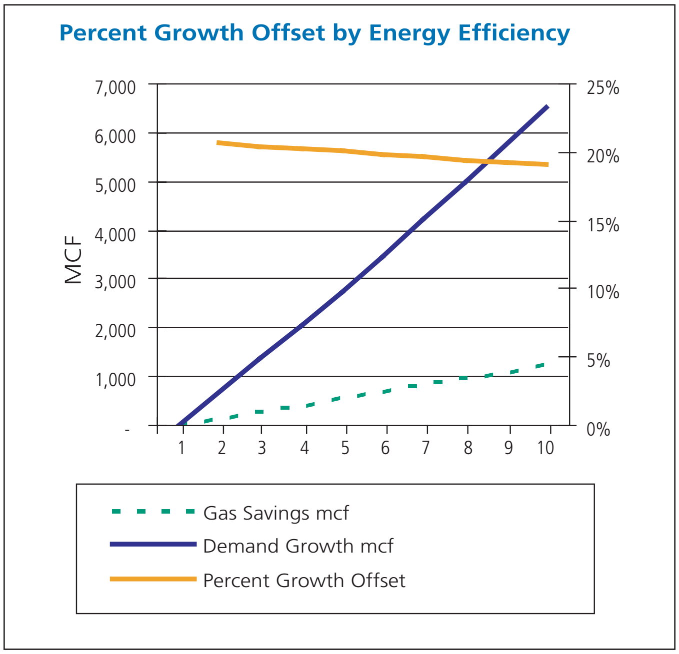
Gas



Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without the EE and illustrates the amount of EE relative to load growth. Demand growth and energy savings are not impacted by decoupling, therefore only one case is shown.

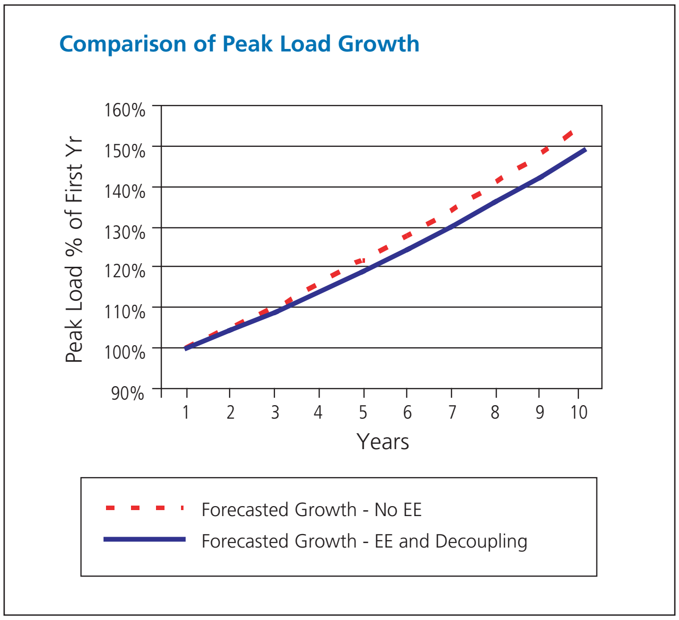




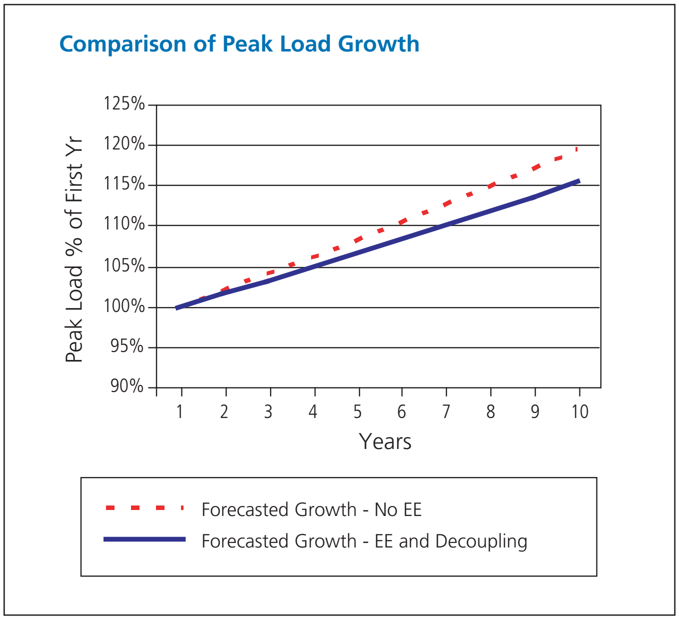
Peak Load Growth – Decrease

Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling, therefore only one case is shown.

Electric



Gas



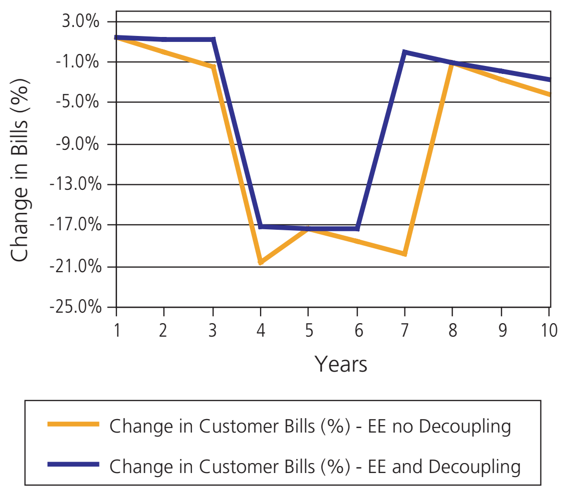
Case 3: Low-Growth with Power Plant Deferral

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.

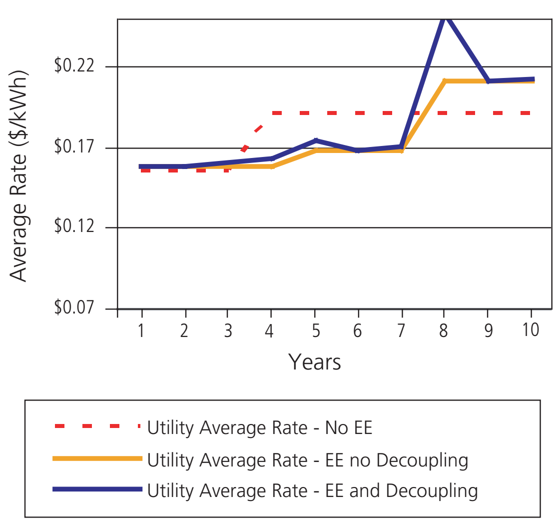
Percent Change in Customer Bills



Utility Rates – Mild Increase

The rates customers pay ($/kWh, $/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.

Comparison of Average Rate

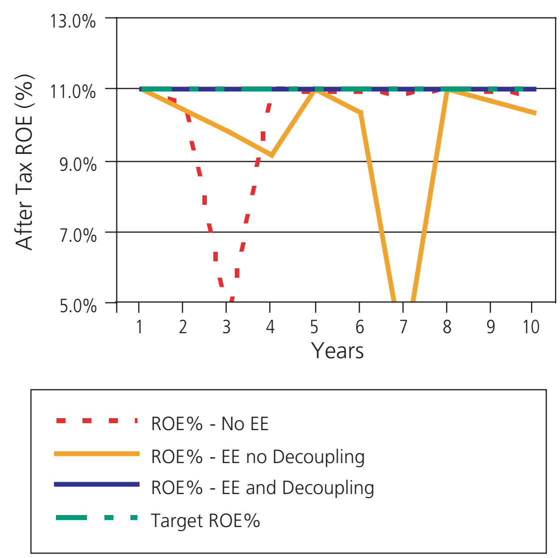


Utility Perspective

Utility Financial Health – Small Changes

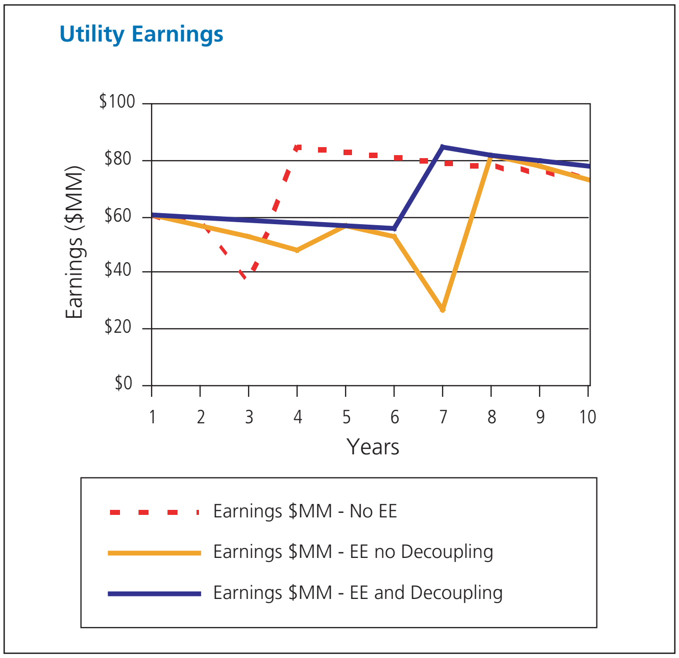
The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility the measure of financial health changes. Investor-Owned Utility - ROE, Publicly- or Cooperatively-Owned Utility - Cash Position or Debt Coverage Ratio.

Investor-Owned Utility Comparison of Return on Equity



Utility Earnings – Results Vary

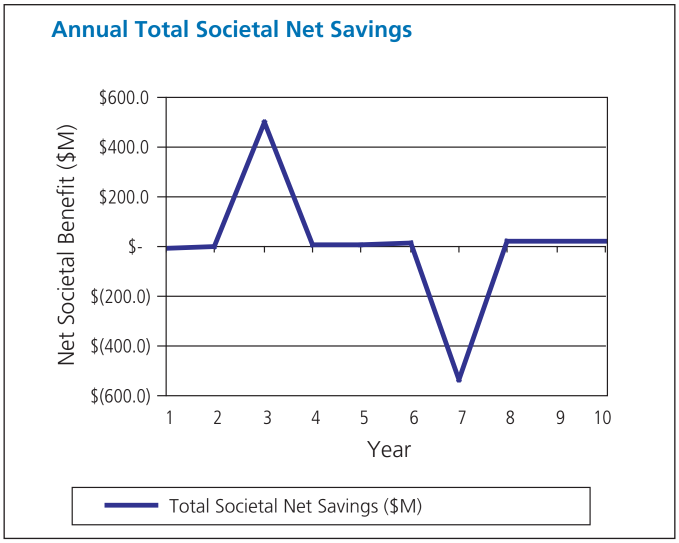
Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If EE reduces capital investment, the earnings will be lower in the EE case unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be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



Community or Society Perspective

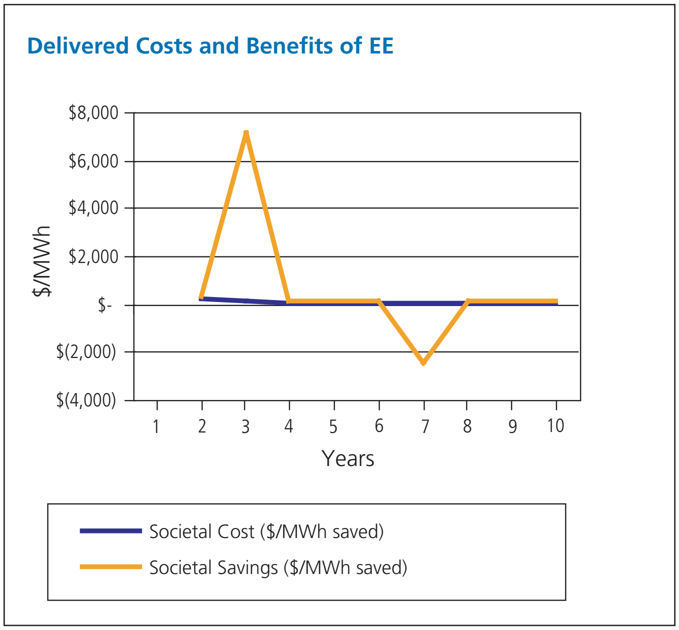
Societal Net Savings - Increase

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.



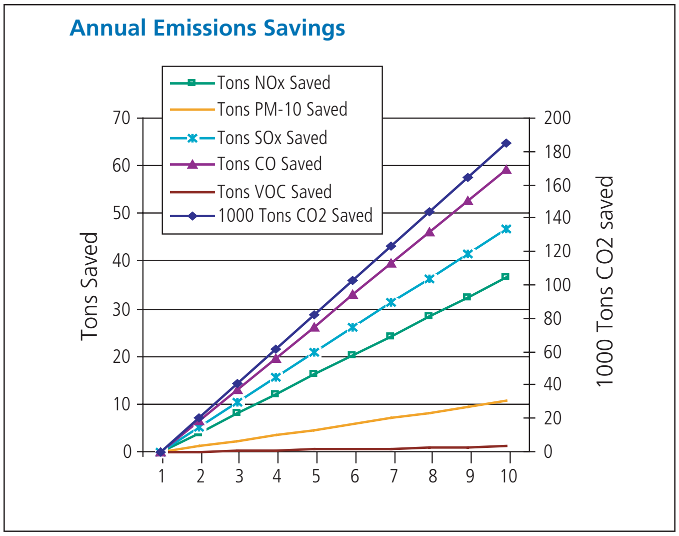
Total Societal Cost Per Unit - Declines

Total cost of providing each unit of energy (MWh, cf) 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.



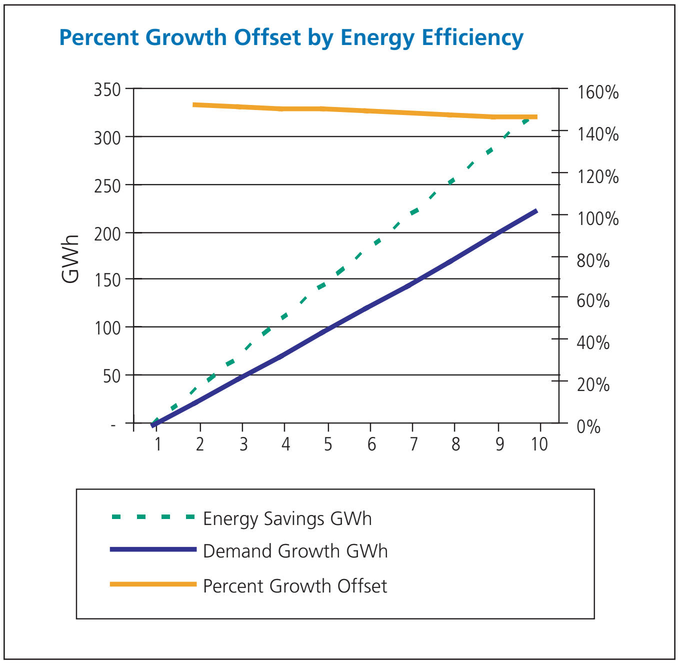
Emissions and Cost Savings - Increase

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, therefore only one case is shown.



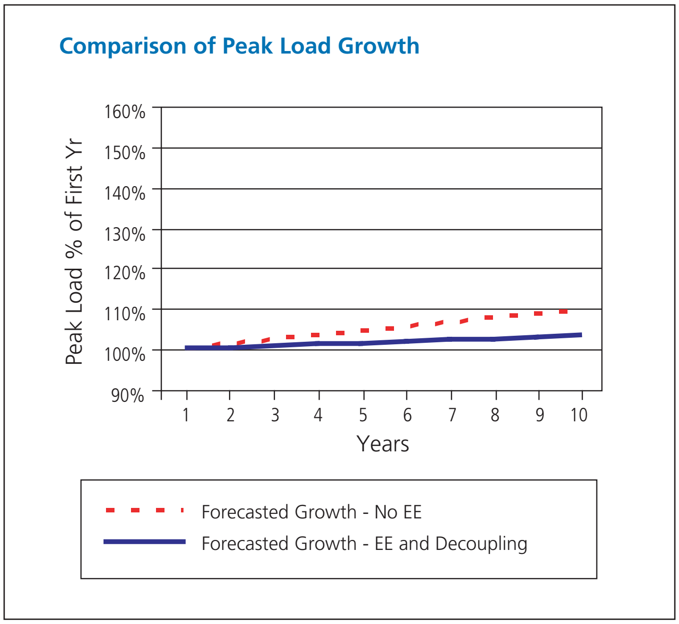
Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without the EE and illustrates the amount of EE relative to load growth. Demand growth and energy savings are not impacted by decoupling, therefore only one case is 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, therefore only one case is shown.

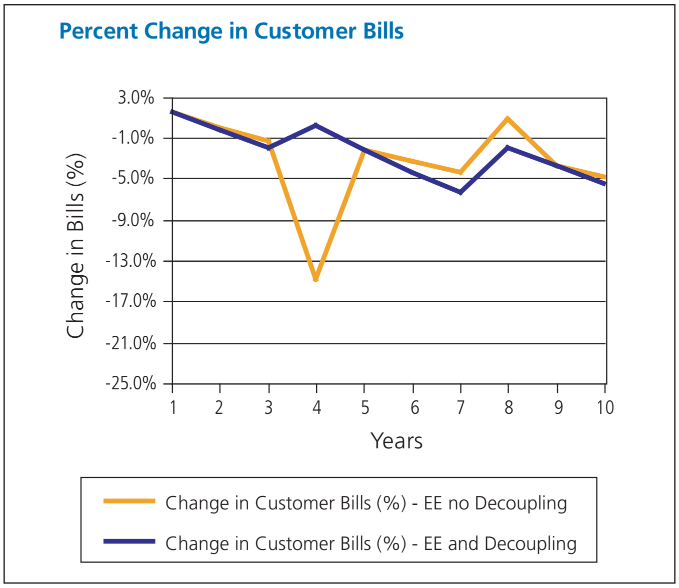


Case 4: High-Growth with Power Plant Deferral

Customer Perspective

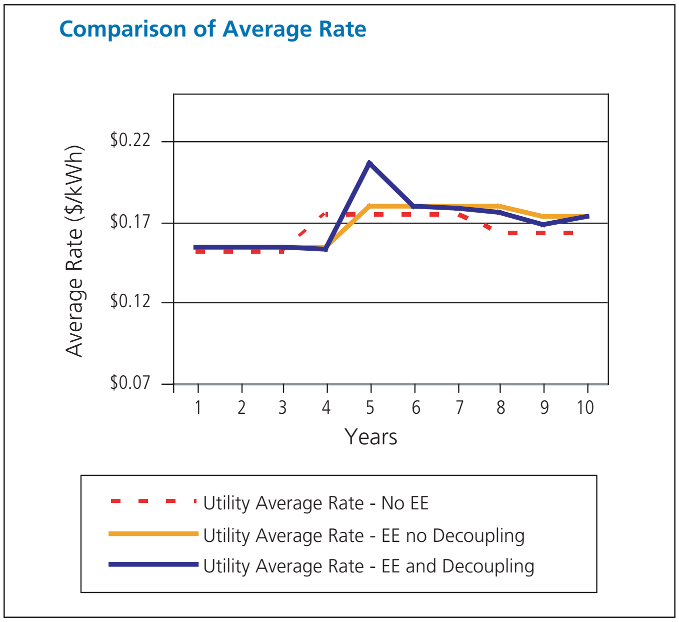
Customer Bills – Decrease

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

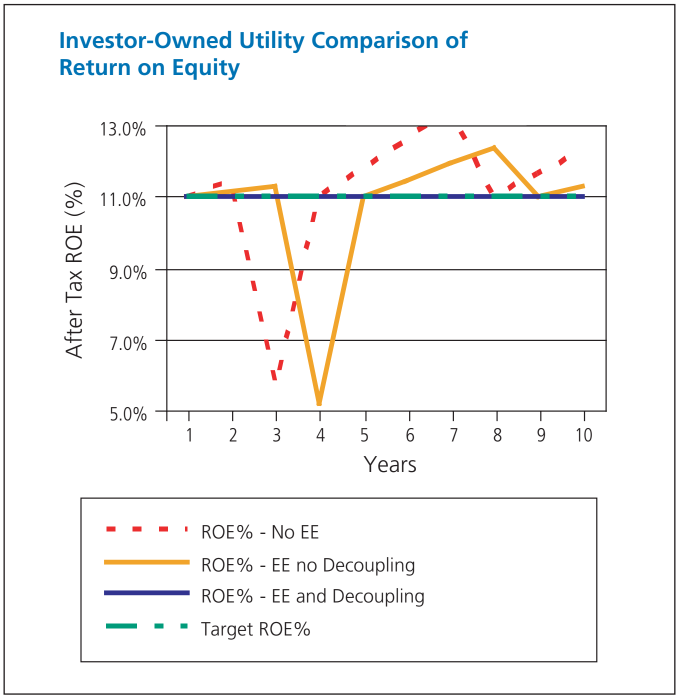
The rates customers pay ($/kWh, $/therm) increase when avoided costs are less than retail rates, which is typically the case for most EE programs. Rates increase because revenue requirements increase more quickly than sales.



Utility Perspective

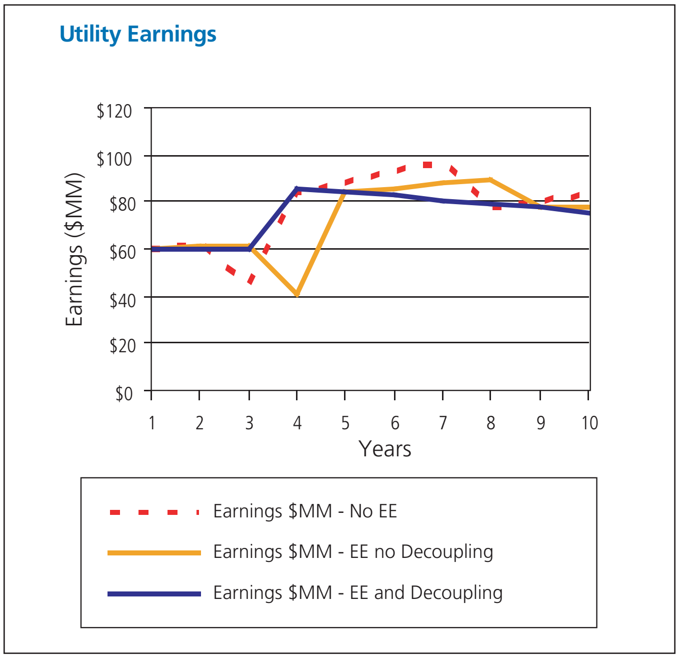
Utility Financial Health – Small Changes

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 - ROE, Publicly- or Cooperatively-Owned Utility - Cash Position or Debt Coverage Ratio.



Utility Earnings – Results Vary

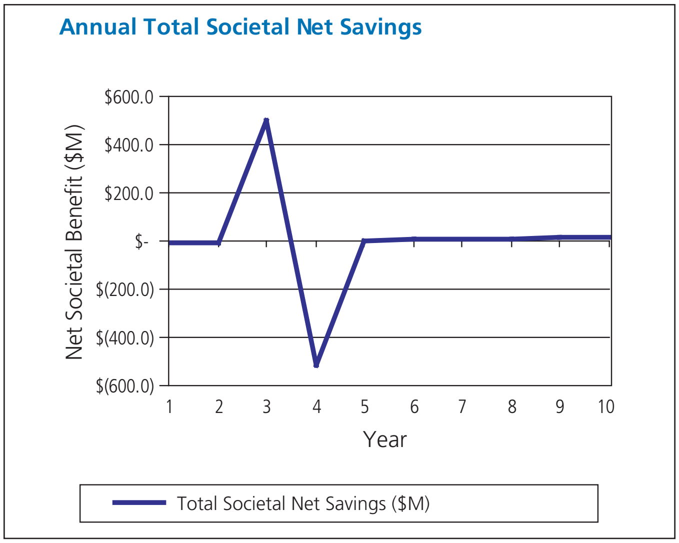
Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If EE reduces capital investment, the earnings will be lower in the EE case unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be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



Community or Society Perspective

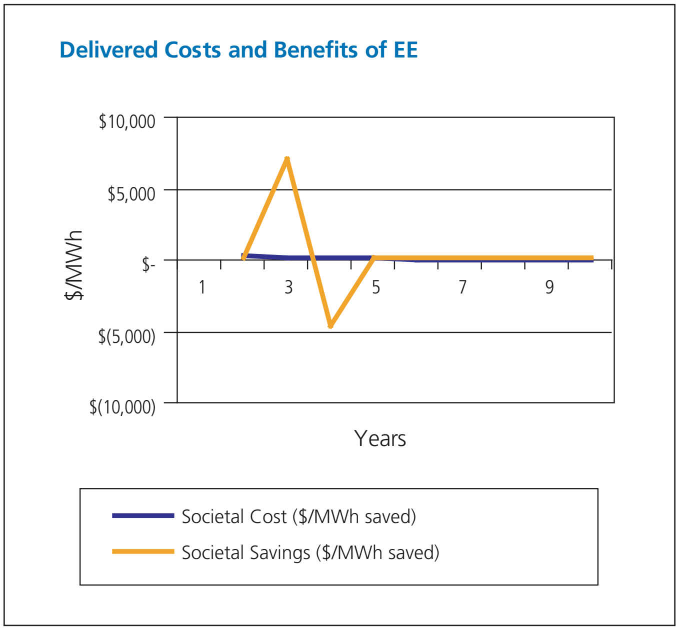
Societal Net Savings - Increase

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.



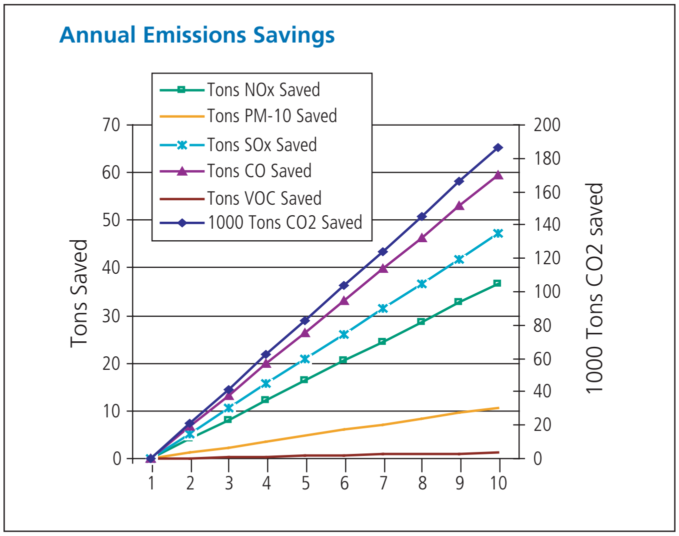
Total Societal Cost Per Unit - Declines

Total cost of providing each unit of energy (MWh, cf) 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.



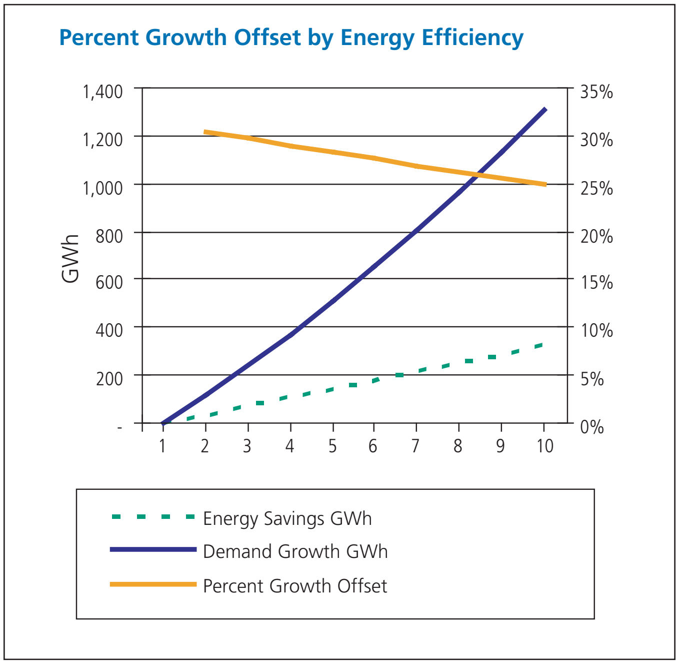
Emissions and Cost Savings - Increase

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, therefore only one case is shown.



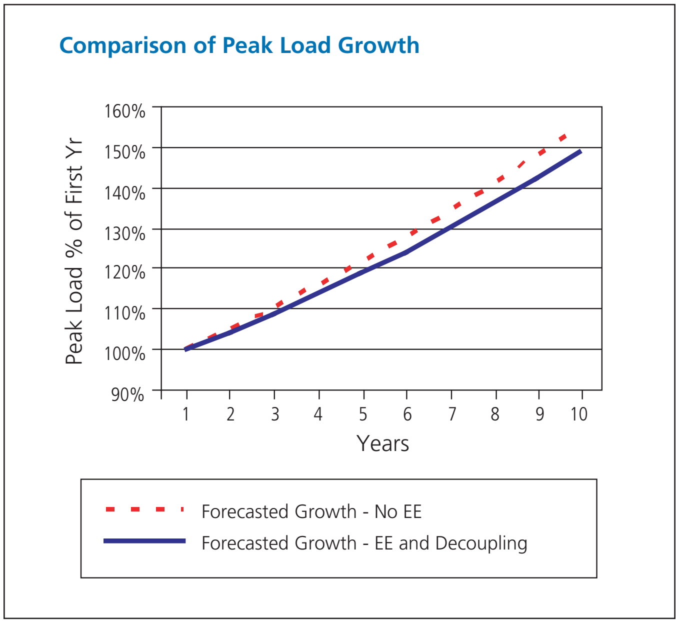
Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without the EE and illustrates the amount of EE relative to load growth. Demand growth and energy savings are not impacted by decoupling, therefore only one case is 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, therefore only one case is shown.



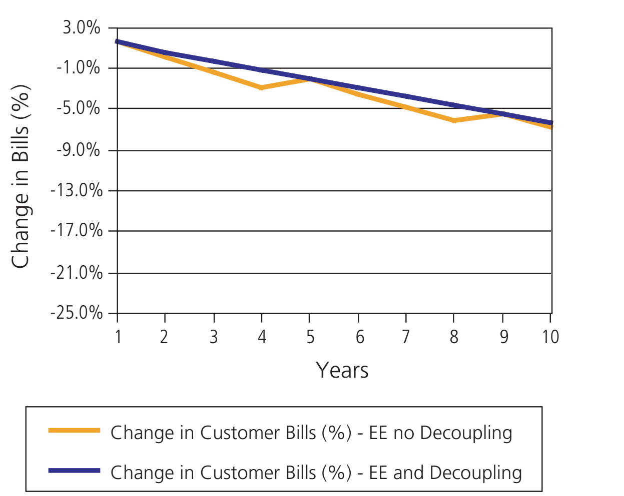
Case 5: Vertically-Integrated Utility

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.

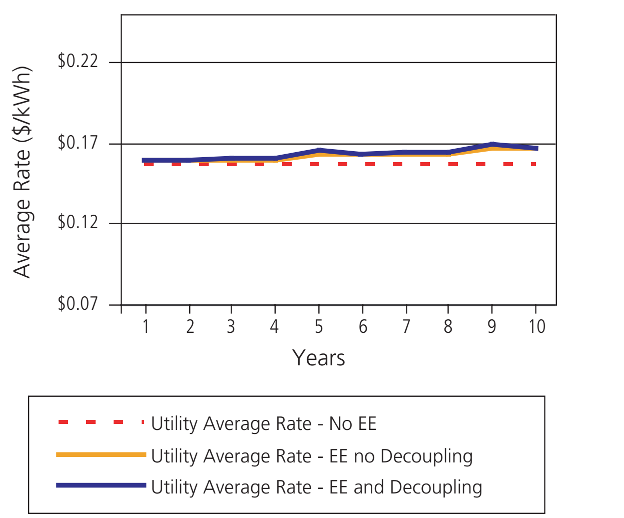
Percent Change in Customer Bills



Utility Rates – Mild Increase

The rates customers pay ($/kWh, $/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.

Comparison of Average Rate

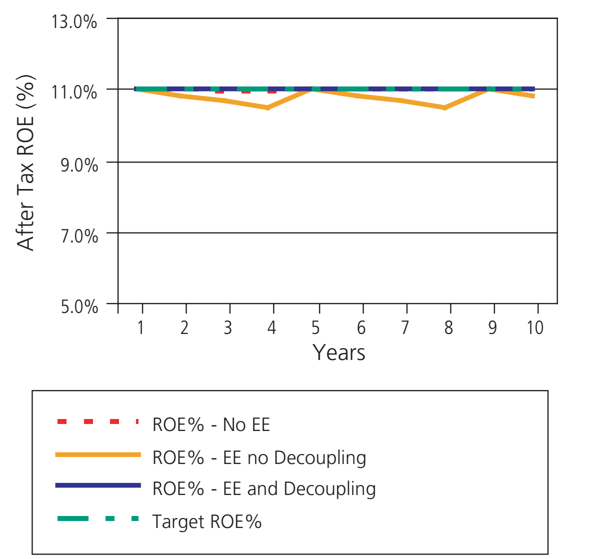


Utility Perspective

Utility Financial Health – Small Changes

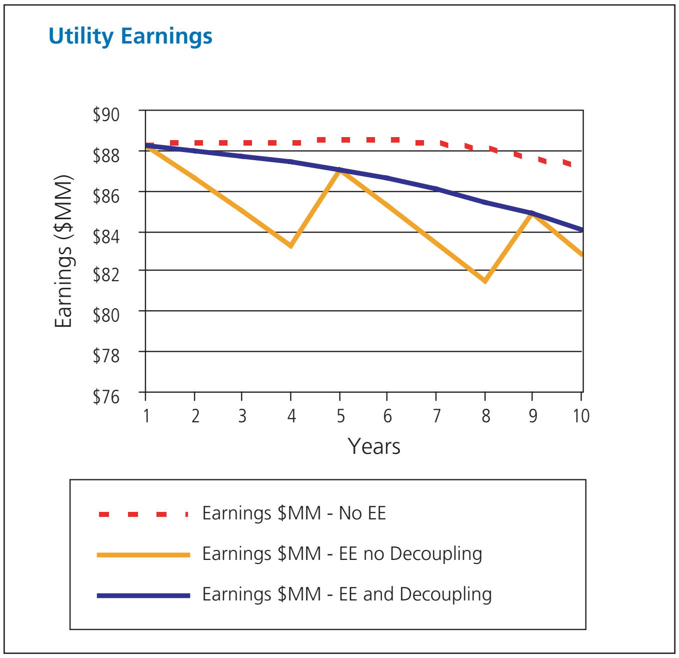
The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility the measure of financial health changes. Investor-Owned Utility - ROE, Publicly- or Cooperatively-Owned Utility - Cash Position or Debt Coverage Ratio.

Investor-Owned Utility Comparison of Return on Equity



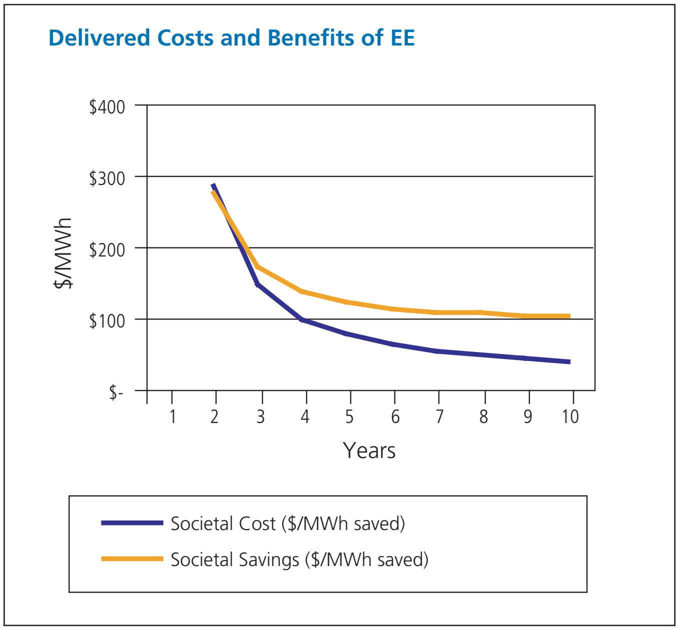
Utility Earnings – Results Vary

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.



Total Societal Cost Per Unit - Declines

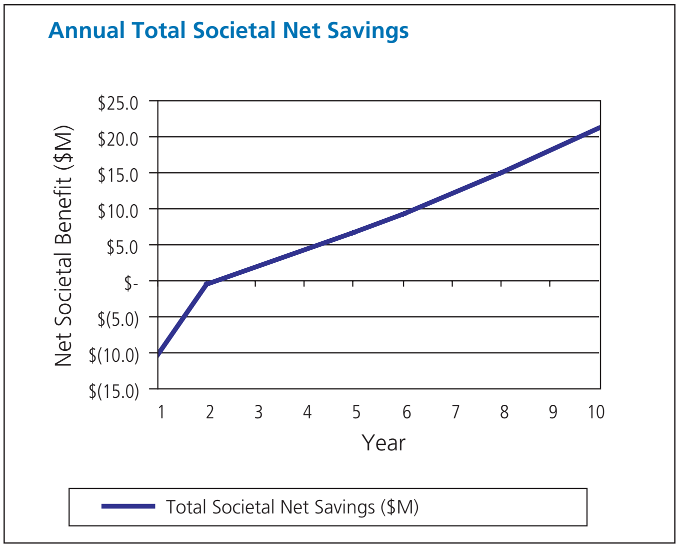
Total cost of providing each unit of energy (MWh, cf) declines over time because of the impacts of energy savings, decreased peak load requirements, and decreased costs during peak periods. Well-designed EE programs can deliver energy at an average cost less than that of new power sources. When the two 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.



Community or Society Perspective

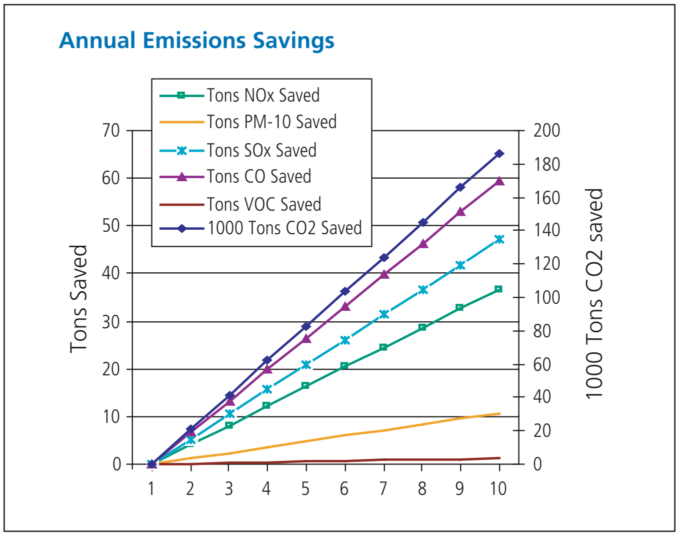
Societal Net Savings - Increase

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.



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, therefore only one case is shown.



Growth Offset by EE – Increase

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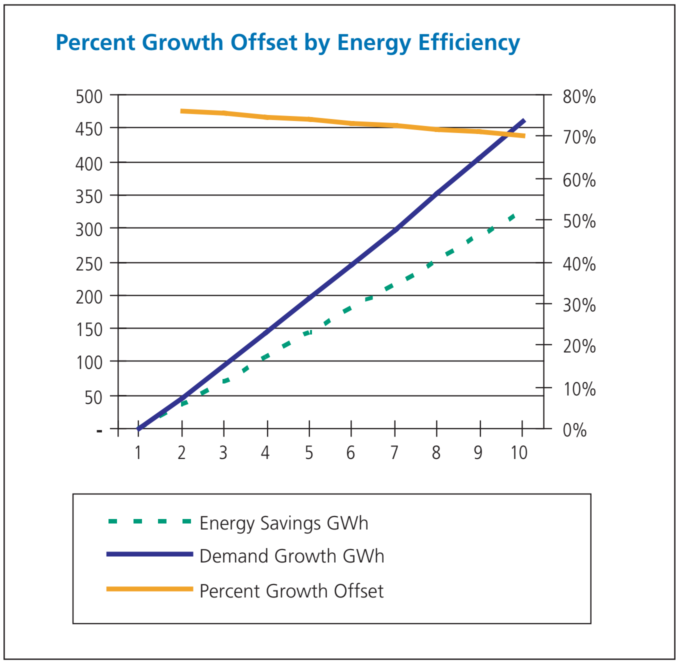
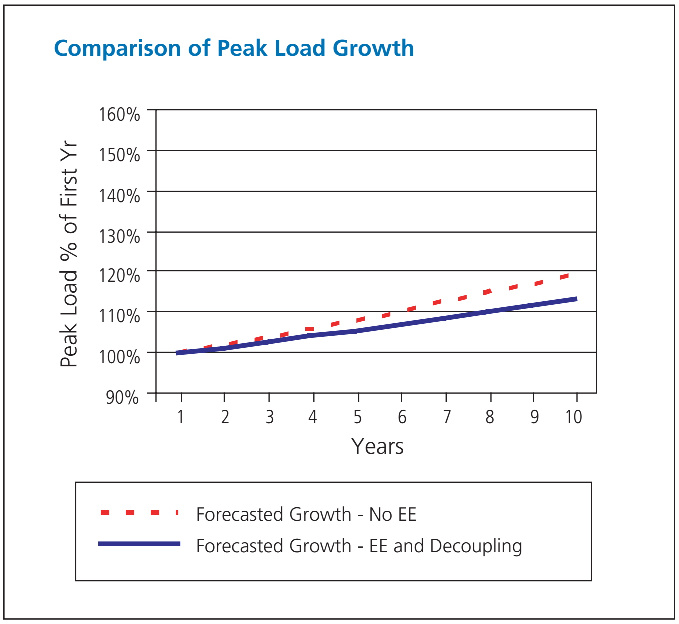


Peak Load Growth – Decrease

Peak load requirements decrease because peak capacity savings are captured due to EE measures. Peak load is not impacted by decoupling, therefore only one case is shown.



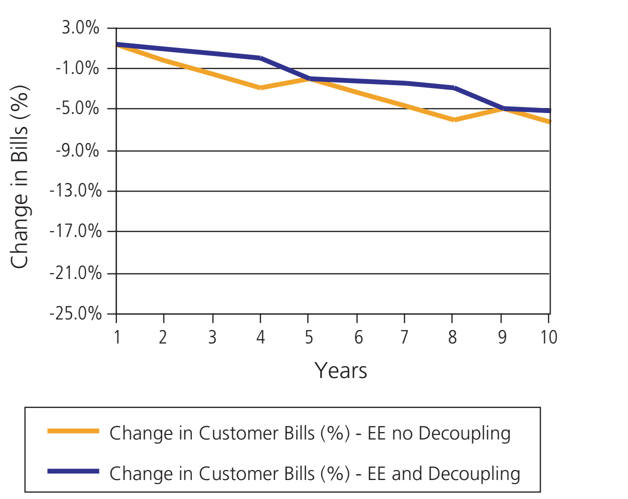
Case 6: Restructured Delivery-Only Utility

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.

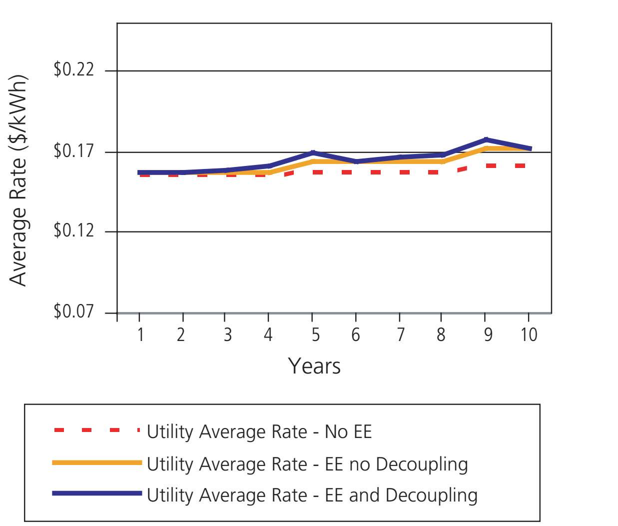
Percent Change in Customer Bills



Utility Rates – Mild Increase

The rates customers pay ($/kWh, $/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.

Comparison of Average Rate

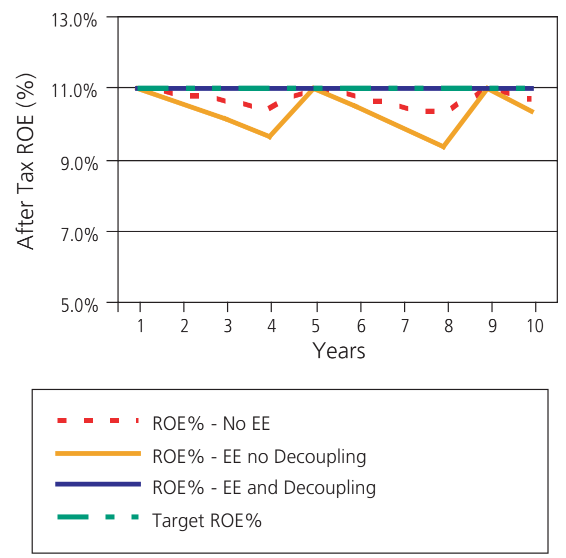


Utility Perspective

Utility Financial Health – Small Changes

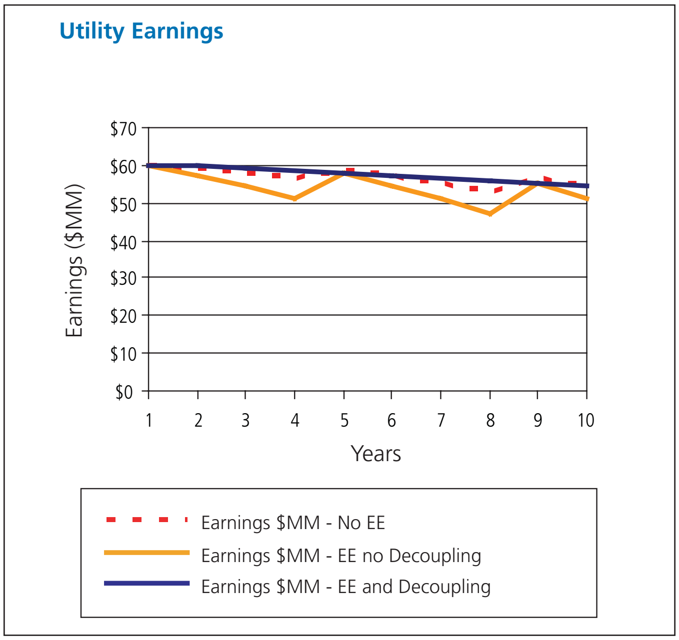
The change in utility financial health depends on whether or not there are decoupling mechanisms in place, if there are shareholder incentives in place (for investor-owned utilities), the frequency of rate adjustments, and other factors. Depending on the type of utility the measure of financial health changes. Investor-Owned Utility - ROE, Publicly- or Cooperatively-Owned Utility - Cash Position or Debt Coverage Ratio.

Investor-Owned Utility Comparison of Return on Equity



Utility Earnings – Results Vary

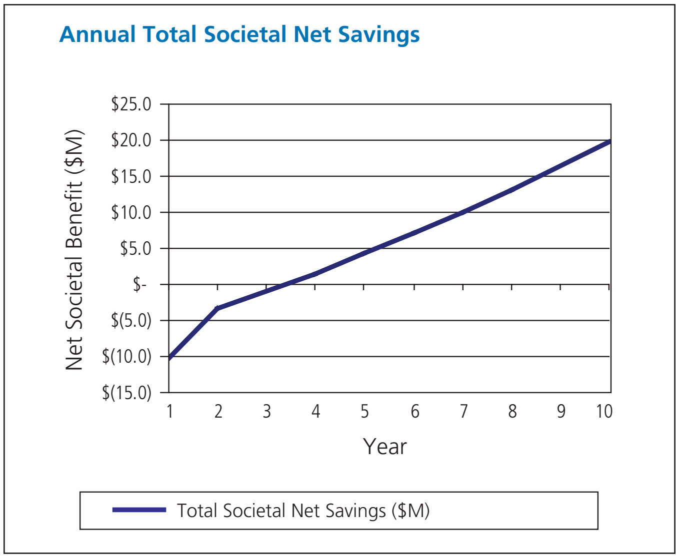
Utility earnings depend on growth rate, capital investment, frequency of rate adjustments, and other factors. If EE reduces capital investment, the earnings will be lower in the EE case unless shareholder incentives for EE are introduced. However, utility return (ROE or earnings per share) may not be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



Community or Society Perspective

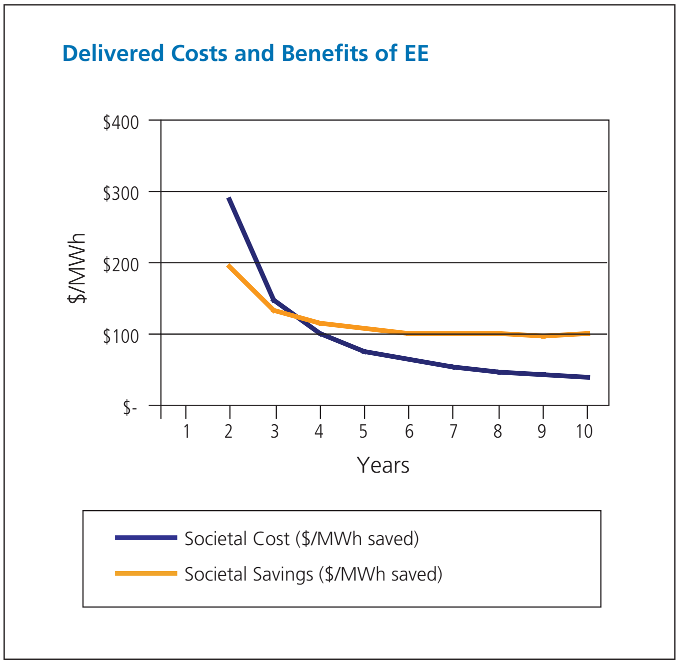
Societal Net Savings - Increase

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.



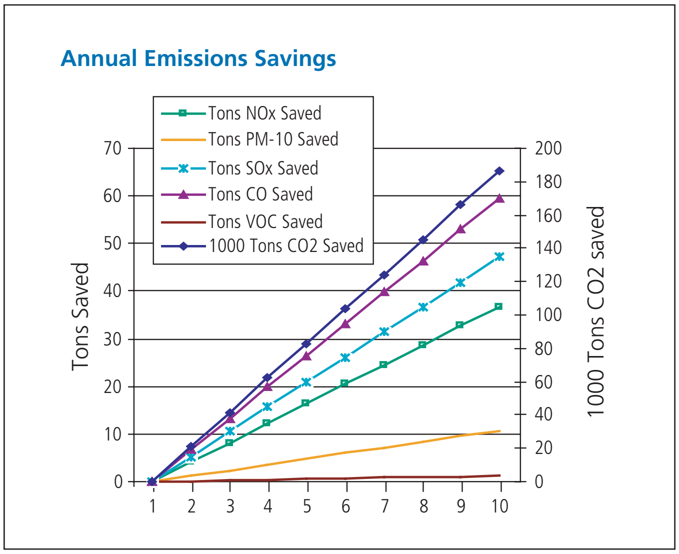
Total Societal Cost Per Unit - Declines

Total cost of providing each unit of energy (MWh, cf) 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.



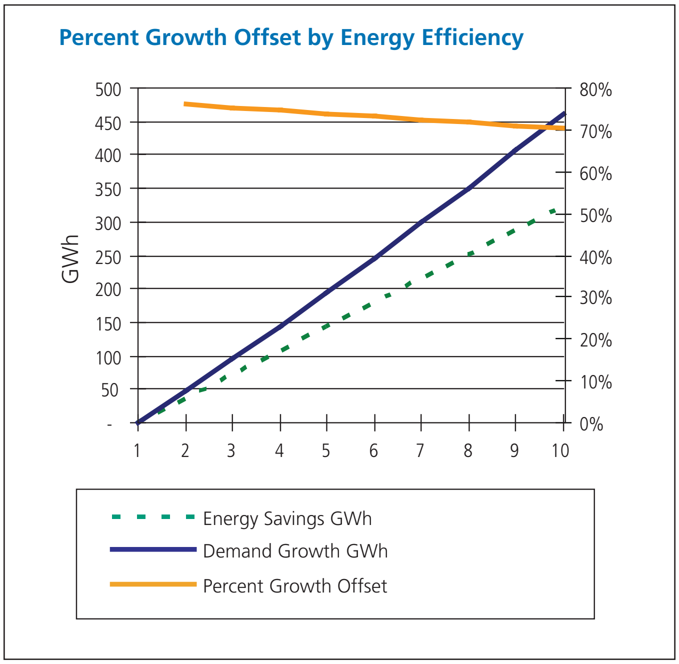
Emissions and Cost Savings - Increase

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, therefore only one case is shown.



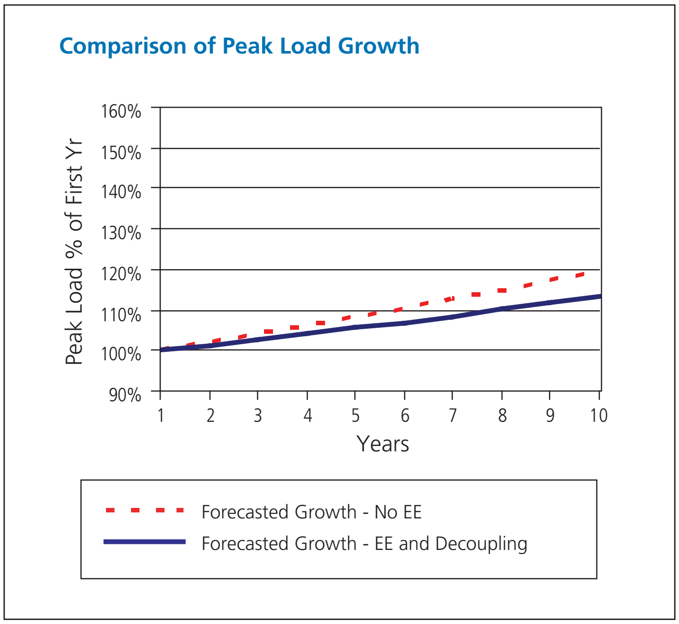
Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without the EE and illustrates the amount of EE relative to load growth. Demand growth and energy savings are not impacted by decoupling, therefore only one case is 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, therefore only one case is shown.

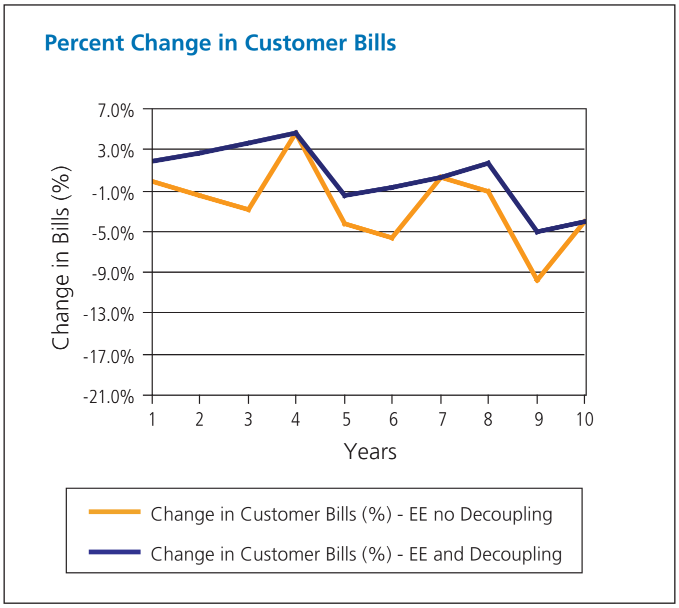


Case 7: Electric Publicly- and Cooperatively-Owned Debt Coverage Ratio

Customer Perspective

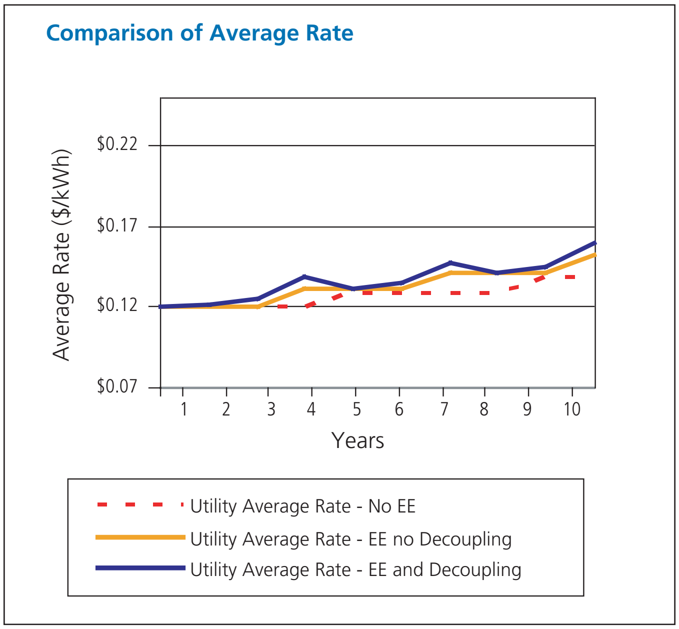
Customer Bills – Decrease

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

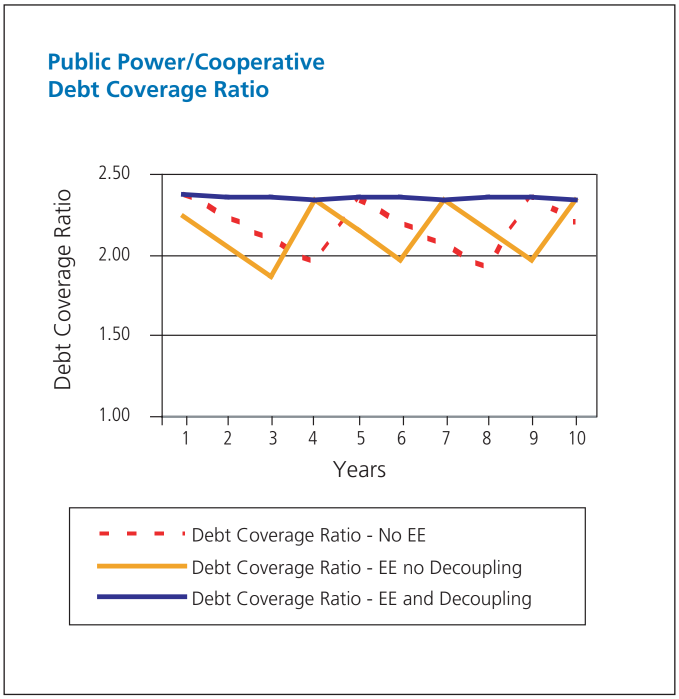
The rates customers pay ($/kWh, $/therm) increase when avoided costs are less than retail rates, which is typically the case for most EE programs. Rates increase because revenue requirements increase more quickly than sales.



Utility Perspective

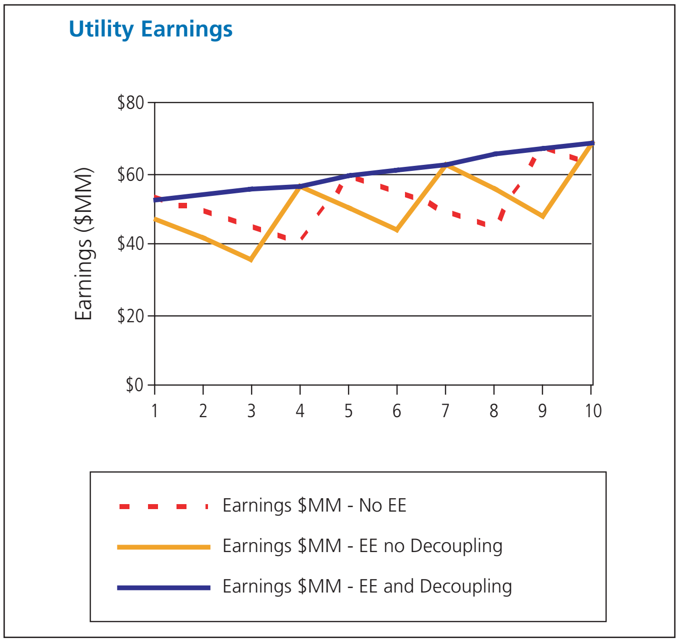
Utility Financial Health – Small Changes

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 - ROE, Publicly- or Cooperatively-Owned Utility - 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.



Community or Society Perspective

Societal Net Savings - Increase

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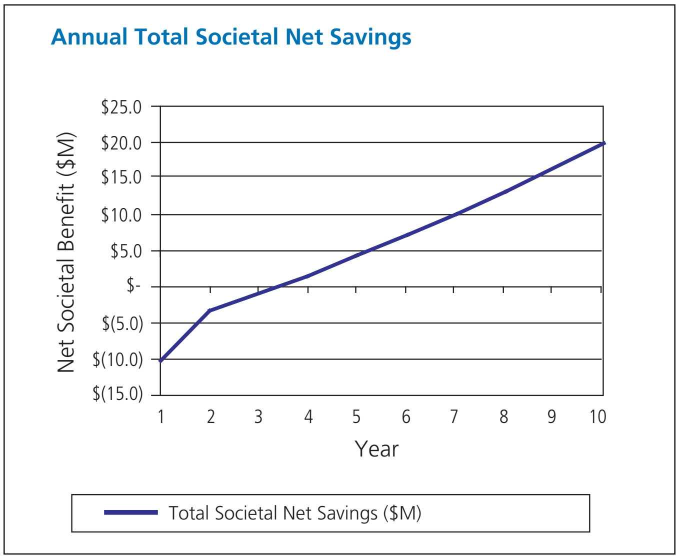

Total Societal Cost Per Unit - Declines

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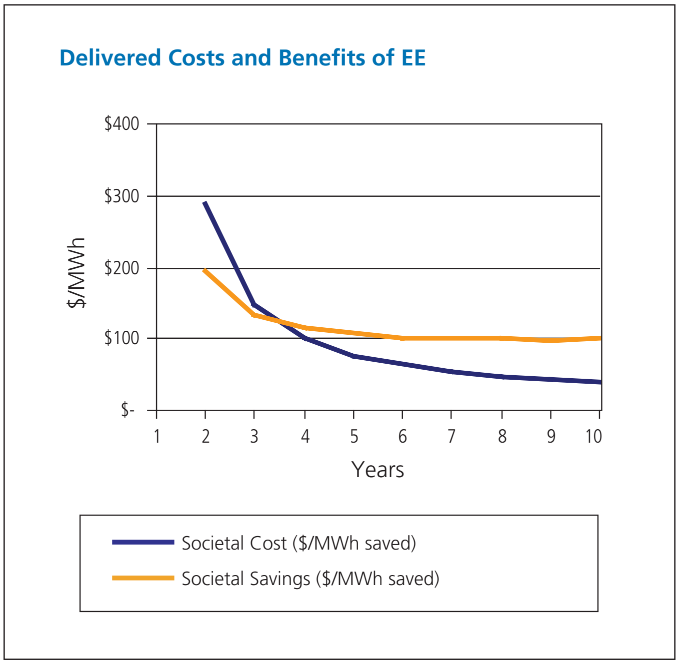

Emissions and Cost Savings - Increase

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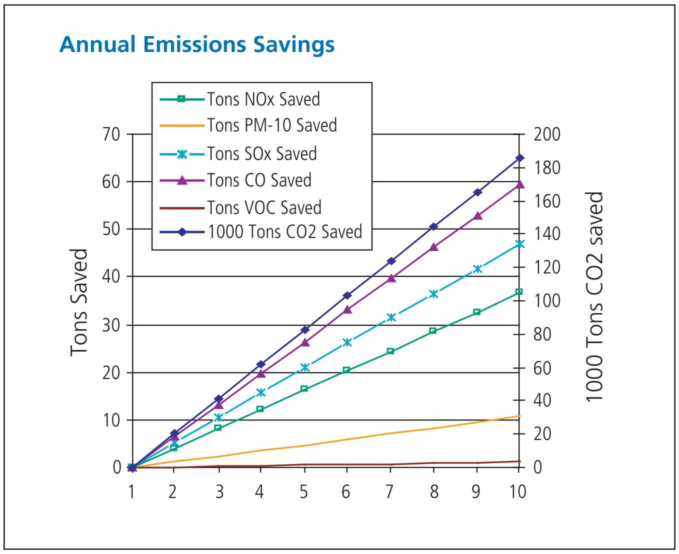
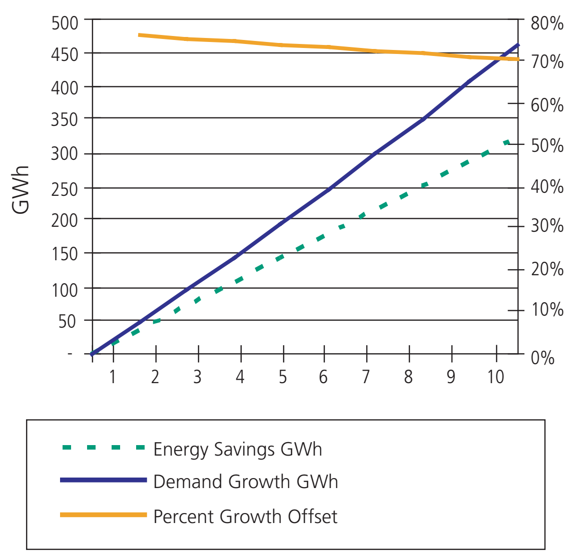


Growth Offset by EE – Increase

As EE programs ramp up, energy consumption declines. This comparison shows the growth with and without the EE and illustrates the amount of EE relative to load growth. Demand growth and energy savings are not impacted by decoupling, therefore only one case is shown.

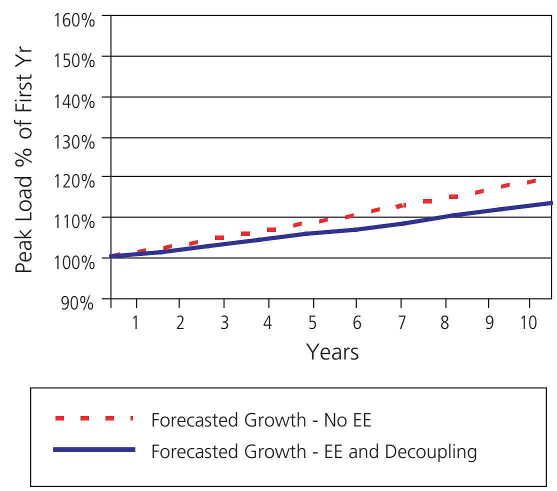
Percent Growth Offset by Energy Efficiency



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, therefore only one case is shown.

Comparison of Peak Load Growth



Case 8: Electric Publicly- and Cooperatively-Owned Cash Position

Customer Perspective

Customer Bills – Decrease

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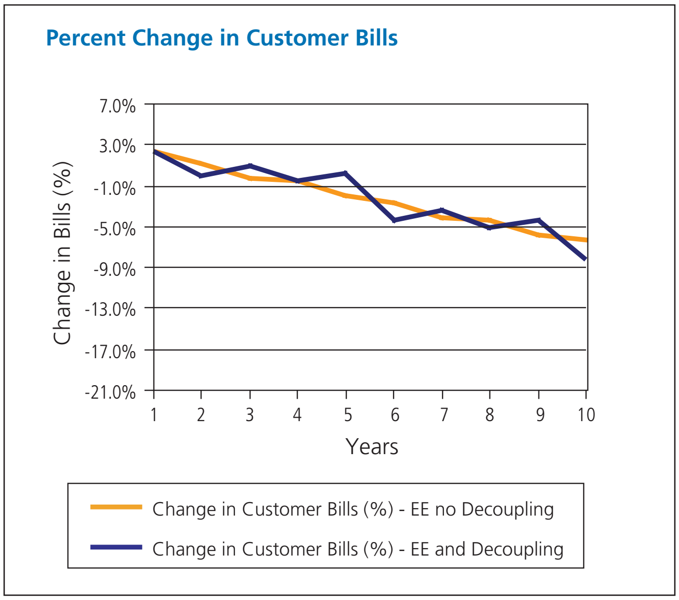

Utility Rates – Mild Increase

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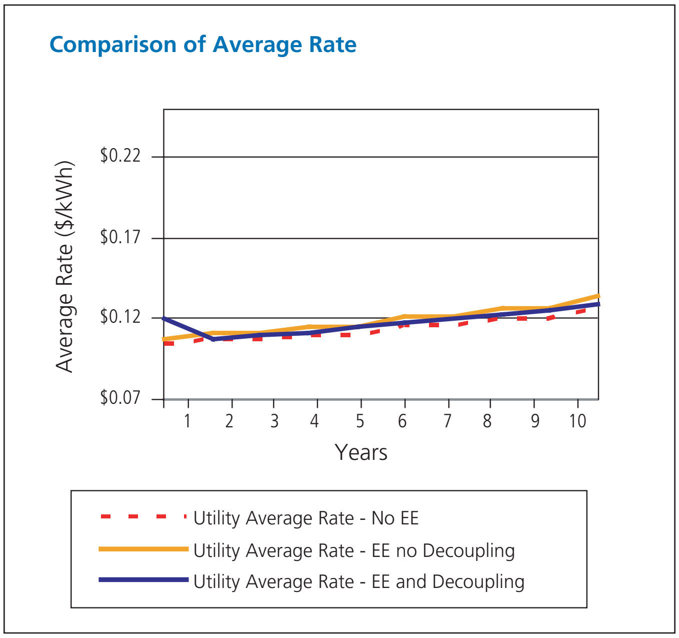

Utility Perspective

Utility Financial Health – Small Changes

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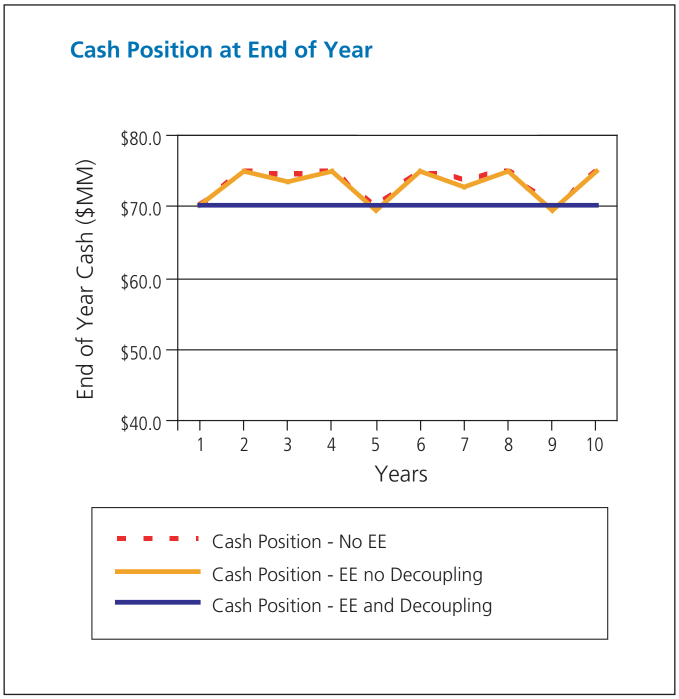
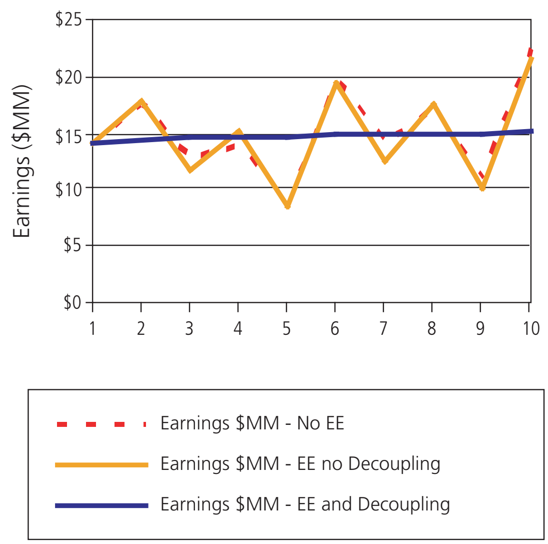


Utility Earnings – Results Vary

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



Community or Society Perspective

Societal Net Savings - Increase

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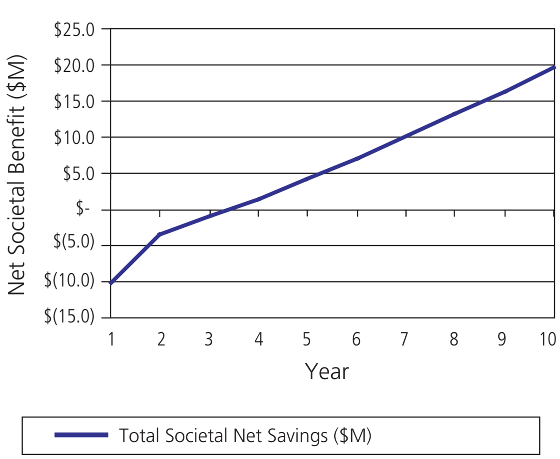
Annual Total Societal Net Savings



Total Societal Cost Per Unit - Declines

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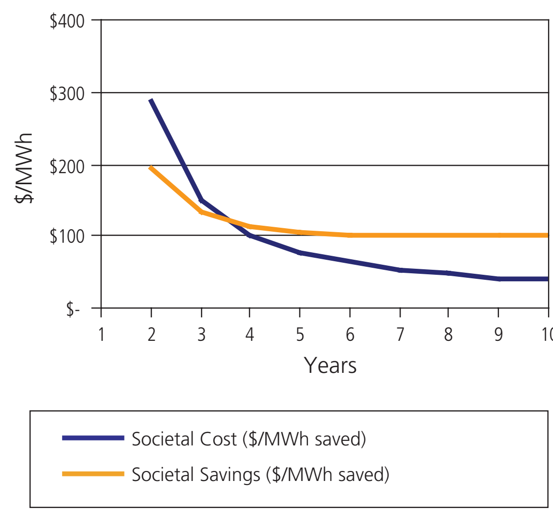
Delivered Costs and Benefits of EE



Emissions and Cost Savings - Increase

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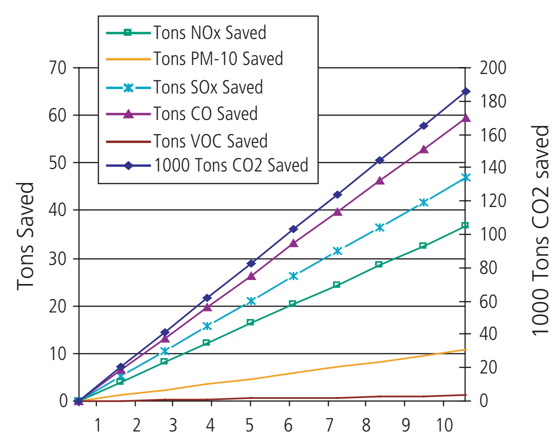
Annual Emissions Savings



Growth Offset by EE – Increase

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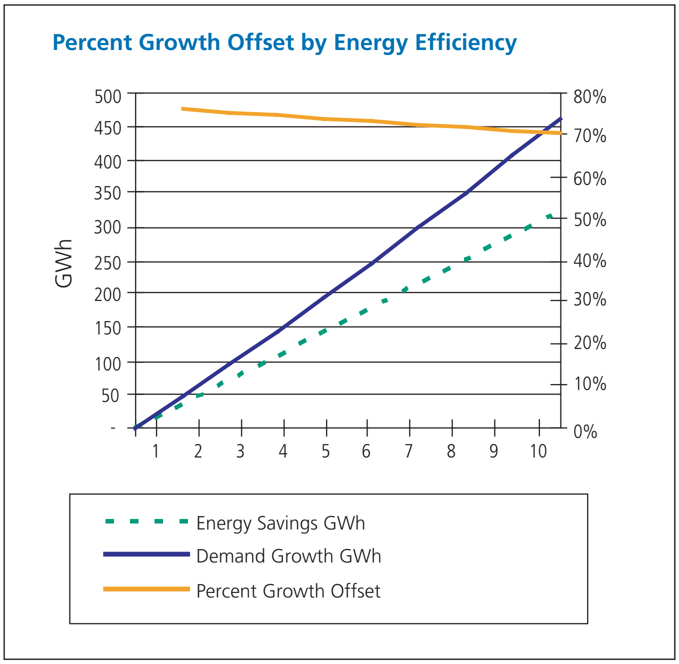

Peak Load Growth – Decrease

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