

# 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, for 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 resource planning decisions for both of these areas.

## 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.*

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.

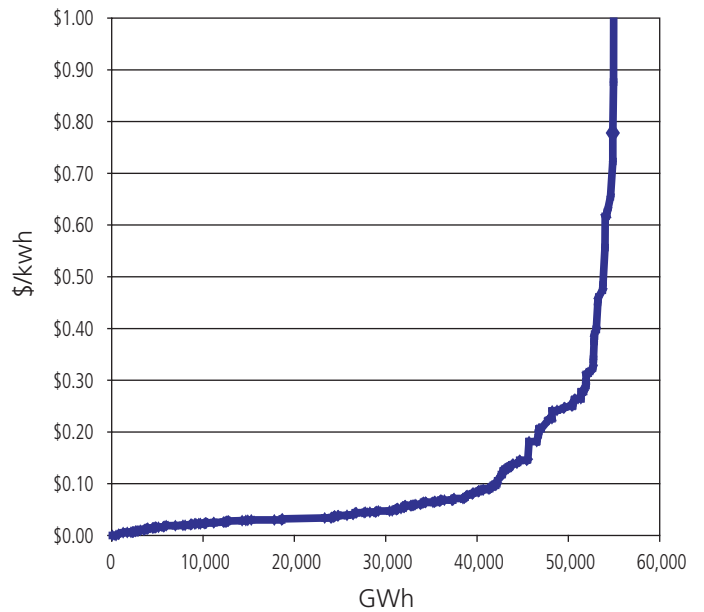
## Challenges to Incorporating Energy Efficiency Into Planning

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 \$/kilowatt-hours [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 here.

## 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) might 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

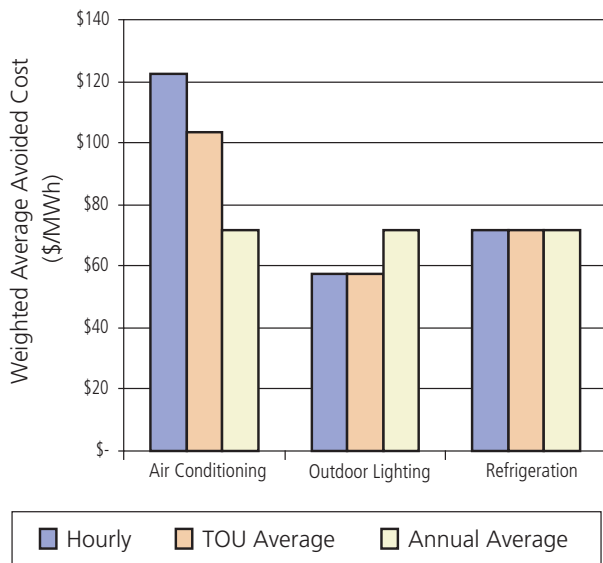
and solar with traditional fossil-fueled generation. In markets where capacity is purchased, “counting” rules for different resource types determine the equivalent reliability. The probability that savings will actually occur during peak periods is easier to estimate with some certainty for a large number 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

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**



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

**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<sup>1</sup> 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 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 Administration (BPA) transmission planning process (described later). Vermont Docket 7081 is another collaborative process—initiated at the direc-

tion 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 New England (ISO-NE) Demand Resources Working Group will be including

<sup>1</sup> 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)/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, might or might 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 [NO<sub>x</sub>], sulfur dioxide [SO<sub>2</sub>]), and emission reduction equipment. Emissions of carbon dioxide (CO<sub>2</sub>), also are affected by planning decisions of whether to consider the value of unregulated emissions. The costs of CO<sub>2</sub> 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<sub>2</sub> prices should be considered when making energy efficiency investments.<sup>2</sup> Even without regulatory policy guidance, several utilities incorporate the estimated future costs of emissions such as CO<sub>2</sub> into their resources planning process to control the financial risks associated with future regulatory changes.<sup>3</sup> For example, Idaho Power

Company includes an estimated future cost of CO<sub>2</sub> 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 (IOUs). Regulators of IOUs 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 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

<sup>2</sup> California established a cost of \$8/ton of CO<sub>2</sub> in 2004, escalating at 5% per year (CPUC, 2005).

<sup>3</sup> For further discussion, see Bokenkamp, et al., 2005.

measures identified as cost effective in an integrated resource plan (IRP) should be implemented.<sup>4</sup> 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 some 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

<sup>4</sup> Established cost-effectiveness tests, such as the total resource cost (TRC) 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/kilowatt-hour (kWh) and \$0.03/kWh for Pacific Gas & Electric (PG&E), NYSERDA, and the Northwest Power and Conservation Council (NWPPCC). 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 <sup>1</sup>	0.03	0.05	0.08	0.28	0.56	0.81
NYSERDA <sup>2</sup>	0.01	0.03	0.06	N/A	N/A	N/A
NWPPCC <sup>3</sup>	0.024	N/A	0.060	N/A	N/A	N/A
Texas <sup>4</sup>	0.02 <sup>5</sup>	N/A	0.060 <sup>6</sup>	N/A	N/A	N/A

<sup>1</sup> PG&E, 2005

<sup>2</sup> NYSERDA, 2005

<sup>3</sup> NWPPCC, 2005

<sup>4</sup> Calculated based on Texas Utility Avoided Cost (PUCT Substantive Rule §25.18 of 2000). \$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).

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

<sup>6</sup> Based on Public Utility Commission of Texas (PUCT) Deemed Avoided Costs of \$0.0268/kWh for energy and \$78.50/kW-year for capacity; 448GWh and 193MW of peak load reduction.

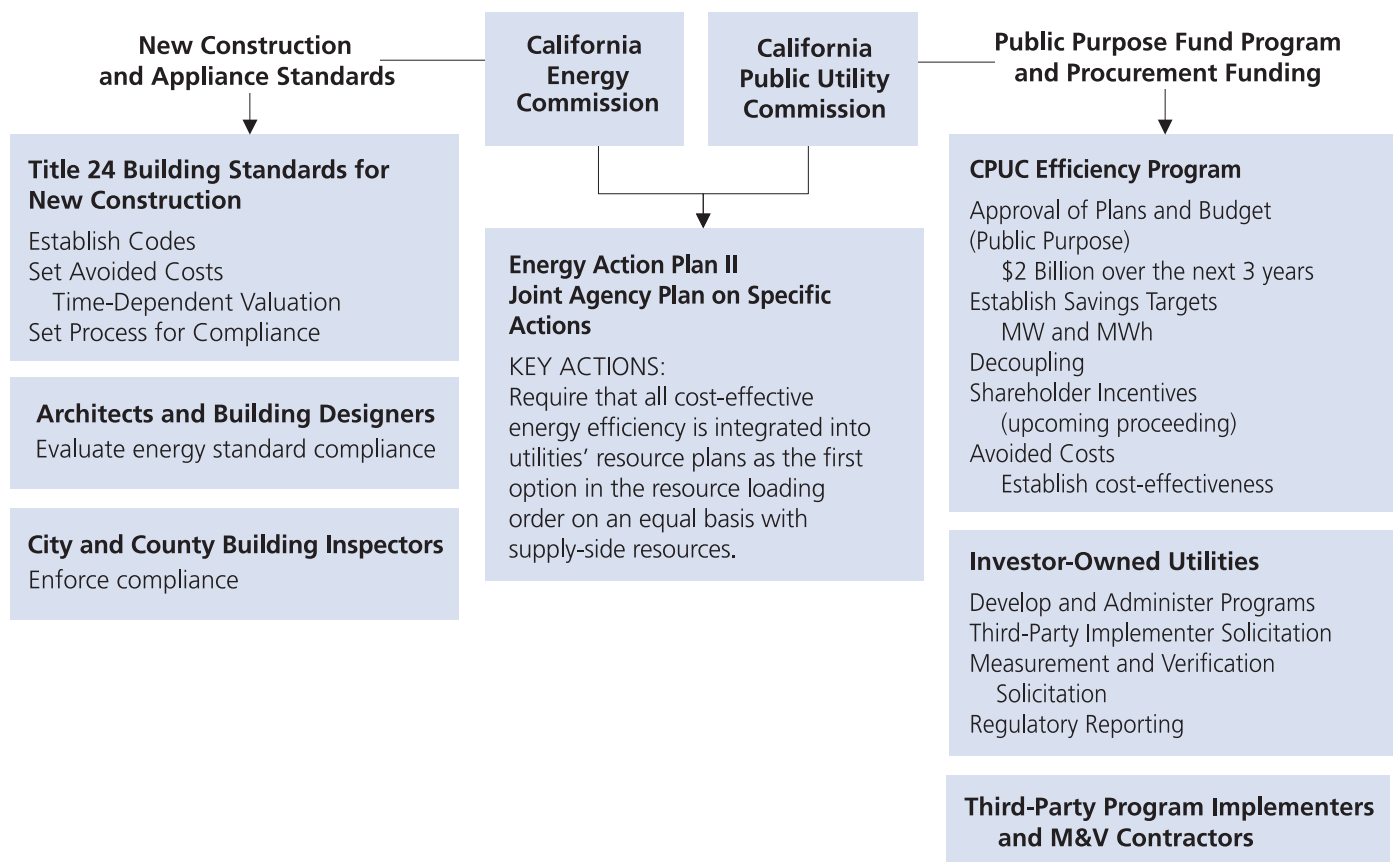
## California

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 IOU 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 IOUs 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 M&V. Figure 3-2 illustrates this approach.

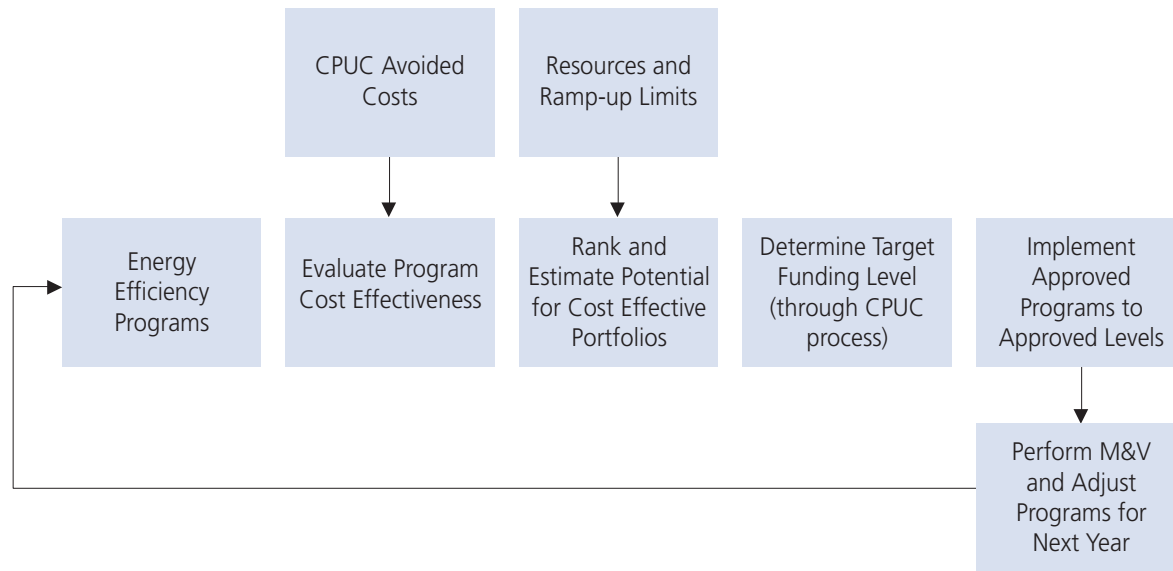
Table 3-2 describes how California addresses barriers for incorporating energy efficiency in planning for the IOU process.

**Figure 3-2. California Efficiency Structure Overview**



Source: Energy and Environmental Economics, Inc.

**Figure 3-3. California Investor-Owned Utility (IOU) 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
<b>A. Determining the Value of Energy Efficiency</b>	
<b>Energy Procurement</b>	
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.
<b>Capacity &amp; Resource Adequacy</b>	
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.
<b>Other Benefits</b>	
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>B. Setting Targets and Allocating Budget</b>	
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.

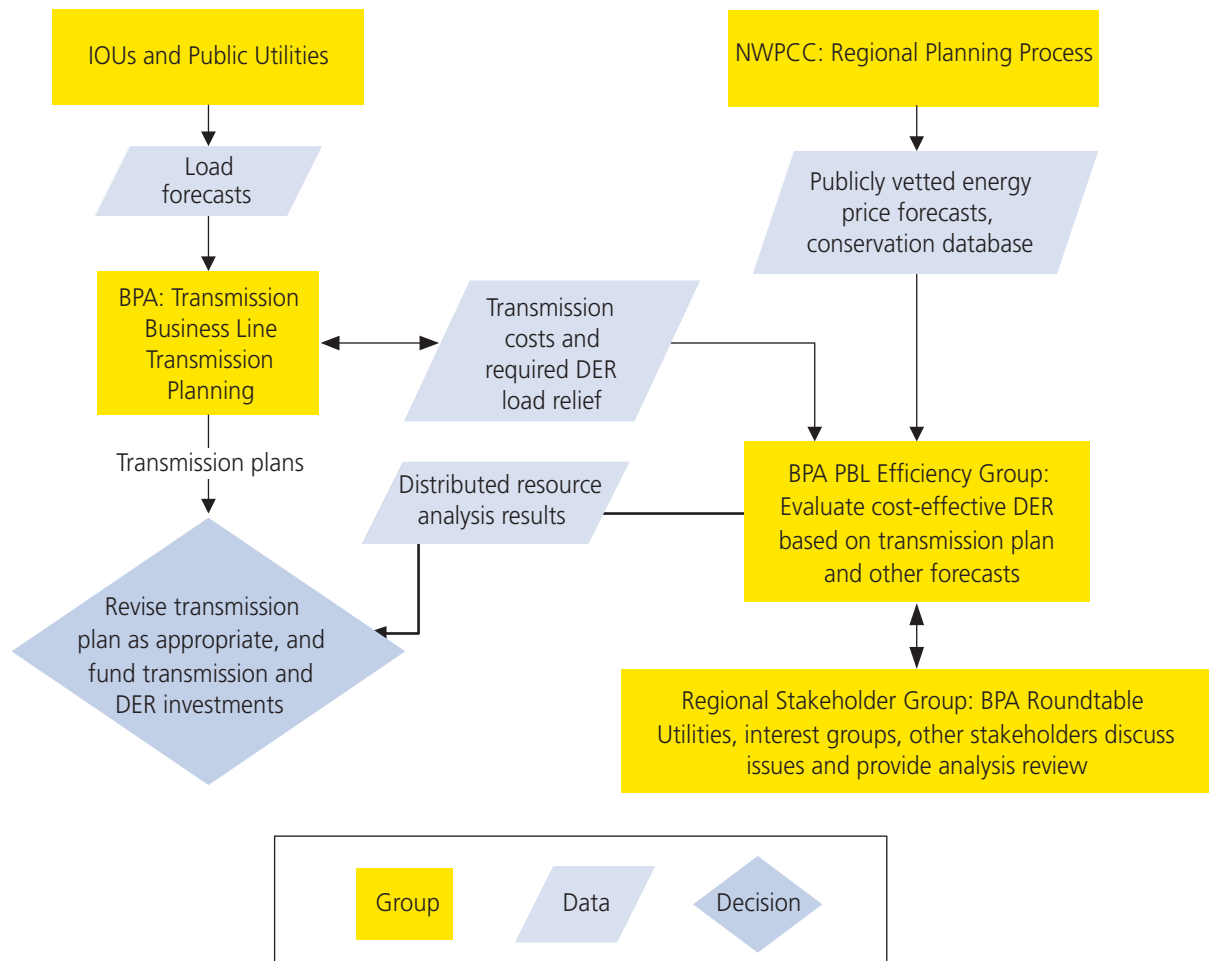
## Bonneville Power Administration Transmission Planning and Regional Roundtable

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.<sup>5</sup>

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.

<sup>5</sup> NWPCC conducts regional energy efficiency planning. More information can be found at <<http://www.nwcouncil.org>>.

**Table 3-3. Incorporation of Energy Efficiency in BPA's Planning Processes**

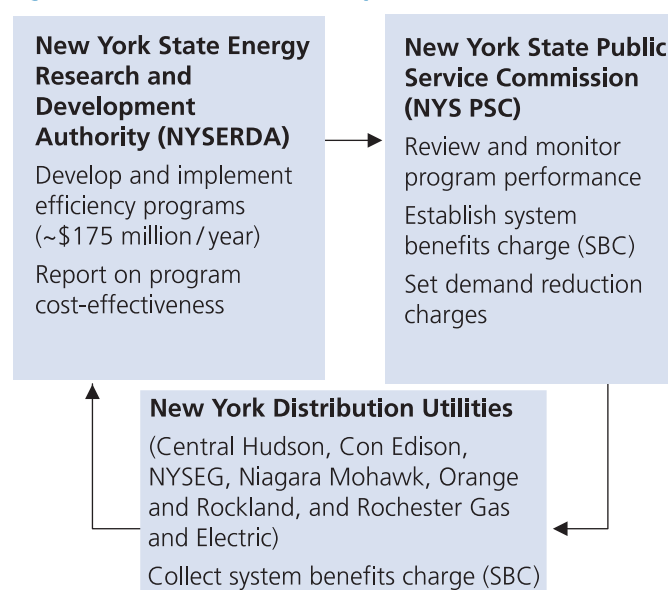
Barriers	BPA-Administered Programs
<b>A. Determining the Value of Energy Efficiency</b>	
<b>Energy Procurement</b>	
Estimated energy savings	The process uses the NWPCC database to define the measure impact and costs. NWPCC maintains a publicly available regional efficiency database that is well regarded 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.
<b>Capacity &amp; Resource Adequacy</b>	
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.
<b>Other Benefits</b>	
Incorporating non-energy benefits	The analysis includes an evaluation of the environmental externalities, but no other non-energy benefits.
<b>B. Setting Targets and Allocating Budget</b>	
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
<b>A. Determining the Value of Energy Efficiency</b>	
<b>Energy Procurement</b>	
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 an 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.
<b>Capacity &amp; Resource Adequacy</b>	
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, however, between the forecasted savings and the actual change in utility procurement budgets.
<b>Other Benefits</b>	
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>B. Setting Energy Efficiency Targets</b>	
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 SBCs collected by the utilities at the 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 (MW) 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 IOUs.

Utilities are required to file an IRP 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 (DSM) 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

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

Barriers	Minnesota-Administered Programs
<b>A. Determining the Value of Energy Efficiency</b>	
<b>Energy Procurement</b>	
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	
<b>Capacity &amp; Resource Adequacy</b>	
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.
<b>Other Benefits</b>	
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>B. Setting Targets and Allocating Budget</b>	
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.

primary mechanism by which the electric utilities achieve the conservation targets included in their IRPs.

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.

### 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

**Table 3-6. Incorporation of Energy Efficiency in Texas' Planning Processes**

Barriers	Texas-Administered Programs
<b>A. Determining the Value of Energy Efficiency</b>	
<b>Energy Procurement</b>	
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.
<b>Capacity &amp; Resource Adequacy</b>	
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.
<b>Other Benefits</b>	
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>B. Setting Energy Efficiency Targets</b>	
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.

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 gigawatt-hours (GWh) of demand reduction was achieved. These energy savings correspond to a reduction of 1,460,352 pounds of nitrogen oxide (NO<sub>x</sub>) 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.

### **PacifiCorp**

PacifiCorp is an investor-owned utility with more than 8,400 MW 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 toward 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 (aMW) of energy efficiency, and to seek an additional 200 aMW 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 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 East and West].

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

Barriers	PacifiCorp-Administered Programs
<b>A. Determining the Value of Energy Efficiency</b>	
<b>Energy Procurement</b>	
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 (RFPs). 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.
<b>Capacity &amp; Resource Adequacy</b>	
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.
<b>Other Benefits</b>	
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>B. Setting Energy Efficiency Targets</b>	
Quantity of energy efficiency to implement	As part of the 2004 IRP, PacifiCorp determined that a base of 250 aMW of efficiency should be included in the goals for the next 10 years, and that an additional 200 aMW 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.

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<sup>6</sup> and NWPCC Database in the Northwest.<sup>7</sup> DEER includes both electricity and natural gas measures while NWPCC contains only electricity 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 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,

<sup>6</sup> 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/>.

<sup>7</sup> The NWPCC Web site, comments, and efficiency measure definition can be found at: <http://www.nwcouncil.org/comments/default.asp>.

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 SBC 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 implement 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 might include assessing the long-term potential for cost-effective energy efficiency within a region (i.e., the energy efficiency that can be delivered cost-effectively through proven programs for each customer class within a planning horizon); examining the role for cutting-edge initiatives and technologies; establishing the cost of supply-side options versus energy efficiency; establishing robust M&V procedures; and providing for routine updates to information on energy efficiency potential and key costs.

### *Options to Consider:*

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

**Recommendation: Broadly communicate the benefits of, and opportunities for, energy efficiency.** Experience shows that energy efficiency programs help customers save money and contribute to lower cost energy systems. But these 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, 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 program 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, SBCs, rate-basing, shared-savings, incentive mechanisms, etc.
- Establishing funding for multi-year periods.

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